

НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ БІОРЕСУРСІВ І
ПРИРОДОКОРИСТУВАННЯ УКРАЇНИ

Кафедра англійської мови для технічних та агробіологічних спеціальностей

ENGLISH
for Forestry
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Навчальний посібник містить автентичні тексти, лексичні та граматичні вправи, матеріали для самостійної роботи, спрямовані на професійно-комунікативне навчання майбутніх фахівців деревообробної галузі, лісового та садово-паркового господарства.

Для студентів I курсу денної форми та скороченого терміну навчання, а також для студентів заочної форми навчання аграрних вищих навчальних закладів спеціальностей «Лісове господарство», «Деревообробні та меблеві технології», «Садово-паркове господарство»

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Укладач: ПОЛІЩУК АНЖЕЛІНА ВОЛОДИМИРІВНА

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Від укладача

Навчальний посібник призначений для студентів ОС «Бакалавр» спеціальностей «Лісове господарство», «Деревообробні та меблеві технології», «Садово-паркове господарство». Відповідно до програми, навчальне видання містить необхідну кількість матеріалів для професійно-комунікативного навчання майбутніх фахівців лісового та садово-паркового господарства. Посібник складається з двох частин: основної, призначеної для аудиторної роботи, та другої частини, що містить додаткові тексти зі спеціальності для самостійного опрацювання. Видання містить також термінологічний словник, додатки, таблицю «неправильних дієслів», перелік назв лісових культур і покажчик найуживаніших одиниць вимірювання. Навчальний матеріал відповідно до календарного плану розподілений на модулі, кожен із яких включає обов'язкові для виконання тести для перевірки знань із граматики та лексики, що є важливим етапом підготовки до іспиту.

Навчальний посібник також може використовуватись для навчання студентів скороченого терміну та заочної форми навчання. Значний обсяг мовного матеріалу підлягає самостійному опрацюванню: граматичний матеріал із завданнями для тренування, викладений на початку уроку (є необхідною складовою формування мовленнєвої компетенції); читання й переклад автентичних текстів зі спеціальності, що сприяє кращому засвоєнню матеріалу та збільшенню термінологічного багажу з таких тем: «Фізичні властивості деревини», «Структура та види деревини», «Твердолистяні та хвойні породи дерев», «Ліси та природно-рослинні зони України», «Лісозаготівля», «Технологія деревообробки», «Целюлозно-паперова промисловість», «Лістяні та хвойні види дерев», «Декоративне садівництво», «Дендрологія», «Ландшафтна архітектура» тощо.

Читання оригінальних наукових текстів, виконання лексико-граматичних вправ, інтерактивні методи навчання на основі цих матеріалів мають забезпечити формування професійних комунікативно-мовленнєвих навичок, уміння самостійно працювати з автентичними фаховими текстами, одержувати новітню інформацію з іноземних джерел.

Англійський алфавіт

A [ei]
Bb [bi:]
Cc [si:]
Dd [di:]
Ee [i:]
Ff [ef]
Gg [dʒi:]
Hh [eitʃ]
Ii [ai]
Jj [dʒei]
Kk [kei]
Ll [el]
Mm [em]

Nn [en]
Oo [ou]
Pp [pi:]
Qq [kju:]
Rr [a:]
Ss [es]
Tt [ti:]
Uu [ju:]
Vv [vi:]
Ww [`dʌbl `ju:]
Xx [eks]
Yy [wai]
Zz [zed]

Приголосні

[f] five
[v] very
[θ] thick
[ð] this
[s] so
[z] zoo
[ʃ] ship
[ʒ] pleasure
[h] horse
[p] park
[b] book
[t] tea

[d] do
[k] key
[g] gas
[tʃ] chin
[dʒ] Jim
[m] mother
[n] no
[ŋ] long
[l] less
[r] river
[j] yellow
[w] white

Голосні

[i:] eat
[i] it
[e] pen
[æ] bad
[a:] art
[ɒ] box
[ʌ] cup
[u] cook
[u:] school
[ju:] tune
[ə:] girl
[ə] paper

[ei] lake
[ai] like
[au] house
[ɔi] boy
[ou] home
[iə] ear
[eə] air
[uə] poor
[juə] Europe
[aiə] fire
[auə] hour
[ɔ:] all

PART I

MODULE I

UNIT 1

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

1.1. Артикль The Article

В англійській мові є два артиклі (articles): неозначений **a (an)** й означений **the**.

Неозначений артикль

Неозначений артикль (the indefinite article) **a** вживається перед словами, що починаються з приголосного, тоді як **an** – перед словами, що починаються з голосного.

Неозначений артикль утворився від числівника *one* (один) і тому вживається тільки перед обчислюваними іменниками в однині.

Перед абстрактними і конкретними іменниками, які не мають форми множини, артикль не вживається.

Неозначений артикль вживається:

1) з іменником – іменною частиною складного присудка	His brother is a doctor
2) з іменником – підметом після зворотів <i>there is (there was, there will be)</i>	There is a table in the middle of the room
3) з додатком після дієслова <i>have</i>	I have a brother
4) перед іменниками в однині після слів <i>such, rather, quite</i> тощо	She is such a good student
5) після слова <i>what</i> в окличних реченнях	What a good idea! <i>Але:</i> what beautiful music!
6) з деякими словами: <i>a lot, a few, a little, a bit</i> тощо	He speaks English a little
7) у значенні числівника <i>one</i> а) перед числівниками <i>hundred, thousand, million, dozen</i> ; б) в кількісних словосполученнях	a) The library has a hundred books b) half a kilo; a pound of sugar; 60km an hour; a bottle of milk
8) коли мається на увазі “будь-який” “кожний”	A child can understand it
9) коли мова йде про особу чи предмет, що вперше згадується	It happened in a small town
10) перед іменником-прикладкою, яка вказує на те, ким є особа або чим є предмет, до якого вона відноситься	Volodymyr Ivanov, a student of our group, has made a very interesting report

Означений артикль

Означений артикль **the** (the definite article) походить від вказівного займенника *that*. Він вживається перед іменниками в однині та в множині у тих випадках, коли йдеться про певний, вже відомий чи згадуваний раніше предмет або поняття, а також тоді, коли предмет або явище уточнюється контекстом чи ситуацією.

Означений артикль уживається:

1) коли перед іменником є: а) порядковий числівник; б) прикметник у вищому ступені; в) один із прикметників <i>last, next, same, following, very, only</i> (єдиний)	He was the first to come. This is the most beautiful flower. Answer the following questions. Але: next door, last week
2) перед іменником, за яким йде означення, виражене іменниковим сполученням, означувальним підрядним реченням, дієприкметником, інфінітивним або герундіальним означувальним зворотом	The winter of last year wasn't frosty. This is the man I told you about
3) з іменниками, що означають предмети, єдині у своєму роді	the earth, the sun, the moon, the world, the sky, the Bible, the truth, the President, etc.
4) у сталих виразах	in the afternoon, in the evening, on the left, on the right, the other day, etc.
5) у виразах типу <i>the more..., the better...</i>	the more we learn, the more we know
б) перед прізвищами, коли маються на увазі всі члени певної родини. У цьому випадку прізвище ставиться у формі множини	the Taylors
7) перед назвами більшості газет і пароплавів; перед назвами готелів	the Daily Mail, the Titanic, the Guardian, the Hilton Hotel
8) перед назвами народів (іменник у формі множини)	the Ukrainians, the Americans
9) перед прикметниками і дієприкметниками, які вживаються як іменники у значенні множини	the poor, the unemployed, the blind
10) перед назвами деяких країн	the US, the United Kingdom, the Netherlands
11) перед назвами міст та установ, географічними назвами з прийменником of	The Bank of England, the University of London, the city of Kyiv, the lake of Geneva
12) перед назвами річок, гірських хребтів, півостровів, морів, океанів, архіпелагів, пустель	the Dnieper, the Crimea, the Black Sea, the Carpathians, the Alps, the Sahara

13) перед необчислюваними іменниками у тих випадках, коли мається на увазі обмежена, певна кількість речовини	Give me the bread, please. The water is frozen. Але: Water is a liquid
14) перед іменниками в однині, коли останній означає цілий клас предметів	The pine grows in northern countries. The rose is a beautiful flower

Артикль не вживається:

1) перед власними іменами, в тому числі й тоді, коли перед ними стоїть звання, титул тощо	Professor Snow, Mister Pollit, Inspector Mitchell
2) якщо перед іменником є вказівний, присвійний, неозначений або заперечний займенник, а також <i>many/much/every/each</i>	some/many books, her hat, this street, every morning, no/much money
3) перед іменником-додатком до присудка, що виражений дієсловами <i>to elect, to appoint</i>	he was elected chairman
4) перед назвами міст, вулиць, площ, континентів, країн, штатів, графств	London, Trafalgar Square, South America, California Але: the Hague
5) перед назвами місяців, днів, пір року, святами	in April, on Wednesday, in summer,
6) Але якщо мова йде про частину певного року, то перед назвою пори року ставиться означений артикль	Independence Day <i>but: in the winter of 1992</i>
7) перед абстрактними і речовинними іменниками, яких не можна перерахувати і які вживаються в загальному значенні	freedom, metal Knowledge is power
8) перед множиною злічуваних іменників, коли зміст потребує неозначеного артикля, напр. перед іменниками, що означають «будь-яких» представників данного класу та в інших випадках – див. таблицю «неозначений артикль»	a) Squares have four equal sides. Children can understand it. b) Both his sons are students. c) The test was carried out by J. Brown and P. White, assistants to Professor Smith. d) What fine bridges! These are rather good cigarettes
9) перед такими іменниками, якщо вони мають узагальнююче значення: man/woman, nature,	Man must take care of animals. Nature is threatened

fate, fortune, heaven, paradise, hell, etc.	
10) У газетних та журнальних заголовках, об'явах, телеграмах	Arrival of Polish Trade Delegation
11) перед словами <i>breakfast, lunch, dinner</i> , ужитих у загальному значенні	We have breakfast at 8 o'clock. <i>but</i> : That was a very nice lunch
12) перед звертаннями	May I ask you a question, professor?
13) якщо після іменника є кількісний числівник у значенні порядкового	Unit five, page seventeen
14) перед іменниками, що означають назви наук, ігор, хвороб	They play tennis well. Flu can be dangerous. He studies history and literature

1.2. Займенник

The Pronoun

Класифікація займенників

1. Особові	I, you, he, she, it, we, you, they
2. Присвійні	my, your, his, her, its, our, your, their mine, yours, his, hers, its, ours, yours, theirs
3. Вказівні	this – these, that – those, such
4. Питальні	who (whom), whose, which, what, where (в питальних реченнях)
5. Сполучні	who, whose, which, that (в підрядних реченнях)
6. Зворотні	myself, yourself, himself, etc.
7. Взаємні	each other, one another
8. Заперечні	no, nobody, none, nothing
9. Неозначені	some, any, all, both, each, every, other, another, one
10. Означальні	all, both, each, every, either
Кількісні	much, many, little, few

Особові займенники

Число	Особа	Називний відмінок	Об'єктний відмінок
Однина	1	I (я)	me (мене, мені)
	2	you (ти)	you (тебе, тобі)
	3	he (він)	him (його, йому)
		she (вона)	her (її, їй)
		it (воно)	it (його, йому, їй)
множина	1	we (ми)	us (нас, нам)
	2	you (ви)	you (вас, вам)
	3	they (вони)	them (їх, їм)

They saw **me** in the street.

Вони бачили **мене** на вулиці.

He showed **her** a picture.

Він показав **їй** картину.

I met **them** at the station.

Я зустрів **їх** на вокзалі.

Займенник **it** замінює іменники – назви неістот, абстрактних понять і тварин коли їхня стать невідома, а також іменник *baby*.

Займенник **it** також уживається:

а) як підмет у безособових реченнях:

It is snowing.

Йде сніг.

б) у значенні вказівного займенника:

It must be a visitor.

Це, напевно, відвідувач.

It is very interesting.

Це дуже цікаво.

в) як слово, що вводить речення, якщо підмет, виражений інфінітивом, герундієм або підрядним реченням, стоїть після присудка:

It's nice to see you again.

Приємно Вас знову бачити.

г) з деякими дієсловами у пасивному стані: *it is said* – кажуть, *it is known* – відомо та ін.

It is reported the delegation has already been arrived.

Повідомляють, що делегація вже прибула.

д) у підсилювальних зворотах *it is* + підмет + *that/who*:

It is this book that I gave you yesterday.

Саме цю книжку я дав тобі вчора.

Присвійні займенники

Число	Особа	Відносна форма (що вживається перед іменником)	Абсолютна форма (що вживається самостійно)
Однина	1	my (мій)	mine (мій, мої)
	2	your (твій)	yours (твій)
	3	his (його)	his (його)
		her (її)	hers (її)
		its (його)	its (його)
Множина	1	our (наш)	ours (наш)
	2	your (ваш)	yours (ваш)
	3	their (їхній)	theirs (їхній)

She has lost **her** textbook.

Вона загубила свій підручник.

This working place is **yours**.

Це робоче місце – ваше.

He is an old friend of **mine**.

Він мій старий приятель.

Вказівні займенники

Однина	Множина
This – <i>цей, ця, це</i>	These – <i>ці (або це)</i>
That – <i>той, та, те</i>	Those – <i>ті (або то, те)</i>
Such – <i>такий, така, таке, такі</i>	

Присвійні займенники *this (these), that (those)* можуть вживатися у значенні іменника або прикметника:

Як іменник:

This is my child. Це моя дитина.
These are my children. Це мої діти.

Як прикметник:

I am busy at **this** moment. Я зайнятий зараз.
 I'll be back by **that** time. До того часу я повернусь.

Зворотні займенники

Особа	Однина	Множина
	+ self	+ selves
1	myself	ourselves yourselves themselves
2	yourself	
3	himself herself itself	
Неозначено-особова форма	oneself	

Вони вживаються як *зворотні* та *підсилювальні* займенники.

Зворотні займенники завжди пов'язані з дієсловами. У реченні вони стоять після дієслова і виконують функцію додатка. Перекладається дієсловом з часткою *–ся* або відповідають займеннику *себе (собі, собою)*.

She doesn't like to wash **herself**. Вона не любить вмиватися.
 He saw **himself** in the mirror. Він побачив себе в дзеркалі.
 I am not pleased **with myself**. Я незадоволений собою.

Підсилювальні займенники відповідають українському *сам*.

They did this home task Вони виконали це завдання самі.
themselves.

Зворотній займенник **oneself** вживається з інфінітивом дієслів і коли підмет виражений неозначеним займенником **one**.

To amuse **oneself**. Розважатися.
 One should take care of **oneself**. Треба самому турбуватися про себе.

З такими дієсловами, як **to wash, to dress, to shave, to bathe, to hide** зворотній займенник часто опускається, а з дієсловами **to feel, to behave** – не вживається.

He **washed, shaved and dressed**. Він помився, поголився та одягнувся.
 He **feels** well. Він добре себе почуває.
 He **behaved** like a child. Він поведився як дитина.

Неозначені займенники

До неозначених займенників належать *some, any, one*, а також складні займенники *somebody, someone, something, anybody, anyone, anything*.

Займенники some, any

Можуть вживатися перед обчислюваними та необчислюваними іменниками. Означають невизначену (невелику) кількість предметів або речовини.

Some вживається в стверджувальних реченнях і не завжди потребує перекладу.

Any вживається в заперечних і питальних реченнях, часто не перекладається. У стверджувальних реченнях **any** вживається в значенні «будь-який».

Але якщо в загальному питанні висловлюється прохання чи щось пропонується, то замість **any** вживається **some**.

Переклад *some, any* українською мовою

Some		Any
<i>Ask some experienced person</i> Запитай якусь досвідчену людину	Перед обчислюваними іменниками однини «якийсь, який-небудь»	<i>Is there any hotel nearby?</i> Чи є поблизу який-небудь готель?
<i>Some days he earns more, some days less.</i> В деякі дні він заробляє більше, в деякі – менше.	Перед обчислюваними іменниками множини «які-небудь, деякі, декілька»	<i>Did you meet any difficulties?</i> У вас були які-небудь труднощі?
<i>Give me some work, I have nothing to do.</i> Дайте мені яку-небудь роботу, мені нічого робити. <i>Give him some water.</i> Дайте йому води.	Перед необчислюваними іменниками «який-небудь, небагато» Або зовсім не перекладається	<i>Any help will be valuable.</i> Будь-яка допомога буде корисною. <i>Have you any milk?</i> У вас є молоко?

Складні неозначені займенники **somebody, someone, something, anybody, anyone, anything** є займенниками-іменниками. Вони вживаються в загальному і присвійному відмінках. У загальному відмінку ці займенники виконують функції підмета і додатка (іноді іменної частини присудка), а в присвійному відмінку – функцію означення:

Somebody knocked on the door.	Хтось постукав у двері.
There was someone's book on the table.	На столі була чиясь книжка.
You can have anything you like.	Можеш взяти все, що тобі подобається.

Займенник no

Означає «ні один, ніякий, жоден».

No sensible man would say that. Жодна розумна людина цього не скаже.

There is **no** doubt about it. У цьому нема жодного сумніву.

No вживається перед обчислюваними та необчислюваними іменниками, має те ж значення, що й not a, not any:

He has no sister = He hasn't a sister

He has no sisters = He hasn't any sisters

Займенник *all*

<u>Всі</u> (з обчислюваними іменниками у множині, з дієсловом у формі множини)	<u>Весь, вся, все</u> (з необчислюваними іменниками у множині, з дієсловом у формі множини)
All are ready. – Всі готові.	All is ready. – Все готово.
We all know it. = All of us know it.	All day = the whole day

Займенник *one*

1. Може бути підметом у реченні. Перекладається безособовим реченням:

One must know this rule. Потрібно знати це правило.

One може вживатися у формі присвійного відмінку:

One must do **one's** duty. Треба виконувати свій обов'язок.

2. Вживається як слово-замінник:

Which dictionary do you prefer – this one or that **one**? (цей чи той?)

I don't like these maps. Can you show me better **ones**?

Займенники *much, many, little, few*.

	З обчислюваними іменниками	З необчислюваними іменниками
“багато”	many books many people	much time much noise
“мало”	few flowers few mistakes	little money little knowledge
	a few – “небагато, кілька”	a little – “небагато, трохи”

Many people think so.

Have you got **much** time?

There were very **few** people in the street. There is very **little** water in the kettle.

(дуже мало людей – негативне значення) (дуже мало води - негативне значення).

There were **a few** people in the street.

There is **a little** water in the kettle.

(декілька чоловік – позитивне значення) (небагато, трохи води - позитивне значення)

Much, many вживаються, в основному, у питальних і заперечних реченнях, а в стверджувальних реченнях краще вживати **a lot of**:

We haven't got much time.

We spent a lot of money.

Запитання для самоконтролю

1. Які артикли є в англійській мові?
2. Від яких слів походять неозначений та означений артикли?
3. Яка різниця між формами неозначеного артикля *a* та *an*?
4. Перед якими іменниками вживається неозначений артикль?
5. Коли потрібно вживати означений артикль?
6. В яких випадках не вживається артикль перед обчислюваними іменниками?

7. Назвіть правила вживання артикля з абстрактними іменниками.
8. В яких випадках вживається означений артикль з власними іменниками?
9. На скільки груп поділяються займенники в англійській мові за значенням і граматичними особливостями? Назвіть ці групи.
10. Скільки відмінків мають особові займенники? Назвіть займенники об'єктного відмінку.
11. Скільки існує форм присвійних займенників? Які функції в реченні вони виконують?
12. Які ви знаєте зворотні та взаємні займенники? Наведіть декілька прикладів з ними.
13. Коли вказівні займенники вживаються як займенники-прикметники у функції означення? Наведіть приклади.
14. Коли вказівні займенники вживаються як займенники-іменники у функції підмета і додатка? Наведіть приклади.
15. Назвіть питальні займенники англійської мови. Коли вони виконують функцію сполучних займенників?
16. Які основні правила вживання неозначених займенників *any* та *some*? Яке значення займенника *any* у стверджувальному реченні?
17. Які кількісні займенники вживаються перед злічуваними та незлічуваними іменниками?

Завдання для самостійного виконання

1.1.1. Заповніть пропуски артиклями *a, an, the*:

1. Have you made all ... arrangements for our holiday yet? – Yes, I think so. – Did you find ... good hotel? – Well, it isn't ... luxurious hotel, but it's near ... centre of ... city and each bedroom has ... private bathroom.
2. Is this ... old car? – Four years old. Come and have ... look at it. – Were you ... first owner? – No, I got it two years ago.
3. Have ... Browns gone on holiday?
4. Did you go to ... bank to change ... money into French francs?
5. I'll book ... taxi to take us to ... airport, so we can leave our car at home.

1.1.2. Впишіть замість пропусків *a, an, the* або *some* там, де це необхідно:

1. I bought ... butter and ... sugar. – Are you going to make ... cake?
2. What did you have for ... lunch today? - ... piece of cheese and ... bread.
3. I need ... information for my history project. – Why don't you go to ... library?
4. I'm going to ... post office. Do you need anything? – Could you get me ... stamps and ... envelope, please?
5. Grandpa is in ... hospital. Grandma went to ... hospital to see Grandpa.
6. You need ... visa to visit ... foreign countries.
7. When we reached ... city centre, ... shops were still open but most of them were already closed.
8. Have you finished with ... book I lent you last week?

1.1.3. Впишіть замість пропусків артикль the (де необхідно):

1. I think this bag is ... Brenda's.
2. The hotel is called ... Park Hotel.
3. Let's play ... football on Sunday.
4. In ... evening we often listen to ... radio and watch ... television.
5. Yesterday we had ... dinner in a restaurant.
6. He tried to park his car but ... space wasn't big enough.
7. Do you think ... rich should pay more taxes?
8. ... whale is a mammal, but it lives in ... sea.
9. I'm learning to play ... piano.
10. I like listening to ... music.
11. The film wasn't very good, but I liked ... music.
12. Mr. Smith went to ... school to meet his son's teacher.

1.2.1. Заповніть пропуски займенниками some, any, no:

1. Have you got ... coffee? – No, I haven't got ... coffee.
2. Would you like ... tea?
3. Don't worry. I've got ... free time. I'll go shopping.
4. I'm going to buy ... oranges.
5. There is ... milk left in the fridge.
6. I'm afraid there is ... tea left.
7. You can call me ... time you like.

1.2.2. Заповніть пропуски займенниками any, anyone, anybody, anything, anywhere:

1. You can ask me ... you want.
2. ... can go to the new sports center.
3. What shall I wear to the party? – Wear ... you like. It's up to you.
4. If ... needs help, they can ask me.
5. We left the door unlocked. ... could have come in.
6. What time do you want dinner? – Oh, ... time you like.
7. Where can I find this magazine? – At ... shop in the centre.

1.2.3. Заповніть пропуски займенниками any, some, no, anyone, anybody, anywhere:

1. I've got ... biscuits.
2. Do you have ... advice for me?
3. Mark doesn't like ... vegetables.
4. He's going to buy ... milk.
5. Sorry! I have ... time.
6. I haven't got ... money.
7. Have you got ... coffee?
8. Where shall we go for our holidays? ... as long as it's hot!
9. Who can drive the company car? - ... who has a driver's license.

10. When can we meet for lunch? Oh, ... day next week. I haven't made any plans.

1.2.4. Заповніть пропуски займенниками *every, everyone / everybody / everything / everywhere*:

1. ... you need is on the table.
2. ... person in my family has their own car.
3. My uncle knows ... about gardening.
4. Ann knows ... in her street.
5. ... looks tired today.
6. When I arrived home, ... had gone out.
7. Your desk is untidy. There are papers
8. Jill doesn't do any of the housework. Her husband does ...

1.2.5. Заповніть пропуски кількісними займенниками *much, many, a lot of*:

1. I've got ... spare time today.
2. There isn't ... snow on the ground. – No, the sun has melted it.
3. How ... times did you have a shower yesterday?
4. There are ... flowers in the garden. – Yes, they are beautiful, aren't they?
5. Have you got any money? – Yes, I've got
6. Have you got any vegetables? - Yes, but
7. Can you lend me some money? – No, sorry –I haven't got ... money with me.
8. We'll have to hurry. The man was badly injured in the accident. He lost ... blood.
9. Don't disturb me. I've got...work to do.
10. We didn't take ... photographs when we were on holiday.

1.3. Прочитайте про Національний університет біоресурсів і природокористування України та виконайте вправи після тексту

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES
OF UKRAINE**

The National University of Life and Environmental Sciences of Ukraine is one of the leading higher educational institutions in Ukraine. Nowadays it includes 3 educational and research institutes and 13 faculties of the basic university institution (in Kyiv) and 10 separate units - regional educational establishments of I-III accreditation levels.

Its history began with an Agricultural (Agronomy) department founded at Kyiv Polytechnic Institute (KPI) in 1898. This department was transformed into the faculty in 1918. The Agricultural Institute (KAI) which included 4 faculties was established on its basis in 1922. By 1930 four buildings for training, two residential buildings, and three hostels had been built in Holosiievo. In 1954 Kyiv Agricultural and Forestry Institutes were united into the Ukrainian Agricultural Academy (UAA). Kyiv Veterinary Institute joined the Academy in 1957. Since then, the institution had been variously named: in 1994, it received the status of National and was named National

Agrarian University. In 2008 National Agrarian University was renamed to the National University of Life and Environmental Sciences of Ukraine (NULES).

Now more than 26 thousand students and about 600 post-graduate students, doctoral candidates, and external doctorate students study and do their research work at our University and its regional establishments. Educational process and scientific research at the University are provided by more than 2,600 scientific and pedagogical workers, including about 300 professors and Doctors of Sciences, more than 1,000 associate professors, and PhDs (Doctors of Philosophy/Candidates of Sciences). There are three education research institutes: the Institute of Forestry and Landscape-Park Management; ERI of Energetics, Automatics and Energy Saving; ERI of Continuing Education and Tourism and 13 faculties: Faculty of Economics; Agricultural Management Faculty; Veterinary Medicine Faculty; Faculty of Construction and Design; Mechanical and Technological Faculty; Land Management Faculty; Agrobiological Faculty; Faculty of Plant Protection, Biotechnology and Ecology; Faculty of Law; Faculty of Livestock Raising and Water Bioresources; Faculty of Food Technology and Quality Management of Agricultural Products; Faculty of Information Technologies; Faculty of Humanities and Pedagogy. Our university awards Bachelor's and Master's degrees in all these specialities.

The University according to the status of higher educational establishments has the IV-th level of accreditation. It is a research institution, and its research and teaching staff carries out educational, scientific and research, scientific and innovative, informative and consulting work. The scientific and pedagogical workers' activities are aimed at studying and solving modern problems of life and environment: the use, reproduction, and balanced development of bio-resources in terrestrial and aquatic ecosystems, the introduction of new environmental biotechnologies, the technology of soil fertility recovery, energy-saving technologies, monitoring and control of standards, quality, and safety of agricultural products, etc.

The activities of the University as a research establishment also include integration into the world research and education system: implementation of joint research projects, holding conferences, symposia, exhibitions, scientific student competitions, obtaining grants, publication of joint scientific and educational works - books, monographs, manuals, guidelines, the creation of educational, scientific and methodical electronic database, the use of modern information and communication systems in agricultural and environmental branches.

The goal of international activities is to obtain recognition of the education system and scientific research of NULES by the world-leading universities through their meeting the requirements of international standards of education quality. Nowadays our university cooperates with many corresponding higher education institutions in such countries as the USA, Germany, France, the Netherlands, Belgium, Japan, China, Poland, Slovakia, Hungary, Bulgaria, and others.

(from <https://nubip.edu.ua/en/about>)

Vocabulary

1. leading	провідний
2. unit	підрозділ, частина, одиниця
3. found	засновувати
4. department	відділення (кафедра)
5. to transform	перетворювати
6. faculty	факультет
7. to create	створювати
8. forestry	лісогосподарський
9. to appear	з'являтися
10. to unite	об'єднувати
11. variously	по-різному, різним чином
12. to join	приєднувати(ся), об'єднувати(ся)
13. to receive	одержувати
14. besides	крім
15. to include	включати
16. level	рівень
17. to offer	пропонувати
18. degree	ступінь
19. bachelor	бакалавр
20. master	магістр
21. scholar	вчений
22. establish	засновувати, встановлювати
23. obtain	отримувати
24. joint	сумісний, спільний, об'єднаний
25. carry out	виконувати
26. implementation	виконання, здійснення, впровадження
27. branch	галузь
28. activity	діяльність
29. graduate (from)	закінчувати вищий навчальний заклад
30. corresponding	відповідний, подібний
31. nowadays	тепер, в наші дні
32. recognition	визнання
33. introduction	впровадження (нових технологій)

Словосполучення

educational establishment	навчальний заклад
farm mechanization	механізація сільського господарства
separate units	відокремлені підрозділи
land management	землепорядкування
soil fertility recovery	відновлення родючості ґрунту
energy-saving	енергозбереження
meet the requirements	відповідати вимогам

1.3.1. Дайте відповіді на запитання:

1. When was our university founded?
2. Where did its history begin?
4. When did Kyiv Agricultural Institute appear?
5. When were Kyiv Agricultural and Forestry Institutes united into a single institution – the Ukrainian Agricultural Academy?
6. When did Kyiv Veterinary Institute join the Academy?
7. When did our university receive the status of National?
8. What is its level of accreditation?
9. How many faculties and institutes are there in our university?
10. What scientific degrees does our university award?
11. What kind of research work do the scientists of our university carry out?
12. What is the goal of the University international activities?

1.3.2. Знайдіть синоніми:

educational institution	acknowledgment
include	fulfil, perform, implement
goal	get, obtain
recognition	cooperate
carry out	aim, objective
receive	educational establishment
collaborate	involve

1.3.3. Складіть речення:

1. The, of, department, founded, Agriculture, at, was, in 1898, Kyiv, Polytechnic Institute (KPI).
2. In, Kyiv, Agricultural, were, Institutes. Into, united, Forestry, the, and, Ukrainian, Agricultural, Academy (UAA), 1954.
3. The, has, the, IV, of, level, accreditation, University.
4. The, National, of, Life, institutions, and, Environmental, University, Sciences, Ukraine, one, of, the, leading, is, higher, of, educational, in, Ukraine.
5. Nowadays, University, cooperates, the, with, corresponding, our, higher, institutions, education, in, many, countries, the, of, world.

1.3.4. Складіть діалог про навчання в університеті, користуючись зразками:

Samples of Dialogues

I.

- Hi, Kate!
- Hi, Peter!
- Do you know that we are going to celebrate our university anniversary?
- Yes, I do. But I don't remember how old it is.
- Let's count. We have just studied the topic "NULES of Ukraine" at our English lesson. What do you know about the history of our Alma Mater? When was it founded?
- As far as I remember it was founded as an agricultural department in 1898.

- Now it's easy to count. Perhaps you remember where the agricultural department was created?
- Yes, of course. It was created at Kyiv Polytechnic Institute. Moreover, I know that Dmytro Mendeleiev, a well-known scientist, was the Head of the examining board in 1903 when the first agronomist graduated from it.
- And as for me I remember that in 1954 Agricultural and Forestry Institutes were united into the Ukrainian Agricultural Academy. I know some professors who were the first graduates of the Academy.

II. - Hi, Helen!

- Hello, Mike!
- Where are you going?
- I am going to the University.
- Do you like studying here? Which Institute or faculty do you study at?
- I study at the Institute of Forestry and Garden-Park Management. I'm a first-year student. I've entered the Institute recently and I hope I'll like studying here.
- Are there any other Institutes in the University?
- There are two other educational and research institutes: ERI of Energetics, Automatics and Energy Saving; ERI of Continuing Education and Tourism and 13 faculties such as Agrarian Management, Faculty of Economics, Veterinary Medicine, Agrobiological, Construction and Design of Machines; Mechanical and Technological; Land Management; Plant Protection, Biotechnology and Ecology; Law; Livestock Raising and Water Bioresources, and others.
- Do you have good conditions for studying at the University?
- Yes, we do. We've got many well-equipped classrooms and laboratories; there are a lot of Students' Scientific Circles at our University.
- And what about living conditions?
- The University also provides students with sufficient living conditions: there are 12 hostels on the campus which is situated in one of the most beautiful places – Holossiiievo Park. I advise you to enter the University next year.
- Thank you for the information. I think I'll take your advice.

1.3.5. Складіть план до тексту “National University of Life and Environmental Sciences of Ukraine” та перекажіть його.

1.3.6. Прочитайте додатковий текст “Tree”, користуючись словником. Перекажіть його зміст українською або англійською мовою.

TREE

Trees are the largest living things on the earth, and they live longer than any animals. They are found in all regions (except where the soil is very thin) in deserts and in the Arctic and Antarctic. In the tropics they form dense, hot forests with climbing plants binding the trees together and thick undergrowth tangled round their roots. Even in northern regions like Canada, Siberia and Alaska mighty forests of fir trees grow.

Trees draw in water through their roots, which may spread long distances under the earth, or — as in the case of the mangrove—arch down from the trunk into the soil. Like all other green plants, they build up food by means of their leaves. Deciduous trees lose their leaves each winter and grow new ones each spring, the buds containing

the new shoots and leaves often being protected with scales against cold weather. Evergreen trees are always covered with leaves, although actually they do lose their leaves gradually and new ones replace them. In areas where many deciduous trees grow, the woods and forests are bare during the winter, but in the tropics, where most trees are evergreen, the landscape looks much the same all the year round.

Trees are able to live for many years (the Californian giant sequoia may live for more than 3,000 years) because they can form a new set of cells every year. If a tree is cut down, its age can be found by counting the number of rings on the stump. The branches also grow in length, forming a new set of buds each year, and from these comes the fresh crop of leaves.

Trees reproduce by means of fruits, which appear after the flowers have fallen. Some trees have more obvious flowers than others. It can be seen at first glance that the white blossom of a cherry tree consists of flowers, but it is not so clear that the dangling catkins of a hazel tree are flowers. The same can be said about fruits.

Notes:

dense – густий, щільний

climbing – виткий

bind – пов'язувати, поєднувати

undergrowth – підлісок (кущі та інші рослини, що ростуть під деревами)

tangled – заплутаний

mighty – могутній

spread – розростатися, поширюватися

shoots – пагони

dangling – звисаючий

catkins – сережки

DO YOU KNOW THAT ...

What Is the Oldest Tree in the World?

Until 2013, the oldest individual tree in the world was Methuselah, a 4,845-year-old Great Basin bristlecone pine (*Pinus longaeva*) in the White Mountains of California. But then researchers announced the dating of a 5,062-year-old *P. longaeva*, which is also in the White Mountains, according to the Rocky Mountain Tree-Ring Research group. The tree has not yet been named.

The next oldest tree on the list is a national monument in Iran: The Zoroastrian Sarv (Sarv-e-Abarkooh), estimated to be about 4,000 years old, or older. This Mediterranean cypress tree (*Cupressus sempervirens*), which is in Abarkuh, Yazd, Iran, may well be the oldest living thing in Asia.

Living in a church yard of the Llangernyw village in North Wales, the Llangernyw Yew is also estimated to be at least 4,000 years old. The yew tree (*Taxus baccata*) is believed to have taken root sometime during Britain's Bronze Age.

And on the other side of the world, in an Andes Mountains grove in Chile, we have a 3,642-year-old Patagonian cypress (*Fitzroya cupressoides*). The ancient specimen, which is sometimes called the Alerce (alerce is a common Spanish name for *F. cupressoides*), is the third-oldest tree to have its exact age calculated.

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UNIT 2. OUR INSTITUTE

2.1. Іменник The Noun

Іменники діляться на *власні* (Proper Nouns) та *загальні* (Common Nouns).

1. Власні іменники: London, the Caucasus, the French Revolution, Sunday, May.
2. Загальні іменники: water, boy, country, darkness, family.

Загальні іменники діляться на *злічувані* (countable nouns) та *незлічувані* (uncountable nouns).

1. Злічувані іменники: a book – books, a girl – two girls, a car – many cars.
2. Незлічувані іменники:

а) назви абстрактних понять: freedom, air, love, knowledge;

б) назви речовин, матеріалів: gold, sugar, coal, tea.

Незлічувані іменники вживаються тільки в однині (singular).

Злічувані іменники вживаються в однині (singular) і множині (plural).

Утворення множини іменників:

1) додавання закінчення –s:

lamp - lamps, chair - chairs, shoe – shoes, flower - flowers

2) додаванням закінчення –es:

а) до іменників, що закінчуються на –s, -ss, -sh, -ch, -tch, -x: dish – dishes, lunch – lunches, watch – watches, class – classes, box - boxes

б) до іменників, що закінчуються на –o:

echo – echoes, hero – heroes, potato - potatoes

У деяких іменниках на -o допускаються обидві форми: -es або -s: mosquitoes/mosquitos, volcanoes/volcanos, tornadoes/tornados, zeroes/zeros

в) до іменників, що закінчуються на -f або -fe, причому -f замінюється на -v + es: calf-calves, leaf-leaves, self-selves, half-halves, life-lives, shelf-shelves, knife-knives, loaf-loaves, thief-thieves, wolf-wolves, scarf-scarves

Іменник wharf має дві форми: wharfs/wharves

г) до іменників, що закінчуються на -y після

приголосної: lady – ladies, story – stories, city – cities

до іменників, що закінчуються на -y після голосної додається –s: boy – boys, toy - toys

3. Деякі іменники мають однакову форму в однині та множині: deer, fish, means, series, sheep, species, swine

Винятки:

Pianos,
videos, zoos,
autos, photos,
solos, kilos,
rhinos,
sopranos,
memos,
radios, studios

Винятки:

roof-roofs
belief-beliefs
chief-chiefs
cliff-cliffs
safe – safes

4. У деяких іменниках міняється коренева голосна:
man-men, woman-women, child-children, mouse-mice, ox-oxen, louse-lice, foot-feet, goose-geese, tooth-teeth

Деякі іменники латинського та грецького походження зберігають свої форми множини: criterion-criteria, analysis-analyses, bacterium-bacteria, basis-bases, curriculum-curricula, crisis-crises, datum-data, vertebra-vertebrae, index-indices/indexes, radius-radii

У складних іменниках:

а) форму множини набуває лише головний іменник:

a mother-in-law – mothers-in-law, passer-by – passers-by;

б) які утворені з інших частин мови – -s додається в кінці слова:

forget-me-not – forget-me-nots, merry-go-round – merry-go-rounds;

в) якщо першим словом є man або woman, обидва слова набувають форми множини: man-servant – men-servants, woman-doctor – women-doctors

Перед незлічуваними іменниками можна вживати слова чи словосполучення, що вказують на кількість речовини: a bottle/ jar/ cup/ jug/ glass/ can/ tin/ loaf/ piece/ bar/ kilo/ packet, etc.

Наприклад: two bottles of champagne, a glass of water, a cup of coffee

Іменники, які вживаються тільки у формі множини:

Назви предметів, що складаються з двох рівних частин	scissors, spectacles/glasses, earrings, scales, tongs, trousers, shorts, socks, tights, pyjamas, jeans, gloves, etc.
та інші	goods, clothes, stairs, arms, riches, proceeds, wages, contents

His wages are high.

Його заробітна плата висока

Деякі особливості вживання іменників у множині та однині.

1. Багато збірних іменників мають лише форму однини, але значення множини: police, people, cattle, etc.

Cattle are mainly raised in the North of this country.

Велика рогата худоба в основному розводиться на півночі цієї країни.

The police have arrested these thieves.

Поліція арештувала цих злодіїв.

Але такі збірні іменники, як government, staff, team, family, audience, committee, etc. можуть вживатися з дієсловом і у формі однини (залежно від контексту).

Порівняйте:

The committee is ready to give its recommendations.

Комітет готовий надати свої рекомендації.

The committee are separated from the families for long periods of time.

Члени комітету давно знаходяться окремо від своїх родин.

2. Слова, які означають назви національностей/мов, що закінчуються на –ese, -ch, -sh можуть мати значення однини чи множини – залежно від значення слова (у множині вони не мають закінчення –s):

Chinese, French, – мови; the French – французи, the Chinese – китайці.

English is spoken in many countries.

The English love tea.

3. З іменниками у формі множини, що означають суму грошей, період часу, відстань тощо дієслово вживається у формі однини:

Three years is a long time to be without a job.

4. а) Деякі іменники можуть вживатися як у формі множини, так і у формі однини: fruits (різні сорти фруктів), fishes (різні види риб), people(s) (народ, нація – народи, нації):

Fruit is cheap in summer.

There are apples, plums, pears and other fruits on the table.

Присвійний відмінок (The Possessive Case)

Іменник у присвійному відмінку стоїть перед іншим іменником і є його означенням. Українською мовою він перекладається родовим відмінком іменника або присвійним прикметником: Peter's note-book зошит Петра, Петрів зошит.

Утворення присвійного відмінка:

1) додаванням апострофа і –s:

Kate's brother

брат Каті

Alice's adventures

Алісині пригоди

2) якщо іменник в однині закінчується на –s, –ss, –x, то додається здебільшого тільки апостроф, хоча звичайне позначення –'s також можливе:

James' (або James's) coat

пальто Джеймса

3) якщо іменник у множині закінчується на –s, до нього додається лише апостроф:

The students – the students' meeting

4) якщо іменник у множині не закінчується на –s, то 's додається:

Children's toys

У присвійному відмінку вживаються іменники, що означають:

1. Назви істот	the hawk's nest
2. Час і відстань	three weeks' holiday
3. Назви країн, міст, а також слова <i>country, town, city, world, ocean, river, sun, moon</i>	Kyiv's theatres, the world's population
4. Збірні іменники типу: <i>government, party, crew, family, society</i>	the company's success
5. У стійких словосполученнях	a stone's throw – незначна відстань, to one's heart's content – досхочу

6. Із словами <i>today, yesterday, tomorrow</i> та ін.	yesterday's excursion, last Saturday's newspaper
7. Словосполучення	Jack and Jill's apartment

2.2. Verb

Дієслово

Дієслово – частина мови, яка означає дію або стан. Воно має особові та не особові форми.

Особові форми дієслова мають категорії особи, числа, часу, стану (активного та пасивного) та способу дії; виступають у реченні лише у функції присудка. В англійській мові є 3 способи дієслова:

1. Дійсний спосіб показує, що дія розглядається як реальний факт у теперішньому, минулому і майбутньому: Peter speaks (spoke/will speak) English.
2. Наказовий спосіб висловлює спонукання до дії, тобто наказ, прохання, пораду та ін.: Come in! Give me your dictionary.
3. Умовний спосіб показує, що мовець розглядає дію не як реальний факт, а як щось допустиме чи бажане: If I were you, I would not go there.

Основні форми дієслова:

I– інфінітив (Infinitive);

II– минулий неозначений час (Past Indefinite Tense);

III– дієприкметник минулого часу (Past Participle або Participle II);

IV– дієприкметник теперішнього часу (Present Participle або Participle I).

Неособові форми дієслова – інфінітив, герундій, дієприкметник.

Часи дієслова

В англійській мові є чотири групи часів дієслова (кожна з них має форми теперішнього (Present), минулого (Past), і майбутнього (Future) часу; а також Future-in-the-Past – майбутній час в минулому):

I - Indefinite (Simple) Tenses – неозначені часи;

II - Continuous (Progressive) Tenses – тривалі часи;

III - Perfect Tenses – перфектні (доконані) часи;

IV - Perfect Continuous Tenses – перфектно-тривалі часи.

Кожна група часів вживається для вираження дії, що відбувається в певний час за певних обставин.

Таблиці часів дійсного способу

I.

Прості (неозначені) часи Simple Tenses (Indefinite Tenses)		
Звичайна дія, що може бути одноразовою або повторюватися		
Present	Past	Future
у теперішньому, але не в момент мовлення:	у минулому і не має зв'язку з конкретним моментом:	у майбутньому і не має зв'язку з конкретним моментом:
play(s) take(s)	played took	will } play (shall) } take

II.

Тривалі часи Progressive Tenses (Continuous Tenses)		
Дія, що тривала (триває, триватиме)		
Present	Past	Future
у момент мовлення або в теперішній період часу: am is } reading are	у певний момент або період часу в минулому: was } reading were	у певний момент або період часу в майбутньому: will } be reading (shall)

III.

Перфектні (доконані) часи Perfect Tenses		
Дія, що завершилася до певного моменту		
Present	Past	Future
у теперішньому і виражає її результат: have (has) written	у минулому і виражає її результат: had written	у майбутньому і виражає її результат: will } have (shall) } written

IV.

Перфектно-тривалі часи Perfect Progressive (Continuous) Tenses		
Тривала дія, що почалася		
Present	Past	Future
до моменту мовлення в теперішньому часі і продовжується в цей момент: have } been has } speaking	до певного моменту в минулому і продовжувалася після нього: had been speaking	до певного моменту в майбутньому і триватиме після нього: will } have been (shall) } speaking (Вживається дуже рідко)

ДІЄСЛОВО TO BE У PRESENT INDEFINITE

Дієслово **to be** в англійській мові може вживатися як смислове дієслово і як допоміжне для утворення різних часових форм. **Present Indefinite** дієслова **to be** утворюється не за загальним правилом.

Особа	Однина	Множина
1	I am	We are
2	You are	
3	He (she, it) is	They are

В усному мовленні переважно вживаються скорочені форми:

Особа	Однина	Множина
1	I'm	We're
2	You're	
3	He's (she's, it's)	They're

Питальна і заперечна форми дієслова **to be** утворюються без допоміжного дієслова **to do** У питальних реченнях дієслово **to be** ставиться перед підметом. Наприклад:

Is she a teacher? Вона вчителька?

Are the children at home? Діти вдома?

У заперечних реченнях після дієслова **to be** вживається частка **not**. Наприклад:

She is not a teacher. Вона не вчителька.

The children are not at home. Діти не вдома.

Коротка стверджувальна відповідь на питання з дієсловом **to be** складається зі слова **Yes**, відповідного особового займенника і дієслова **to be** у потрібній формі:

Yes, I am. Yes, they are.

Коротка заперечна відповідь на питання з дієсловом **to be** складається зі слова **No**, відповідного особового займенника і дієслова **to be** у потрібній формі:

No, he isn't. No, we aren't.

У питально-заперечних реченнях дієслово **to be** ставиться перед підметом, а частка **not** після підмета, але в цьому випадку, як правило, вживаються скорочені форми **isn't** і **aren't**. Наприклад:

Am I not your friend? Хіба я не твій друг?

Aren't they ready? Хіба вони не готові?

Isn't he here? Хіба він не тут?

Дієслово **to be** у **Past Indefinite** має дві форми: **was** для однини і **were** для множини. Займенник **you** в усіх випадках вважається множиною.

Yesterday was a beautiful day.

Вчора був прекрасний день.

Питальна і заперечна форми дієслова **to be** у **Past Indefinite**, як і в **Present Indefinite**, утворюються без допоміжного дієслова **to do** У питальних реченнях дієслово **to be** ставиться перед підметом:

Were you at the front? Ви були на фронті?

Was she at home? Вона була вдома?

When were you born?

У заперечних реченнях після дієслова **to be** вживається частка **not**. Наприклад:

He was not at school. Його не було у школі.

They were not there. Їх тут не було.

У питально-заперечних реченнях дієслово **to be** ставиться перед підметом, а частка **not** після підмета, але в цьому випадку, як правило, вживаються скорочені форми **wasn't** і **weren't**. Наприклад:

Was he not at school? Хіба його не було у школі?

Weren't you afraid of the dog? Ти не боявся собаки?

Why wasn't she at work yesterday?

Чому вона не була вчора на роботі?

ДІЄСЛОВО TO HAVE У PRESENT INDEFINITE

Дієслово **to have** в англійській мові вживається як смислове і як допоміжне. У **Present Indefinite** дієслово **to have** має дві форми: **has** для третьої особи однини і **have** для інших осіб.

Питальні речення з дієсловом **to have** утворюються двома способами:

1) без допоміжного дієслова **to do** (так само, як речення з дієсловом **to be**):

Have you a pen? У тебе є ручка?

Has she a brother? У неї є брат?

2) за допомогою дієслова **to do**:

Do you have a car? У вас є машина?

Does he have any brothers and sisters? У нього є брати і сестри?

Заперечні речення з дієсловом **to have** утворюються:

1) за допомогою заперечного займенника **no**, що ставиться перед іменником:

We have no sister. У нас немає сестри.

She has no cat. У неї немає кота.

2) за допомогою частки **not**, що вживається перед іменником, перед яким стоїть займенник (присвійний, вказівний, неозначений) або числівник:

I have not this text. У мене немає цього тексту.

She has not any black pen. У неї немає чорної ручки.

У сталих виразах з дієсловом **to have** питальна і заперечна утворюються лише за допомогою допоміжного дієслова **to do**.

When do you usually have a walk in the evening? Коли ви зазвичай гуляєте ввечері?

She doesn't have dinner at home. Вона не обідає вдома.

PRESENT INDEFINITE TENSE (ТЕПЕРІШНІЙ НЕОЗНАЧЕНИЙ ЧАС)

Present Indefinite Tense дієслів (крім дієслова **to be**) утворюється наступним чином.

Стверджувальна форма дієслова в усіх особах однини і множини збігається з інфінітивом без частки **to** (крім третьої особи однини).

I study. Я навчаюся.

They work. Вони працюють.

У третій особі однини до інфінітива (без частки **to**) додається закінчення **-s** або **-es**. Закінчення **-es** додається у випадках, якщо:

1) основа дієслова закінчується на шиплячий або свистячий: **-s**; **-ss**; **-sh**; **-ch**; **-tch**; **-x**:

He dresses. Він одягається.

He watches. Він дивиться.

He teaches. Він викладає.

He washes. Він миє.

He mixes. Він змішує.

2) основа дієслова закінчується на **-o**:

He does. Він робить.

3) основа дієслова закінчується на **-y** після приголосного:

He studies. Він навчається.

Питальна і заперечна форми утворюються за допомогою допоміжного дієслова **to do** та інфінітива смислового дієслова (без частки **to**). У питальних реченнях допоміжне дієслово **do (does)** ставиться перед підметом:

Do they study? Він навчається?

Does she work? Вона працює?

Does it snow much in your country?

Спеціальні запитання утворюються за допомогою наступних питальних слів:

Who? – Хто?

Whom? – Кому?

What? – Що?

When? – Коли?

Where? – Де?

Which? – Який? Котрий?

Why? – Чому?

Whose? – Чий?

How? – Як?

How many? – Скільки? (зі злічуваними іменниками)

How much? – Скільки? (з незлічуваними іменниками)

How many students are there in your group?

Скільки студентів у вашій групі?

Питання, що відносяться до підмета або до його означення, утворюються без допоміжного дієслова **do (does)**:

Who lives in this house? Хто живе у цьому будинку?

What lies on the table? Що лежить на столі?

Whose children play in the yard? Чії діти грають у дворі?

Зверніть увагу на відмінність між питаннями, що відносяться до підмета і до прямого додатка:

Who loves you? Хто тебе любить?

Who do you love? Кого ти любиш?

У заперечних реченнях після допоміжного дієслова **do (does)** ставиться частка **not**. В усному мовленні вживаються переважно скорочені форми **don't, doesn't**.

They do not study. Вони не навчаються.

She does not work. Вона не працює.

У питально-заперечних реченнях **don't, doesn't** ставиться на початку речення:

Don't they study at the university? Хіба вони не навчаються в університеті?

Doesn't she work at the factory? Хіба вона не працює на фабриці?

Present Indefinite Tense вживається:

1) для вираження постійної або повторюваної дії або стану в теперішньому часі:

I study at the University. Я навчаюся в університеті.

We get up at 7 o'clock. Ви прокидаємося о сьомій годині.

She plays piano. Вона грає на піаніно.

2) для вираження загальновідомих фактів:

Metals conduct electricity. Метали проводять електрику.

Cats catch mice. Коти ловлять мишей.

3) для вираження дії, що відбувається в момент мовлення (зі словами, що не вживаються в Continuous):

I don't hear anything. Я нічого не чую.

I don't understand. Я не розумію.

4) для вираження майбутньої дії:

а) у підрядних реченнях часу та умови:

I'll wait till you come. Я чекатиму поки ти прийдеш.

If the weather is fine, we'll go to the forest. Якщо погода буде гарною, ми підемо до лісу.

б) яка запланована на майбутнє (переважно з дієсловами руху)

I leave Kyiv tomorrow. Завтра я від'їжджаю з Києва.

Present Indefinite Tense вживається з такими обставинами часу: **always, usually, sometimes, often, seldom, every day** тощо:

I usually get up at 7 o'clock. Я зазвичай прокидаюся о сьомій годині.

We go to the University every day. Ми ходимо до університету щодня.

Запитання для самоконтролю

1. Які іменники відносяться до злічуваних (countable nouns)?
2. Які іменники відносяться до незлічуваних (uncountable nouns)? Наведіть приклади.
3. Які іменники мають форму множини? Назвіть основні правила утворення множини іменників.
4. Як вимовляється кінцеве -(e)s після глухих і дзвінких приголосних, після голосних, а також після свистячих і шиплячих звуків?
5. Назвіть винятки з правил для іменників, що закінчуються на -o, -f(e).
6. Які іменники мають однакову форму в однині та множині?
7. В яких іменниках у формі множини міняється коренева голосна?
8. Як утворюється форма множини у складних іменниках? Наведіть приклади.
9. Назвіть іменники, які вживаються тільки у формі множини.
10. Які ви знаєте особливості вживання іменників у формі множини та однини?
11. Як утворюється присвійний відмінок іменників?
12. Які іменники можуть мати форму присвійного відмінку?
13. Що таке особові та неособові форми дієслова?
14. Назвіть три способи дієслова та наведіть приклади до кожного з них.
15. Які є чотири основні форми дієслова?

16. Назвіть чотири групи часових форм дієслова.
17. Для вираження якої дії вживається Present Simple (Indefinite)?
18. Розкажіть правила утворення стверджувальної, заперечної та питальної форм дієслова в Present Simple.
19. Провідмінійте дієслова “to be” та “to have” у Present Simple.
20. Скільки типів питальних речень розрізняють в англійській мові? Назвіть всі питальні слова, за допомогою яких утворюються спеціальні запитання.

Завдання для самостійного виконання

2.1.1. Виберіть правильний варіант:

1. Joanna eats apple / an apple every morning.
2. Kate rarely has biscuit / a biscuit with her coffee.
3. Margaret has got very long black hair / hairs.
4. Sorry I'm late. I had trouble / troubles with the car this morning.
5. We are late because they're re-surfacing the motorway and the traffics / traffic are/is terrible.
6. I want something to read. I'm going to buy a / some paper.

2.1.2. Складіть словосполучення, вживаючи, де це можливо, присвійний відмінок:

e.g. the window / the room - the window of the room
the watch / Mike – Mike's watch

- | | |
|---|------------------------------|
| 1. the laboratories / the Institute | 7. the cinema / the town |
| 2. the daughter / Charles | 8. the name / the street |
| 3. the economic policy / the government | 9. the eyes / the cat |
| 4. the birthday / my friend | 10. the shoes / the children |
| 5. the car / my neighbours | 11. the goods / the factory |
| 6. the roof / the house | 12. the newspaper / today |

2.1.3. Перепишіть речення, починаючи його з підкресленого слова:

e.g. Tourism is the main industry in this country.

This country's main industry is tourism.

1. The football match tomorrow has been cancelled.

Tomorrow _____.

2. Exports from Britain to the United States have fallen recently.

Britain _____.

3. The storm last week caused a lot of damage.

Last _____.

4. The new manager of the company is very qualified.

The company _____.

2.2.1. Заповніть пропуски відповідними формами дієслова to be

1. He ... not a farmer, he ... a worker. 2. ... Tom and Nick at the University already? – No, they ... not. These students are often late for the classes. 3. Who ... you? – I ... Lessia, the student of the Forestry faculty. And this is my friend Olga, she

... a student of Agrobiological faculty. 4. ... it your pen? – No, it ... not. It ... Victor's pen. 5. Bob's parents ... not farmers. His father ... an engineer, and his mother ... a teacher at a local school.

2.2.2. Дайте відповіді на питання:

1. Where are you now? 2. Is your friend at home now? 3. Are your parents doctors? 4. What is your mother's name? 5. Are you from Kyiv? 6. Are you a student? 7. Where are you from? 8. Are your friends students? 9. Is your room large? 10. How old are you?

2.2.3. Заповніть пропуски дієсловом *have (got)* або *has (got)*:

1. ... you got an English textbook? – Yes, I have. 2. She ... many excellent marks. 3. They ... a beautiful house in the village. 4. He ... a large family. 5. We ... a cat. It ... green eyes and white legs.

2.2.4. Напишіть питальну і заперечну форми:

1. He has a sister. 2. We have a dictionary. 3. Nick has a computer. 4. They have a big farm. 5. She has a large family. 6. Alex has many interesting books. 7. I have a new computer. 8. They have a big flat. 9. Kate has a beautiful dress. 10. Liz has a dog and two cats.

2.2.5. Заповніть пропуски словами:

be not be collect deliver drive get up like not go
have live make

Jenny Gonzalez (1) lives in New York with her husband, Pablo. She (2) _____ a school bus driver. Every morning, Jenny and Pablo (3) _____ at 6.00 and (4) _____ breakfast. Then Jenny (5) _____ 40 children to school on her bus. Pablo (6) _____ a bus driver, he (7) _____ a postman. He (8) _____ letters to two hundred flats and offices in Manhattan.

Jenny and Pablo (9) _____ two children, Benny and Bella. The children (10) _____ to school on Jenny's bus, they (11) _____ walking with their friends.

2.2.6. Напишіть дієслова в *Present Indefinite Tense*:

1. I (to study) at the university. 2. My parents (to work) at the factory. 3. Where ... you (to study)? 3. This girl (to sing) very well. 4. I (to get up) at seven o'clock. 5. The student (to go) to the university. 6. His friend ... not (to live) in Cherkassy. She (to live) in Poltava. 7. Where ... your mother (to work)? – She (to work) at a hospital. 8. My brother (to want) to become a lawyer. 9. Tom and Dick often (to play) chess. 10. It often (to rain) in autumn.

2.2.7. Утворіть питальну та заперечну форми:

1. We study English. 2. His father works at the plant. 3. My brother goes to school. 4. Kate lives in Chernihiv. 5. I like this story. 6. My sister and I go to the theatre every week-end. 7. These boys go in for sports. 8. She wants to become a good

specialist. 9. Our family go to the Crimea each summer. 10. After the lessons the students often play chess.

2.3. Прочитайте про Інститут лісового і садово-паркового господарства та виконайте вправи після тексту

INSTITUTE OF FORESTRY AND LANDSCAPE-PARK MANAGEMENT

The Institute of Forestry and Landscape-Park Management of the University is one of the oldest in our country. Its history dates back to the middle of the 19th century. Many outstanding Ukrainian scientists contributed much to its development. The history of the Institute is associated with such prominent scientists as P. Pogrebniak, I. Zyma, K. Nikitin, E. Alekseiev, N. Konovalov, A. Kotov, and G. Dubinin.

The Institute is destined to provide students with the highest quality education in any field of forestry (for example, forest management, woodworking technology, forest melioration, etc.). The aim of the curriculum in forestry is to prepare students for professional employment in the management and utilization of natural resources.

Teaching has been a major strength of the Forestry Institute for many decades. The Institute has the best, consecutive programmes in our country for Bachelor's and Master's degrees. Areas of specialization for the Master's degree are Forest Management, Regeneration of forests and Forest melioration, Silviculture, Technology of Wood processing, Garden and Park Construction, and Landscape Design.

Now the Institute of Forestry and Landscape-Park Management includes 6 departments: Botany, Dendrology, and Forest Tree Breeding; Forest Restoration and Melioration; Landscape Architecture and Phytodesign; Forest Inventory and Forest Management; Technology and Design of Wood Products, and the Department of Silviculture. There are many research laboratories at the Institute.

Master's degree programmes offer study and practice in a variety of disciplines and provide graduate students with research training that serves as the basis for their academic careers as scientists.

The Institute also offers research work for the following degrees: Ph.D. - Doctor of Philosophy (the former degree of Candidate of Science), and Doctor of Science. Areas of specialization for Ph.D. and Doctor of Science are Silvics and Silviculture, Forest Inventory, Phytomelioration, Garden and Park Management, Forest Management, Wood Processing Technologies, and others. It is well known that only a balance of study and work is required to develop students' full potential. The necessary conditions for practical training have been created at Boiarka Forest Research Station. The Botanical Garden of the University may be called a real student instruction laboratory. About 1,000 tree species from various geographical zones have been collected here.

A great deal of scientific work is carried out at the Institute. The scientists study problems on increasing the productivity of Ukrainian forests, reforestation, and afforestation, application of means against drought and soil erosion, tree diseases, and fire control.

The Forestry Institute cooperates with different higher institutions in Baltic countries, Hungary, Poland, Austria, Denmark, France, Belgium, the Netherlands, China, etc. It has close relations with Universities in the USA (Iowa, Illinois, Pennsylvania, Maine, and Vermont states) and Germany.

Vocabulary

1. application	застосування, вживання
2. carry out	виконувати
3. consecutive	послідовний
4. curriculum	курс навчання, навчальний план
5. decade	десятиріччя
6. destine	визначати, призначати
7. diverse	різний, різноманітний, відмінний
8. enhance	підвищувати (ціну, якість)
9. explore	вивчати, досліджувати
10. forest inventory	лісова таксація
11. instruction	навчання
12. means	засоби, заходи
13. offer	пропонувати
14. provide	забезпечувати
15. aim, purpose	мета
16. require	вимагати
17. reserve	резервація, заповідник
18. scholarship	вченість, ерудиція
19. Silvics	лісознавство
20. Silviculture	лісівництво

2.3.1. До англійських слів та фраз підберіть українські еквіваленти:

- | | |
|------------------------------------|--------------------------------|
| 1. Scientific degrees | a) Навчальна лабораторія |
| 2. Curriculum | b) Багато наукової роботи |
| 3. Outstanding scientists | c) Лісознавство та лісівництво |
| 4. Instruction laboratory | d) Лісова таксація |
| 5. A great deal of scientific work | e) Навчальний план |
| 6. Forest inventory | f) Наукові ступені |
| 7. Silvics and Silviculture | g) Підвищення продуктивності |
| 8. Increasing the productivity | h) Вживання заходів |
| 9. Consecutive programmes | i) Видатні вчені |

2.3.2. Доповніть речення, користуючись текстом:

1. The history of the Forestry Institute dates back to _____.
2. Many outstanding Ukrainian scientists contributed _____.
3. The Institute is destined to provide _____.
4. It has the best, consecutive programmes in _____.
5. Master's degree programmes offer _____.
6. Areas of specialization for Ph.D. and Doctor of Science are _____.
7. Only a balance of study and work is required to _____.
8. A great deal of scientific work is _____.
9. The scientists study problems on _____.
10. The Forestry Institute has close relations with _____.

2.3.3. До слів у лівій колонці підберіть синоніми з правої колонки:

- | | |
|---------------------|-----------------------|
| 1. Outstanding adj | a) Increase v |
| 2. Purpose n | b) Different adj |
| 3. Utilization n | c) Fulfil v |
| 4. Enhance v | d) Collaborate with v |
| 5. Require v | e) Aim n |
| 6. Various adj | f) Subject n |
| 7. Carry out v | g) Institution n |
| 8. Cooperate with v | h) Prominent adj |
| 9. Discipline n | i) Use n |
| 10. Establishment n | j) Need v |

2.3.4. Дайте відповіді на запитання:

1. When was the Institute of Forestry and Landscape-Park Management founded? Is it one of the oldest in our country?
2. Who contributed much to its development?
3. Who is the director of the Institute now?
4. What special education does the Institute provide students with?
5. What degree programmes does the Institute offer?
6. What are the areas of specialization for the Master's degree? (for Ph.D. and Doctor of Science degrees)?
7. Where do future specialists have practical training?
8. Do the scholars of the Institute carry out much scientific work? What problems are they solving now?
9. Does the Institute of Forestry and Landscape-Park Management cooperate with other Institutes and Universities in our country and abroad?

2.3.5. Складіть діалог за текстом "The Insititute of Forestry and Landscape-Park Management".

2.3.6. Складіть план до тексту та перекажіть його.

2.3.7. Прочитайте додатковий текст “Reasons to learn English”, користуючись словником. Перекажіть його зміст українською або англійською мовою

Reasons to learn English

English is commonly spoken throughout the world due to Great Britain’s colonial empire expansion during the Age of Discovery (from the end of the 15th century to the 18th century). English is the official language of 53 countries. It is spoken as a first language by about 400 million people around the world. People in Australia, New Zealand, Canada, parts of Africa, India, and many smaller island nations speak English. This is the most commonly used language among foreign language speakers. Many countries include English as a second language in their school programmes and children start learning English at a young age.

English is the commonly adopted second language in Germany, Norway, Sweden, Denmark, and the Netherlands. Speaking English opens these countries and cultures for you.

Another reason why English is so important is that it is the language of science. To excel in science, you need to know English. Except for China, the United States is still a leader in technical innovation and economic development. English is widely used in each of these fields.

It is also the language of aviation, computers, diplomacy, and tourism. Knowing English increases your chances of getting a good job in a multinational company within your home country or of finding work abroad.

English is the language of the media industry. If you speak English, you won’t need to rely on translations and subtitles anymore to enjoy your favourite books, songs, films and TV shows.

English is also the language of the Internet. Many websites are written in English – you will be able to understand them and to take part in forums and discussions.

English is based on a simple alphabet and it is fairly quick and easy to learn it compared to other languages.

English is not only useful — it gives you a lot of satisfaction. Making progress feels great. You will enjoy learning English if you remember that every hour you spend gets you closer to perfection.

2.3.8. Наведіть свої аргументи на користь знання іноземних мов, зокрема англійської. Складіть діалоги на тему “How do you learn English?”

UNIT 3 MY FUTURE SPECIALITY

3.1 Ступені порівняння прикметників і прислівників (Degrees of Comparison of Adjectives and Adverbs)

В англійській мові, як і в українській, якісні прикметники і прислівники мають ступені порівняння: початкову форму, вищий і найвищий ступені порівняння.

Форми вищого і найвищого ступенів порівняння в англійській мові бувають двох видів:

1) прості, які утворюються за допомогою суфіксів **-er** (для вищого ступеню) та **-est** (для найвищого ступеню):

big – bigger – the biggest;

early – earlier – the earliest;

2) складені які утворюються додаванням до початкової форми слова **more** у вищому ступені і слова **most** у найвищому:

interesting – **more** interesting – **the most** interesting

carefully – **more** carefully – **the most** carefully

Прості форми ступенів порівняння мають:

1) односкладові прикметники та прислівники:

high – higher – the highest

fast – faster – the fastest

2) двоскладові прикметники, що закінчуються на **-y, -er, -le, -ow**:

heavy – heavier – the heaviest

clever – cleverer – the cleverest

simple – simpler – the simplest

narrow – narrower – the narrowest

3) двоскладові прикметники з наголосом на другому складі:

polite – politer – the politest

Складені форми ступенів порівняння мають:

1) багатоскладові прикметники

excellent – more excellent – the most excellent

2) двоскладові прикметники з наголосом на першому складі, крім тих, що закінчуються на **-y, -er, -le, -ow**:

modern – more modern – the most modern

3) дво- та багатоскладові прислівники крім **early**:

carefully – more carefully – the most carefully.

Ступені порівняння деяких прикметників і прислівників утворюються від іншої основи:

good (well) – better – the best;

bad (badly) – worse – the worst;

little – less – the least;

many (much) – more – the most.

Слова **far, old** мають дві форми вищого і найвищого ступенів порівняння:

far (прикметник) – farther – the farthest;
 far (прислівник) – further – the furthest;
 old – older – the oldest (старший за віком);
 old – elder – the eldest (старший у сім'ї).

При порівнянні двох об'єктів з різним ступенем якості після прикметника чи прислівника у вищому ступені вживається сполучник **than**:

Kyiv is larger than Lviv.

При порівнянні двох об'єктів з однаковим ступенем якості вживається сполучник **as ... as**:

Alice is as skillful as Tom.

При запереченні рівності якостей двох предметів вживається сполучник **not so ... as**:

Lviv is not so large as Kyiv.

3.2. PAST SIMPLE (INDEFINITE) TENSE (ТЕПЕРІШНІЙ ПРОСТІЙ / НЕОЗНАЧЕНИЙ ЧАС)

Past Simple вживається для вираження одноразової або постійної дії, що відбувалася в минулому; може передавати ряд послідовних дій у минулому:

He came home at 6 o'clock.

He lived in Poltava when he was a child.

They swam in the river every day in summer.

He stood up, came up to the window and opened it.

За способом утворення Past Simple, а також форми Past Participle дієслова в англійській мові поділяються на правильні й неправильні.

Утворення:

	to play	to go
+	II форма -ed played I played tennis every Sunday.	II форма went She went to school every day.
?	Did Did you play tennis every Sunday?	
-	did not (didn't) I did not play tennis every Sunday.	

Закінчення **-ed**, що додається до основи інфінітива у правильних дієсловах, вимовляється:

[t] – після глухих приголосних, крім t:

to ask - asked

[d] – після дзвінких приголосних, крім d:

to live - lived

[id] – після **t, te, d, de**:

to wanted – wanted

to hateed – hateed

to decideed - decideed

Запам'ятайте:

- (to) copy → he copied
- (to) stop → he stopped
- (to) permit → he permitted
- (to) prefer → he preferred
- (to) travel → he travelled

Але:

- (to) play → he played

Прислівники, з якими вживається Past Simple:

yesterday	an hour ago
last week	at six o'clock
last year	the other day
on Monday	in 1980

**3.3. FUTURE SIMPLE (INDEFINITE) TENSE
(МАЙБУТНІЙ ПРОСТИЙ /НЕОЗНАЧЕНИЙ ЧАС)**

Future Simple вживається для вираження 1) одноразової або повторюваної дії в майбутньому:

They will finish school in June.
He won't see her till Monday.

2) передбачення майбутньої дії:

People will live on the Moon in future.
Don't worry, you'll pass the exam.

3) вірогідної дії (особливо після слів: to think, to expect, probably, perhaps, to be sure, to be afraid that...):

We'll probably go to England in summer.

4) майбутньої дії, рішення про яку приймається в момент мовлення:

Don't get up – I'll open the door.
Would you like tea or coffee? – I'll have some coffee.

Для вираження дії в майбутньому замість **Future Simple** у підрядних реченнях **часу** та **умови**, які починаються сполучниками **when, after, before, till, until, if, unless, as soon as** тощо, вживається **Present Simple**.

If he **comes** I will (shall) ask him about it. - Якщо він **прийде**, я спитаю його про це.

We'll buy it if/when we have money.
I'll tell it to him when he comes back.
If Peter comes to see me, we'll play chess.

Утворення:

	to read
+	will (shall) I/we will (shall) read a book tomorrow. She will read a journal tomorrow.
?	Will (Shall)

	Shall I/we read a book tomorrow? Will you/he/they read a book tomorrow?
-	will not (shall not) I/we will not (won't)/ shall not (shan't) read a book tomorrow. He will not (won't) go to the theatre.

Прислівники, з якими вживається Future Simple:

next year	tomorrow
next week	the day after tomorrow
some day	soon
in two months	one of these days

Запам'ятайте:

До недавнього часу допоміжне дієслово shall вживалося в першій особі однини і множини Future Simple. У сучасній англійській мові shall вживається дуже рідко, особливо в стверджувальних реченнях. Але в питальних реченнях, при модальному значенні, (до 1-ої особи однини та множини) краще вживати shall.

Часові форми групи Simple

Present Simple передає звичайну або повторювану дію.	Does Kate often write letters to her friends?	Yes, she does. She often writes letters to her friends.	No, she doesn't. Kate doesn't write letters to her friends.
Past Simple передає одноразову або постійну дію в минулому.	Did Kate often write letters to her friends during summer holidays?	Yes, she did. Kate often wrote letters to her friends during summer holidays.	No, she didn't. Kate didn't often write letters to her friends during summer holidays.
Future Simple передає одноразову або повторювану дію у майбутньому.	Will Kate often write letters to her friends next summer?	Yes, she will. Kate will often write letters to her friends next summer.	No, she won't. Kate won't write letters to her friends next summer.

Запам'ятайте:

В англійській мові у формах минулого, теперішнього і майбутнього часів групи Simple у питальних і заперечних реченнях змінюються лише допоміжні дієслова **did, do (does), will (shall)**.

+ She often	{	wrote	}	letters to her friends.
		writes	}	
		will write	}	
Did				
? Does	}	she often write letters to her friends?		
Will				
	{	didn't	}	often write letters to her

- She doesn't friends.
won't

3.4. MODAL VERBS МОДАЛЬНІ ДІЄСЛОВА

До групи модальних дієслів відносяться: **can (could), may (might), must, ought, shall, will, should, would, need**. Самостійно (без інфінітива іншого дієслова) ці дієслова не вживаються, оскільки вони не виражають дії або стану, а лише вказують на можливість, необхідність, бажаність, вірогідність, дозвіл, заборону та здатність виконання дії, вираженої інфінітивом.

Разом з інфінітивом вони утворюють складну форму присудка.

They can do it.

Вони можуть це зробити.

Kate must go there.

Кейт мусить туди йти.

You may take my book.

Ти можеш взяти мою книжку.

Особливості модальних дієслів:

1. Дієслова **can** і **may** мають форми теперішнього та минулого часу (**could, might**), тоді як дієслова **must, ought, need** мають тільки одну форму теперішнього часу.

2. Не мають закінчення **-s** в третій особі однини теперішнього часу:

She **can** speak English. She **may** take my copy-book. She **must** do it. **Need** she do it? She **ought** to help them.

3. Не мають неособових форм: інфінітива, герундія, дієприкметників. Інфінітив після модальних дієслів вживається без частки **to**, окрім дієслова **ought**: You may take it. You needn't do it.

Але: You **ought to** read it.

Вам слід це прочитати

4. Питальну та заперечну форми утворюють самостійно, без допоміжного дієслова **to do**: **Can I** help you? **May I** come in? **Must he** go there? **Ought he** to read it? **Need they** do it?

She **cannot** help you. You **may not** take it. He **must not** go there. He **ought not** to read it. They **need not** do it.

Повні та короткі заперечні форми:

Can – cannot – can't

Could – could not – couldn't

May – may not – mayn't

Might – might not – mightn't

Must – must not – mustn't

Shall – shall not – shan't

Should – should not – shouldn't

Will – will not – won't

Would – would not – wouldn't

Ought – ought not – oughtn't

Need – need not – needn't

Для вираження дії модальних дієслів в минулому чи майбутньому часі вживаються їхні еквіваленти (замінники):

Модальні дієслова та їх еквіваленти	Present	Past	Future
<u>can</u> (МОГТИ, ВМІТИ) <u>to be able (to)</u> (бути спроможним)	can am is able (to) are	could was were able (to)	- will be able (to)
<u>may</u> (МОГТИ) <u>to be allowed (to)</u> (ДОЗВОЛЯТИ)	may am is allowed (to) are	might was were allowed (to)	- will be allowed (to)
<u>must</u> (ПОВИНЕН, ТРЕБА) <u>to have (to)</u> <u>to be (to)</u>	must has have (to) am is (to) are	- had (to) was were (to)	- will have (to) -
<u>should</u>	should	-	-
<u>ought to</u>	ought to	-	-
<u>Need ...?/needn't</u>	Need ...?/needn't	-	-

Can (Could)

Дієслово **can** у сполученні з інфінітивом вживається для вираження фізичної, розумової здатності, уміння або можливості виконати дію, перекладається українською мовою **могти, вміти, бути спроможним**.

Can може стосуватися теперішнього та майбутнього часу: She can speak English. – Вона вміє (може) розмовляти англійською мовою. I can do this work tomorrow. – Я зможу виконати цю роботу завтра. **Could** вживається для минулого часу: Ann could sing very well when she was a child. - Аня вміла (могла) дуже гарно співати в дитинстві.

To be able (to) “бути спроможним” щось зробити – еквівалент дієслова **can** – може вживатися замість **can** і **could** (I am able, I was able), а також у майбутньому часі та в інших часових формах: I shall be able, I have been able, та ін.: I hope I'll be able to do it next week. - Сподіваюсь, що я зможу це зробити наступного тижня.

May (might)

Дієслово **may** (в теперішньому часі) та його форма минулого часу – **might** вживаються:

1. Для вираження дозволу (з Indefinite Infinitive) – тільки дієслово <i>may</i>	You may use my pen	Ви можете взяти мою ручку
---	--------------------	---------------------------

<p>2. Для вираження припущення: а) в теперішньому або майбутньому часі (з Indefinite Infinitive) б) в минулому часі (з Perfect Infinitive)</p>	<p>He may go to Italy. It may be true. It might be true. He may have felt tired</p>	<p>Він, можливо, поїде в Італію. Можливо, це правда. Можливо, це і правда (хоча навряд чи). Він, мабуть, почував себе стомленим</p>
<p>3. <i>Might</i> вживається (замість <i>may</i>) в непрямій мові, коли дієслово головного речення стоїть в минулому часі (згідно з правилами узгодження часових форм)</p>	<p>He said that she might know their address. He said that they might use his dictionary</p>	<p>Він сказав, що вона, можливо, знає їх адресу. Він сказав, що вони можуть взяти його словник</p>

Дієслово *must*

Дієслово **must** має лише одну форму теперішнього часу та два еквіваленти - модальні дієслова **to have** та **to be**, що вживаються в усіх інших часових формах.

Дієслово **must** вживається:

<p>1. Для вираження необхідності дії за певних умов, обов'язку, в стверджувальних і питальних реченнях (з Indefinite Infinitive). Замість <i>must</i> може вживатися <i>to have (to)</i>, особливо стосовно минулого та майбутнього часу</p>	<p>They must go to university now. Must you work tomorrow? Did he have to go to university yesterday?</p>	<p>Вони повинні (їм треба) зараз піти в університет. Ви повинні завтра працювати? Він повинен був піти вчора в університет?</p>
<p>2. Для вираження наказу та поради в стверджувальних та заперечних реченнях (з Indefinite Infinitive). Дієслово <i>to have (to)</i> в цьому значенні <u>не вживається</u></p>	<p>You must post the letter at once. You must consult the doctor</p>	<p>Ви повинні відправити листа негайно. Вам треба (ви повинні) порадитися з лікарем</p>
<p>3. Для вираження припущення в <u>стверджувальних реченнях</u>: а) в теперішньому часі (з Indefinite Infinitive) б) в минулому часі (з Perfect Infinitive)</p>	<p>She must know this material. She must have caught cold</p>	<p>Вона, напевно, знає (повинна знати) цей матеріал. Вона, напевно, застудилася</p>

Примітка: 1. У заперечній відповіді на запитання з дієсловом **must** вживається **needn't**:

Must I go there? – No? You **needn't**.

Я повинен туди йти? – Ні, не треба.

І навпаки, в стверджувальній відповіді на питання з дієсловом **need** вживається **must**:

Need I go there? – Yes, you **must**. Мені треба туди йти? – Так, треба.

2. Заперечні форми **mustn't** та **don't have to** різняться за значенням: **mustn't** виражає категоричну заборону, одночас **don't have to** вказує на відсутність необхідності виконання дії:

You **mustn't** talk in the library. They **don't have to/needn't** call us
(You aren't allowed...) tonight. (It isn't necessary.)

3. У розмовній мові вираз **to have got** також уживається в модальному значенні і виражає необхідність чи обов'язок, зумовлені обставинами:

I've **got to get up** early. Мені треба встати рано.

Питальна й заперечна форми:

Have you got to get up early?

I haven't got to get up early.

Вираз **to have got** у модальному значенні вживається лише в теперішньому часі.

Модальне дієслово **to be**

1. Модальне дієслово **to be**, еквівалент дієслова **must**, виражає обов'язок, що впливає з попередньої домовленості, плану, розкладу, графіка тощо

They were to meet at the cinema. Вони повинні були зустрітися в
кінотеатрі.

2. Модальне дієслово **to be** вживається для вираження наказу або інструкції:

You are not to come here anymore. Не приходьте сюди більше.

3. Модальне дієслово **to be**, вжите з інфінітивом у пасивному стані, виражає можливість:

They were to be found. Їх можна було знайти.

Модальне дієслово **to be** вживається лише в двох часових формах: Present Indefinite і Past Indefinite.

4. З модальним дієсловом **to be** в Present Indefinite вживається лише неозначений інфінітив (Indefinite Infinitive):

She is to come at 9 o'clock. Вона повинна прийти о 9.00.

5. Після **to be** в Past Indefinite вживається також перфектний інфінітив, який вказує на те, що виражена ним дія не відбулася:

She was to have come at 9 o'clock. Вона повинна була прийти о 9.00 (але не прийшла).

Дієслово **need**

1. Дієслово **need** вживається як модальне і як смислове. Як модальне дієслово **need** у сполученні з неозначеним інфінітивом виражає необхідність виконання дії стосовно теперішнього або майбутнього часу і вживається лише в питальних і заперечних реченнях:

Need I go there? – No, you needn't. (Yes, you must.)

У заперечній формі має теж саме значення, що й **don't have (to)**.

2. У значенні модального дієслова **need** має лише форму теперішнього часу (питальну та заперечну).

Питальна й заперечна форми утворюються без допоміжного дієслова **to do** і вживаються з інфінітивом основного дієслова без частки **to**.

3. Perfect Infinitive, вжитий з дієсловом **need**, означає, що дія, в якій не було необхідності, відбулася:

You needn't have done this work. Не треба було виконувати цю роботу (не було необхідності).

4. Дієслово **need** як смислове означає мати потребу в чомусь. У цьому значенні воно відмінюється за загальними правилами і вживається в теперішньому, минулому і майбутньому часі.

Інфінітив після нього вживається з часткою **to**, питальна й заперечна форми в Present Indefinite і Past Indefinite утворюються з допомогою дієслова **to do**.

Дієслова *should* і *ought (to)*

Дієслова **should** і **ought** майже не різняться за значенням. Кожне з них має лише одну форму. **Should** вживається з інфінітивом без частки **to**. Після **ought** інфінітив вживається з часткою **to**.

Дієслова **should** і **ought** виражають моральний обов'язок (з точки зору того, хто говорить), пораду, рекомендацію. У цих значеннях **should** і **ought** вживаються з різними формами інфінітива.

Сполучення should і ought з Indefinite Infinitive виражають дію відносно теперішнього або майбутнього часу	You should (ought to) listen to the teacher more carefully	Вам слід (ви повинні) слухати викладача більш уважно
Сполучення Perfect Infinitive з дієсловами should і ought у стверджувальній формі означає, що дія, бажана на думку того, хто говорить, не відбулася. Заперечна форма should і ought у сполученні з Perfect Infinitive виражає дію, що відбулася як небажана з точки зору того, хто говорить	You should have shortened your article. You shouldn't have finished this experiment	Вам варто було скоротити свою статтю. Не треба було закінчувати цей експеримент
Дієслово should вживається в риторичних питаннях з питальним словом why для вираження подиву, сильного здивування, обурення	Why should I feel guilty about it?	Чому я маю почувати себе винним у цьому?

Запитання для самоконтролю

1. Які ступені порівняння мають якісні прикметники?
2. Як утворюються форми вищого та найвищого ступенів порівняння прикметників?
3. Які двоскладові прикметники мають прості форми ступенів порівняння?
4. Назвіть прикметники та прислівники, ступені порівняння яких утворюються від інших коренів.

5. Для вираження якої дії вживається часова форма дієслова Past Simple (Indefinite)?
6. Як утворюється ця часова форма?
7. Назвіть правила правопису правильних дієслів у Past Simple. Як читається закінчення -ed?
8. Яку форму в Past Simple мають такі “неправильні” дієслова: to begin, to bring, to catch, to choose, to drink, to eat, to fight, to find, to know, to grow.
9. Яку дію виражає часова форма дієслова Future Simple?
10. Як утворюється ця часова форма? Напишіть питальну та заперечну форми дієслова *graduate*: They will graduate from university in 2 years.
11. В яких підрядних реченнях для вираження майбутньої дії вживається не Future Simple а Present Simple? Наведіть приклади.
12. Які дієслова називаються модальними, що вони означають?
13. Яку форму минулого часу має дієслово *can*? Коли вживається це модальне дієслово? Назвіть еквівалент цього дієслова.
14. Який еквівалент та форму минулого часу має дієслово *may*? Поясніть вживання цих форм.
15. Скільки еквівалентів має дієслово *must*? Поясніть різницю вживання *must* і його заміників. Наведіть приклади.
16. Що означають дієслова *should* і *ought (to)*? Наведіть приклади їх вживання.
17. В яких формах вживається дієслово *need* у значенні модального?
18. Як сказати англійською “не має потреби” щось робити?
19. Розкажіть про модальне значення *shall*, *will*, *would*.
20. В яких формах вживається дієслово *dare* у значенні модального?

Завдання для самостійного виконання

3.1. 1. Утворіть ступені порівняння поданих прикметників і прислівників:

Tall, large, comfortable, bad, old, little, far, early, carelessly, fast, often, nervous, courageous, good, many, profitable, active, calmly, slowly, well, modern.

3.1.2. Дайте відповіді на питання:

1. Which is the shortest month of the year? 2. Which is the largest city in western Ukraine? 3. Is Khreshchatyk the shortest main street in the world? 4. What city is larger: Kyiv or London? 5. When days are longer: in summer or in winter? 6. What is the largest country in the world? 7. What subject is the most difficult for you? 8. Is chemistry more difficult than English? 9. Who is the youngest in your group?

3.1.3. Напишіть прикметники у потрібному ступені порівняння:

1. This film is much (interesting) than that one. 2. Peter is (old) in our family. 3. Today it is not so (cold) as yesterday. 4. January is as (long) as December. 5. The Black Sea is much (big) than the Azov Sea. 6. Tania is (good) student in our group. 7. The Dnieper is (long) river in Ukraine. 8. In December nights are (long) and days are

(short). 9. Everest is (high) mountain in the world. 10. Her brother usually gets up (early) than she does.

3.2.1. Напишіть форми наступних дієслів в Past Simple і Past Participle:

- a) Standard verbs: to drain, to cover, to mix, to protect, to locate, to organize, to join, to adopt, to prepare.
- b) Non-standard verbs: to make, to find, to give, to do, to leave, to spend, to be, to see, to cut.

3.2.2. Утворіть загальні питання та заперечні речення за зразком:

Зразок: He wrote a letter to his friend yesterday. – Did he write a letter to his friend yesterday? / He didn't write a letter to his friend yesterday.

1. On Monday he came to the office by taxi.
2. Last month Tom and Jim visited Scotland.
3. I last saw her over three years ago.
4. Mr Brown told us about India.
5. Children played computer games yesterday.
6. We all left the party at 11 o'clock.
7. Mr Smith died five years ago.

3.2.3. Розкрийте дужки, вживаючи дієслова в Past Simple:

1. Yesterday Tom (to be) late for work.
2. Last night Ann (to sleep) very well.
3. Kevin's father (to teach) him to drive when he was 17.
4. We needed some money so we (to sell) our car.
5. He (to leave) the room an hour ago.
6. Ann (to spend) a lot of money yesterday. She (to buy) a dress which (to cost) 100\$.
7. Mr Brown (to catch) the eight o'clock train yesterday.
8. He (to send) a letter to his aunt last week.

3.3.1. Утворіть загальні питання та заперечні речення:

1. We'll probably go to Scotland in June.
2. You'll never finish that book.
3. It will be spring soon.
4. She'll be here in a few minutes.
5. We will need the money on the 15th.
6. Tomorrow will be warm, with some clouds in the afternoon.

3.3.2. Розкрийте дужки, вживаючи дієслова в Future Simple:

1. It (not to rain) next week.
2. The weather (to get) much warmer in the next few years.
3. I'm sure Tom (to get) the job. He has a lot of experience.
4. I think she (to go) to London.
5. I expect she (to be) back quite soon.
6. I'm sure we (to miss) her very much.
7. He thinks Tom (to like) the present you bought for him.

3.3.3. Виберіть правильну часову форму дієслова: Future Simple чи Present Simple. Перекладіть речення українською мовою:

1. If I (to be) there tomorrow, I (to phone) you.
2. He doesn't know if he (to be) there next week.
3. Can you look after the children while we (to be) out?
4. Before you (to leave), you must visit the museum.
5. I (to come) as soon as I (to finish) the work.
6. Everyone (to be) surprised if he (to pass) the exam.
7. Hurry up! If we (not to hurry), we (to miss) the train!

3.4.1. Перекладіть подані речення українською та поясніть вживання must, to be (to), to have (to), to have got (to):

1. All applicants must take an entrance exam.
2. I'm looking for Sue. I have to talk to her about our lunch date tomorrow. I can't meet her for lunch because I have to go to a business meeting at 1:00.
3. Where's Sue? I must talk to her right away. I have an urgent message for her.
4. I have got to go now. I have a class in ten minutes.
5. The game is to begin at 10:00.
6. The committee is to meet tomorrow.
7. I must be at the meeting. The meeting can't occur without me because I'm the only one who has certain information.
8. I am to be at the meeting. My boss ordered me to be there. He will accept no excuses.
9. The teacher gave the students a writing assignment. They are to write a composition. They are to write it about a person they admire.
10. He must have been at the airport to meet his sister's plane.

3.4.2. Поставте замість пропусків must not або do not have to та перекладіть ці речення українською:

1. I've already finished all my homework, so I _____ study tonight. I think I'll read for a while.
2. You _____ introduce me to Dr Gray. We've already met.
3. A person _____ become rich and famous in order to live a successful life.
4. In order to be a good salesclerk, you _____ be rude to a customer.
5. I _____ go to the doctor. I'm feeling much better
6. Johnny, You _____ play with sharp knives!
7. We _____ go to the concert if you don't want to, but it might be good.

3.4.3. Вставте модальні дієслова *should, must* або *had to*. Розкрийте дужки, вживаючи потрібну форму інфінітиву:

1. You ... always lock the front door when you go out.
2. I don't think people ... keep pets if they don't have time to care for them properly.
3. You ... be thirsty after carrying those heavy boxes. Shall I make some tea?
4. If you want to take photos while we're going around the museum, you ... ask permission. We don't want to get into trouble.
5. He ... (to attend) the lesson: the material which the teacher explained was very difficult, and now it will be impossible for him to write the test paper well.
6. People really ... smoke when there are children around. It's such a bad example to them.
7. Last night Ann suddenly became ill. Her parents ... call the doctor.

3.4.4. Поставте відповідні модальні дієслова (*must, may, can, could, need, to have to, to be able to*):

1. He ... roller-skate when he was young.
2. You ... not come to help them tomorrow: the work is done.

3. ... you help me now? - I am afraid not: I am in a great hurry. I shall be free in the evening. Come to my place at about eight, and I ... help you.
4. Dad's car broke down yesterday. - ... he ... repair it? – No, he took it to the garage.
5. Those men look alike. They ... be brothers.
6. It is already six o'clock. We ... hurry if we don't want to be late.
7. Shall I do Grandma's shopping for her? – No, you She wants to do it herself.
8. ... you help me with these letters? - ... we do them now? Can't they wait until the morning? – No, I ... have posted them this morning, really. Oh, all right then.

3.4.5. Перекладіть речення українською мовою:

1. I should go to the meeting. I can get some information if I go. Going to the meeting is a good idea.
2. You should study harder. You ought to study harder.
3. Drivers should (ought to) obey the speed limit.
4. You shouldn't leave your keys in the car.
5. Kay has been studying hard. She should do/ought to do well on the test tomorrow.

3.4.6. Дайте пораду, використовуючи модальне дієслово *should* і слова, наведені в дужках:

E.g. These children are very tired. (to go to bed early).

Young children should (ought to) go to bed early.

1. He's been coughing a lot recently. (not to smoke so much)
2. I am afraid they will miss the train. (to take a taxi)
3. He's lost his checkbook and credit cards. (to phone the police and tell the bank)
4. She has just been offered a job. (to accept the job)
5. This child has a bad toothache. (to go to the dentist)
6. The students are unable to follow what the professor is saying. (not to speak so fast)
7. She is going to visit France. (to learn a few words of French)
8. The speed limit is 60 km an hour but Tom is driving at 90. (not to drive so fast)

3.4.7. Перефразуйте речення, використовуючи модальні дієслова:

E.g. 1. Let's leave the party now.

shall Shall we leave the party now?

2. I advise you to look for another job.

ought You ought to look for another job.

3. I'm bored. Let's watch TV.

shall I'm bored. _____ TV?

4. I advise you to stop eating fatty foods.

ought You _____ fatty foods.

5. Would you like me to carry the shopping?

shall _____ I _____ for you?

6. I advise you not to spend so much money on clothes.

should You _____ so much money on clothes.

7. I advise you to leave early.

ought You _____ early.

3.4.8. Використайте модальні дієслова *should, need* або *must*:

1. We ... spend a lot of time at the museum if it is not interesting.
2. You ... have studied the material thoroughly. Then you would not have made so many mistakes.
3. I'm going to be in trouble. I ... have posted these letters yesterday afternoon and I completely forgot.
4. She ... have followed the doctor's advice. She looks very fine.
5. You ... have ignored the instructions of your sports coach. That's why you lost the game.
6. You ... wear a helmet when you ride a motorbike.
7. As my sister offered me a lift, I ... call a taxi.
8. You ... clean the office because we haven't been using it today, but could you tidy the shelves in the storeroom, please?
9. I ... have looked carefully at the number of the bus. Now I must change buses, and I am afraid I shall be late.
10. She ... have set the alarm clock because she woke up early anyway.

3.5. Прочитайте текст про вашу майбутню спеціальність та виконайте вправи після нього

OUR FUTURE SPECIALITY

We study at the Institute of Forestry and Landscape-Park Management of the National University of Life and Environmental Sciences of Ukraine (NULES). We have entered this Institute as we love nature, especially forest with its wildlife, large and old coniferous and broadleaved trees. We also like hand-made wooden articles: from souvenirs to furniture, and the processes of woodworking: woodturning, woodcarving, etc.

Forestry plays an important part in our life, especially in protecting the environment, as it is engaged in the rationally planned exploitation and preservation of forests. Forests are of great value both as raw material and as an important part of the biosphere. They are the "lungs" of our planet. Timber, the most widespread construction material, has become a universal material of great importance. It is used for telegraph posts, railway sleepers, props for mines, manufacture of furniture, tools, musical instruments, etc.

Our Institute offers high-quality training in such specialities as forestry, forest management, woodworking and furniture technology, game management, garden and park management, and landscape architecture.

As future woodworking engineer-technologists, we must know the advanced methods and equipment for woodwork operations, to develop and use the technologies providing the rational use of wood and high-quality production.

The corresponding academic curriculum and programmes provide all the necessary disciplines for our future specialities.

For example, the following subjects are taught on the technology of woodworking: wood science, fundamentals of professional training, wood products technology, design of wood products, wood drying and protection technology,

technology of wood composite materials, structural materials technology, protective treatment of wooden structures, manufacture of furniture from wood composite materials, gluing technology, wooden house construction technology, and others.

Future forestry specialists will be engaged in the growing, conservation, and rational utilization of forests that's why they must know a lot about silvics and silviculture, artificial and natural regeneration of forests, dendrology, forest tree nurseries, forest inventory, entomology, forest mycology and plant pathology, fire control, forest conservation, forest management, forest protection, etc.

The following subjects are taught for specialists in garden and park management and landscape architecture: decorative dendrology, landscape science and geography of forests, ornamental horticulture and nurseries, garden and park construction, floriculture, landscape design, descriptive geometry, topiary art, reconstruction of gardens and parks.

We have sufficient conditions both for studying and practical training at our Institute: there are many well-equipped laboratories, classrooms, and workshops. Boiarka Forest Research Station and the Botanical Garden of the University provide our students with all the necessary types of work during their practical training.

Vocabulary

1. advanced	передовий
2. broadleaved	листяний
3. descriptive geometry	нарисна геометрія
4. drawing	графіка
5. gluing techniques	технологія склеювання
6. Forest inventory	таксація
7. nursery	розсадник
8. post	стовп
9. prop	підпора
10. resin	смола
11. Silvics	лісознавство
12. Silviculture	лісівництво
13. sleeper	залізнична шпала
14. tap	робити надріз
15. to be engaged in	займатися
16. woodcarving	різьба по дереву
17. woodturning	токарна деревообробка
18. coniferous	хвойний
19. composite materials	композиційний матеріал

3.5.1. Дайте відповіді на запитання:

1. Why have you entered the Institute of Forestry and Landscape-Park Management?
2. What role does forestry play in our life? What is forestry engaged in?
3. Is timber the most widespread construction material?

4. How many specialties does your Institute offer to the students?
5. What subjects are taught for future forestry engineers?
6. What special disciplines do technologists of woodworking study at the Institute?
7. Do you have sufficient conditions for studying and practical training?
8. Where will you have your practical training?

3.5.2. Доповніть речення та перекладіть українською мовою:

1. Forestry plays an important ... in our life, especially in ... the environment, as it is ... in rationally planned exploitation and ... of forest both for raw material and as an important part of the biosphere.
2. Timber, the most ... construction material, is used for telegraph ... , railway ... , ... for mines, manufacture of ... , tools, musical instruments, etc.
3. As future engineers-technologists on woodworking, we have to know the ... methods and ... for woodwork operations, to develop and use the technologies ... the rational use of wood and high ... of production.
4. Future forestry engineers will be ... in growing, conservation and rational ... of forests that is why they have to know a lot about Silvics and ... , ... and natural regeneration of forests, forest tree ... , forest ... (mensuration), entomology, plant ... , etc.
5. We have ... conditions ... for studying and practical ... at our faculty.

3.5.3. Складіть план до теми “My Future Speciality”.

3.5.4. Складіть діалог за зразком:

Dialogue

(in the reading room)

- Hi, Mary! I'm very glad to see you.
- Hello, Peter!
- How are things with you?
- No complaints. Thank you.
- Glad to hear it. But I see you look tired.
- I've got a lot of work to do.
- Excuse my curiosity. What are you doing?
- I'm preparing my report for the conference which will take place in two weeks.
- That's great! I'd like to take part too. What is the subject of this conference?
- The subject is “Science contribution to the development of agriculture”. But first, the reports must be in English as the conference is organized by the English department and second, they must be concerned with our future specialities. That's why I'm looking through the English journals on my speciality. I'd like my report to be devoted to the practices of ornamental horticulture, landscape architecture, or floriculture and park design.
- Do you like your future profession?

- Yes, of course! I'm fond of parks both "wild" and formal with their exotic trees, shrubs, and vines, especially I like rock gardens with herbs, stones, and flowers. You know that the colour, form, and even line of plants are used as design elements.

- It's very interesting. I've just decided that my report will be about scientific approaches to forest conservation, the importance of nurseries, the growing of seedlings, and so on. I'm going to look for the material in the library.

- I hope we'll meet soon at the conference.

- Let's hope for the best.

Notes:

Shrub <i>n</i>	кущ, чагарник
Vine <i>n</i>	повзуча рослина
Rock garden <i>n</i>	альпійський сад
To be concerned with	займатися
Ornamental horticulture	декоративне садівництво
Floriculture <i>n</i>	квітникарство
Nursery <i>n</i>	розсадник
Seedling <i>n</i>	сіянець, саджанець

3.5.5. Складіть розповідь про свою майбутню спеціальність.

3.5.6. Вивчіть нові слова та прочитайте текст «Landscape Architecture and Horticulture»:

LANDSCAPE ARCHITECTURE AND HORTICULTURE

Horticulture is a branch of agriculture that specializes in fruits, vegetables, flowers, and ornamental shrubs and trees. Horticulture includes the production, distribution, and processing of fruits and vegetables for food. It also involves the use of plants in landscaping and in such decorations as floral arrangements.

The word *horticulture* comes from the Latin word *hortus*, which means *garden*, and horticulture includes the art and science of gardening. Most horticultural crops were originally grown in gardens. Today, they are raised commercially on farms and in greenhouses, nurseries, and orchards.

Horticulture is widely practiced as an industry and as a hobby. The horticulture industry is the main source of fruits and vegetables, and an important supplier of plants raised for their beauty. Horticulturists in the floral, landscaping, and nursery industries raise plants for use in creating attractive surroundings. Horticultural hobbies include flower arranging and gardening.

Much horticultural research is conducted at agricultural experiment stations, arboretums, botanical gardens, and colleges and universities. Some research involves developing methods to improve the cultivation of plants. For example, horticultural scientists experiment to determine the environment and nutrition necessary for good plant growth. They also work to develop ways to control plant diseases and pests. Other research involves breeding plants to produce new varieties that are especially beautiful, hardy, or productive.

Horticulture is generally divided into four main specialties: (1) pomology, (2) olericulture, (3) floriculture, and (4) ornamental horticulture.

Pomology is the cultivation of shrubs, trees, vines, and other plants for their nuts or their sweet or tart fruits. Crops in this group include almonds, apples, coconuts, dates, grapes, oranges, peaches, and pecans.

Olericulture deals with *herbaceous* (nonwoody) plants raised for use as vegetables. Any part of a herbaceous plant may be the edible part. For example, asparagus is grown for its stem, and cauliflower for its flower buds.

Floriculture is the production and use of flowers and foliage plants. Floriculturists work mainly with house plants, flowers, and greenery for floral arrangements.

Ornamental horticulture is concerned with plants grown outdoors for landscaping. Such plants include shrubs; grasses for lawns; and maples, pines, and other ornamental trees. Ornamental horticulture also involves landscape design for homes, office buildings, highways, and recreational areas.

Landscape architecture is a profession that involves the design and development of land for human use and enjoyment. It is concerned with the beauty of natural surroundings as well as practical ways to use land and the objects on it. People professionally trained in this field are called *landscape architects*.

Landscape architects create plans for a wide variety of land development projects. These projects may range from national parks to small city squares, or from multifamily housing developments to gardens for single family homes. Landscape architects may create equipment for a playground or propose a master plan for university expansion. They might plan the layout of a golf course or for an entire new community. They are involved at all levels at which land use decisions are made, from land planning to site design, to land use management.

Land planning. Landscape architects prepare regional land use reports. These reports include environmental impact statements, which evaluate what land is best suited for residential, industrial, transportation, recreation, and conservation purposes. They study such area features as climate, water supply, vegetation, soil composition, and the slope of the land. They attempt to preserve attractive views and historic landmarks, and to avoid erosion, flooding, and air and water pollution. Landscape architects often work with traffic engineers, economists, ecologists, city planners, and public officials.

Site design. After land use has been determined, landscape architects prepare site development plans and supervise construction contractors. They work with architects to fit structures to land forms, making best use of breezes, sunlight, and views. In designing roads, parks, and other sites, they keep mature trees for shade and arrange for proper grading and drainage. They design walls, fences, steps, pavement patterns, and planting arrangements.

Landscape architects try to arrange outdoor facilities so the facilities function smoothly and harmonize with the surroundings. A city plaza, for example, would have sitting places, fountains, and ornamental plants designed to fit well into traffic and building patterns.

Land use management. Landscape architects help park superintendents and other land administrators develop procedures for using land in a way that conserves its productivity and beauty. For example, a landscape architect might prepare a resource

management program for forests and waterways, or a restoration plan for land with historic significance.

Vocabulary

1. almond	мигдаль
2. arboretum	розсадник дерев
3. asparagus	спаржа
4. attempt	намагатися, старатися, робити спробу
5. cauliflower	цвітна капуста
6. date	фінік, фінікова пальма
7. edible	їстівний
8. expansion	збільшення, розширення
9. floriculture	квітникарство
10. hardy	морозостійкий, зимостійкий
11. herbaceous	трав'яниста рослина
12. horticulture	садівництво
13. impact	поштовх, удар, імпульс
14. landscaping	ландшафтна архітектура
15. lawn	газон
16. layout	планувати, розбивати (сад, ділянку)
17. nursery	розсадник
18. olericulture	виращування овочів та зелені
19. orchard	сад
20. ornamental	декоративний
21. pattern	зразок, модель, шаблон
22. pavement	панель, тротуар
23. pecan	горіх пекан
24. pomology	помологія (наука про плодівництво)
25. process	переробляти
26. public official	посадова особа
27. shrub	кущ
28. statement	заява, твердження, тип офіційного документа
29. tart	кислий, терпкий
30. vine	витка або повзуча рослина

Запитання для самоконтролю

1. What branch of agriculture specializes in fruits, vegetables, flowers, and ornamental shrubs and trees?
2. What does it also involve?
3. Where are horticultural crops raised nowadays?
4. What activities do horticultural hobbies include?
5. What are the main developing methods to improve the cultivation of plants?
6. What four main specialties is horticulture generally divided into?
7. What do pomology and olericulture deal with?
8. What is Ornamental horticulture concerned with?

9. What profession involves the design and development of land for human use and enjoyment?
10. What procedures for using land do landscape architects develop?

Завдання для самостійного виконання

3.5.7. Доповніть речення термінами з тексту:

1. ... is a branch of agriculture that specializes in fruits, vegetables, flowers, and ornamental shrubs and trees.
2. Horticulture is generally divided into four main specialties: (1) ... , (2) ..., (3) ..., and (4)
3. ... is the cultivation of shrubs, trees, vines, and other plants for their nuts or their sweet or tart fruits.
4. ... deals with ... (nonwoody) plants raised for use as vegetables.
5. ... is the production and use of flowers and foliage plants.
6. ... is concerned with plants grown outdoors for landscaping.
7. ... is a profession that involves the design and development of land for human use and enjoyment.

3.5.8. Напишіть анотацію до тексту.

3.5.9. Складіть план та підготуйте переказ тексту «Landscape Architecture and Horticulture».

MODULE TEST I

1. Complete the following sentence:

All of your friends are nice, but Mark is certainly

- | | |
|-------------|--------------|
| A as nice | C more nice |
| B the nicer | D the nicest |

2. Complete the sentence with the verb to come in the correct tense-form:

We'll talk about it after he ... back.

3. Complete the sentence with the verb to do in the correct tense-form:

What sort of music ... you like?

4. Complete the sentence with the correct form of the verb to be (in the Present Simple):

This money ... mine.

5. Match two categories of nouns: A – Countable, B - Uncountable with the following nouns:

- | | | |
|---------------|-----------|-------------------|
| A Countable | 1. leaf | 4. timber |
| B Uncountable | 2. spruce | 5. carbon dioxide |
| | 3. paper | 6. poplar |

6. Choose the correct answer

Jane ... at home until she ... better.

- | | |
|--------------------|--------------|
| A will stay, feels | C stay, feel |
|--------------------|--------------|

B stays, feels

D stay, will feel

7. Complete the sentence with a, an, the or - (= no article):

Yesterday I had ... dinner in a restaurant.

8. Match two quantitative pronouns: A – many, B - much with the following nouns:

A <u>many</u>	1. products	4. oxygen
B <u>much</u>	2. sand	5. money
	3. nitrogen	6. people

9. Complete the following sentence with the verb to be in the correct tense-form:

You can use my car while I ... in Ireland.

10. Complete the following sentence with the verb to live in the correct tense-form:

The Smiths live in a four-room apartment, but last year they ... in a small house in the country.

11. Complete the sentence with a, an, the or - (= no article):

Which ocean is bigger - ... Pacific or ... Atlantic?

12. Complete the sentence:

Do you remember ... (this/that/those/them) people that we met in Greece?

13. Complete the sentence with the correct form of the verb to be (*in the Present Simple*):

The news ... (not) very bad today.

14. Complete the following sentence:

My new car is ... than my old one.

A so fast	C faster
B more faster	D the fastest

15. Complete the sentence with a, an, the or - (= no article):

I saw ... Moon last night.

16. Complete the sentence:

I'd like ... (some/a/any) help.

17. Complete the sentence with the correct form of the verb to be (*in the Present Simple*):

There ... three big sports centres in my town.

18. Complete the following sentence:

Of all the sports in the Olympics, which sport is ... ?

A more dangerous	C as dangerous
B the most dangerous	D dangerous

19. Match two categories of nouns: A – Countable, B - Uncountable with the following nouns:

A few	1. time	4. wood
B little	2. leaf	5. board
	3. yew	6. work

20. Choose the right answer

Jane ... to the cinema if he ... tickets.

A will go, buy
B goes, buys

C go, will buy
D will go, buys

II. Довніть речення та перекладіть українською мовою:

1. Forestry plays an important ... in our life, especially in ... the environment, as it is ... in rationally planned exploitation and ... of forest both for raw material and as an important part of the biosphere.
2. Timber, the most ... construction material, is used for telegraph ... , railway ... , ... for mines, manufacture of ..., tools, musical instruments, etc.
3. As future engineers-technologists on woodworking, we have to know the ... methods and ... for woodwork operations, to develop and use the technologies ... the rational use of wood and high ... of production.
4. ... is concerned with the beauty of natural surroundings as well as practical ways to use land and the objects on it.
5. ... horticulture is concerned with plants grown outdoors for landscaping. Such plants include shrubs; ... for lawns; and maples, pines, and other ... trees. Ornamental horticulture also involves landscape ... for homes, office buildings, highways, and recreational areas.
6. ... is the cultivation of shrubs, trees, vines, and other plants for their nuts or their sweet or tart fruits.
7. ... is the production and use of flowers and foliage plants. Floriculturists work mainly with house plants, flowers, and greenery for floral arrangements.

III. Дайте відповіді на запитання:

1. Why have you entered the Institute of Forestry and Landscape-Park Management?
2. What role does forestry play in our life? What is forestry engaged in?
3. Is timber the most widespread construction material?
4. How many specialities does your Institute offer to the students?
5. What disciplines are taught to future forestry engineers?
6. What special subjects do technologists of woodworking study at the Institute?
7. How many departments are there in your Institute?
8. What do you know about the history of your Institute and University?
9. How many institutes and faculties are there in our university?
10. What scientific degrees does our university award?
11. What kind of research work do the scientists of the University carry out?
12. What is the goal of the international activities of our university?
13. What are your plans for the future?

MODULE II

UNIT 4

FORESTS AND NATURAL VEGETATION ZONES OF UKRAINE

4.1. Дієприкметник теперішнього часу (Participle I)

Participle I – це неособова форма дієслова, що має властивості прикметника, дієприслівника та дієслова. Утворюється шляхом додавання суфікса **ing** до основи дієслова: **to speak - speaking** *той, хто каже; кажучи*; **to rest – resting** *відпочиваючий, відпочиваючи*. Перекладається дієприкметником активного стану теперішнього часу або дієприслівником недоконаного виду.

Додавання суфікса – **ing** призводить до змін в основі дієслів, які закінчуються на:

- 1) наголошену голосну + приголосну:
stop – stopping; begin – beginning; prefer – preferring
- 2) голосну + **l**:
travel – travelling; compel – compelling
- 3) **-ie**: *lie – lying; die – dying; tie – tying*
- 4) приголосну + **e**:
come – coming; make – making

Примітка: кінцева літера **-y** не змінюється:

fly – flying; play – playing

Дієприкметник може виконувати такі функції в реченні:

- 1) обставини:

Looking through the journal she found many interesting articles. Продивляючись журнал, вона знайшла багато цікавих статей.

- 2) означення:

The student reading the journal is my friend. Студент, який читає журнал - мій друг.

- 3) може бути частиною присудка. В цьому випадку Participle I разом з дієсловом **to be** є присудком речення в одному з тривалих часів:

I'll be waiting for you at 8 p.m. Я чекатиму тебе о 8-й вечора.

Форми Participle I

Active Voice		Passive Voice	
Present Participle	writing	being written	Дія одночасна з дією присудка
Perfect Participle	having written	having been written	Дія, що передусе дії присудка

Present Participle може виражати дію

- 1) одночасну з дією, вираженою дієсловом-присудком:

Reading the English article Читаючи цю англійську статтю,

a) I wrote out a lot of new words; я виписав багато нових слів;

b) I'll write out a lot of new words. я випишу багато нових слів.

Participle I може відноситись до теперішнього, минулого чи майбутнього часу.

- 2) що відноситься до теперішнього часу, незалежно від часу дієслова-присудка:

The students working in the field Студенти, що працюють у
came from Kyiv. полі, прибули з Києва.

- 3) що передує дії, вираженій присудком, якщо ці дії відбуваються послідовно. У такому значенні в Participle I вживаються такі дієслова, як to arrive, to enter, to open, to close, to see, to hear, to receive тощо.

Participle I перекладається дієприслівником минулого часу, а дієслово-присудок в англійській мові вживається в Past Simple:

Coming home (When he came Прийшовши додому, він почав
home), he began to work. працювати.

4.2. Дієприкметник минулого часу (Participle II)

Participle II є пасивним дієприкметником, який має лише одну форму і вживається тоді, коли іменник або займенник, до якого він відноситься, позначає об'єкт вираженої дії. Форма Participle II стандартних дієслів збігається з формою минулого часу цих дієслів: **to open відчиняти; opened відчинив; opened відчинений**.

Форма Participle II нестандартних дієслів утворюється різними шляхами: зміною кореневих голосних, кінцевих приголосних тощо. У таблиці нестандартних дієслів дієприкметник II завжди перебуває на третьому місці: to write – wrote – **written**.

У реченні Participle II може виконувати такі функції:

- 1) означення:

The article translated by our students was very interesting. Стаття, перекладена нашими студентами була дуже цікавою.

- 2) обставини причини:

Packed in strong cases, goods arrived in good condition. Упаковані в міцні ящики, товари прибули в хорошому стані.

- 3) обставини часу, що в українській мові відповідають підрядним реченням часу. Такі обставинні дієприкметникові звороти вводяться за допомогою сполучників when, while:

When given the journal read the article about environment protection. Коли вам дадуть журнал, прочитайте статтю про охорону навколишнього середовища.

When done, the results of this experiment will be of great importance for his research. Коли цей дослід буде завершено, його результати матимуть дуже важливе значення для його наукової роботи.

4.3. Тривалі часи (Progressive/Continuous Tenses)

I. Present Progressive (Continuous)

Вживання:

Present Progressive вживається для вираження дії, що відбувається:

1) у момент мовлення:

They are having dinner now.

2) тимчасову дію, що відбувається в певний період теперішнього часу (не обов'язково в момент мовлення):

She is writing a new novel.

He isn't playing football this season.

3) запланованої майбутньої дії і в реченні вживається обставина часу:

We are spending next weekend at home. – *Ми проведемо наступні вихідні дома.*

4) Означає дію або стан, що постійно змінюється:

The population of the world is rising very fast.

Her English is getting better.

Утворення:

Present Simple дієслова **to be (am, is, are)** + **Participle I (reading)** смислового дієслова **to read**

I **am reading** the magazine (now).

+ He **is reading** a new book (at this moment).

You **are reading** a new book (at the present period of time).

Are you reading the magazine?

? **Is he reading** a new book?

Who **is reading** a new book?

What book **are they reading**?

I **am not reading** the magazine.

- She **is not (isn't) reading** a new book.

We **are not (aren't) reading** a new book.

Запам'ятайте:

1) Щоб передати дію, яка відбуватиметься у майбутньому, часто вживається дієслово **to go** у формі **Present Progressive + інфінітив**.

I am going to read a book. - *Я читатиму книгу.*

У цьому випадку дієслово **to go** означає намір виконати дію в найближчому майбутньому.

He is going to play tennis. - *Він збирається грати в теніс.*

Peter has decided. He's going to stop smoking.

Але: He is going to the cinema. - *Він іде в кіно.*

2) **to go** у формі **Present Progressive + інфінітив** означає також дію, що обов'язково відбудеться в найближчому майбутньому і часто є обставини, які вказують на неминучість її виконання:

The sky is full of black clouds. It's going to rain.

Look out! You are going to break that glass!

Look! He is going to fall off his bike.

II. Past Progressive (Continuous)

Вживання:

Past Progressive вживається для вираження дії, що тривала у певний момент або протягом якогось періоду часу в минулому.

Момент виконання дії може вказуватися:

а) такими обставинами часу: at 9 o'clock, at noon (опівдні), at midnight (опівночі), at that moment, all day long (цілий день), from 6 till 8, the whole evening (весь вечір):

They were writing the test from 8 till 10.

б) іншою минулою дією, вираженою в Past Simple:

She was writing an article when her friends came.

Past Progressive (Continuous) може вивжати дві тривалі, одночасні дії:

While he was having his breakfast, he was reading the newspaper.

She was cleaning the room, while he was watching TV.

Past Continuous від дієслова to go – was/were going + інфінітив – передає намір виконання дії в минулому, перекладається як "збирався, мав намір":

He was going to do it but in the end he changed his mind.

Утворення:

Past Simple дієслова **to be (was, were)** + **Participle I** (reading) смислового дієслова **to read**

I **was reading** a book at three o'clock.

Tom **was reading** a book at that moment.

+ Kate **was reading** a book when I came.

The children **were reading** a book at five o'clock.

We **were reading** the book all day long.

Were you reading a book at three o'clock?

When **was** Tom **reading** a book?

? What book **was** Kate **reading** when I came?

Who **was reading** a book at five o'clock?

How long **were you reading** a book?

I **was not (wasn't) reading** a book at three o'clock.

Tom **was not (wasn't) reading** a book when I came.

- The children **were not (weren't) reading** the book at five o'clock.

We **were not (weren't) reading** the book all day long.

III. Future Progressive (Continuous)

Вживання:

Future Progressive вживається для вираження дії, що триватиме в певний момент або протягом якогось періоду часу в майбутньому.

Вживається з тими ж обставинами часу, що й Past Continuous, але стосовно майбутнього часу:

He'll be watching TV the whole evening.

I'll be working at 7 o'clock (from 6 till 8).

I'll be working when he comes.

If he is sleeping when you come, wake him up.

(Якщо він спатиме коли ви прийдете, розбудить його.)

Запам'ятайте:

Future Progressive не вживається в підрядних реченнях часу та умови. Замість нього вживається Present Progressive.

Утворення:

Simple Future дієслова **to be (will be / shall be) + Participle I (reading)** смислового дієслова

to read

- Kate **will still be reading** the book at five o'clock.
- + When I come back, my sister **will be reading** the book.
- I **will (shall) be reading** the book the whole evening.
- When he is having his breakfast I **will (shall) be reading** the book.
- Will Kate be still reading** the book at five o'clock?
- ? What **will my sister be doing** when I come back?
- Will you be reading** this book in summer?
- Who **will be reading** the book the whole evening?
- Kate **will not (won't) be reading** the book at five o'clock.
- When I come back my sister **won't be reading** the book.
- I **won't (shan't) be reading** this book in summer.
- He **won't be reading** the book the whole evening.

Часові форми групи Progressive/Continuous

Present Progressive передає дію, що відбувається у момент мовлення або у даний період часу	I am working (now, at this moment). He is working at the factory (at the present period of time)	Are you working? Where is he working?	I am not working. He is not working at the factory
Past Progressive передає дію, що відбувалася у певний момент або період часу в минулому	I was working when you came. We were working the whole day	What were you doing when I came? Who was working the whole day?	I was not (wasn't) working when you came. We were not (weren't) working the whole day
Future Progressive передає дію, що відбуватиметься у якийсь момент або період часу в майбутньому	I will (shall) be working at five o'clock. They will be working when you come back	When will you be working? Who will be working when I come back?	I will not/won't (shall not/shan't) be working at five o'clock. They will not (won't) be working when you come back

Запам'ятайте:

Деякі дієслова **не вживаються** в часах Progressive, тому що не виражають дію як процес: **to see, to hear, to know, to believe, to want, to wish, to love, to**

hate, to like, to have, to depend, to belong, to feel, to understand, to need, to prefer, to realize, to suppose, to mean, to remember, to forget, to seem, etc.
Замість форм Progressive ці дієслова вживаються у формах групи Simple:
I **hear** somebody knock.

Запитання для самоконтролю

1. Властивості яких частин мов поєднує в собі Participle I?
2. Як перекладається Participle I українською мовою?
3. Як правильно утворити форму дієприкметника теперішнього часу?
4. Які функції в реченні він може виконувати?
5. Яку дію може виражати Present Participle по відношенню до дії, вираженої присудком? Наведіть приклади.
6. Які форми має дієприкметник минулого часу (Participle II) утворений від стандартних дієслів і від нестандартних (“неправильних”)?
7. Які функції в реченні може виконувати Participle II?
8. Дайте загальну характеристику часовим формам групи Continuous (Progressive).
9. Яку дію може виражати Present Continuous?
10. Як утворюється форма Present Continuous? Провідмінійте дієслово to write в теперішньому тривалому часі.
11. Яку дію означає вираз: *to go* у формі *Present Continuous + infinitive*?
12. Як утворюється форма Past Continuous?
13. Яку дію означає форма Past Continuous? Наведіть приклади.
14. Розкажіть правила утворення Future Continuous.
15. Яку дію означає форма Future часових формах Continuous? Наведіть приклади.
16. Яка часова форма вживається замість Future Continuous у підрядних реченнях часу та умови?
17. Які дієслова не вживаються в часових формах Continuous?

Завдання для самостійного виконання

4.1.1. Визначте, в якому з речень дієприкметник I вжито у функції обставини:

1. They often worked on the farms being students.
2. The girl writing the test is my neighbour.
3. Peter is painting the ceiling of his room now.

4.1.2. Прочитайте та перекладіть речення. Зверніть увагу на Participle I в ролі означення та обставини:

1. The chemists dealing with this problem exchange information.
2. Hydrogen and oxygen combine chemically, forming the molecule H₂O.
3. They were sitting at the table, discussing the article.
4. While (when) exploring the island, they found some plants never seen before.
5. Speaking at the conference he paid particular attention to this problem.

4.1.3. Перефразуйте речення з складнопідрядних на прості, використовуючи Participle I в ролі означення:

e.g. *The man who sells newspapers showed me the way to the post-office.*

The man selling newspapers showed me the way to the post-office.

1. The students who spend their holidays in the country help the farmers with their field work.
2. Many students who learn English are members of our English club.
3. The man who is making the report is my father.
4. The women who are working in the field will go to the exhibition.
5. Most trees which grow near our building are broadleaved.
6. The girl who is going along the street is my friend.

4.1.4. Переробіть речення з складнопідрядних на прості, використовуючи Participle I в ролі обставини:

e.g. *When he reads English articles, he writes out new words.*

Reading English articles, he writes out new words.

1. When I go to the Institute, I usually meet our dean.
2. When they arrived in London, they went to see the sights of the city.
3. When the students worked at this problem, they had to read many English journals.
4. While I was waiting for you, I read this article.
5. When my friend studied at the University, he published several scientific articles.

4.2.1. Визначте, в якому з речень вжито Participle II у функції означення:

1. Peter solved a difficult problem.
2. Have you solved this problem yet?
3. The problem solved by my friend was very difficult.

4.2.2. Прочитайте та перекладіть речення. Зверніть увагу на Participle II в ролі означення та обставини:

1. The problems discussed at the conference are of great interest to us.
2. The data obtained must be checked.
3. These scientific articles translated by our students are rather difficult.
4. When translated into Ukrainian these articles will be of great interest to our students.
5. When done this experiment will give good results.
6. Water becomes ice when cooled.
7. Asked whether he intended to return soon, he replied that he would be away for about three months.
8. The Opera House built many years ago is one of the finest buildings in our city.
9. They sent me some illustrated catalogues.
10. The improved methods of work gave good results.

4.2.3. Переробіть речення з складнопідрядних на прості, використовуючи Participle II в ролі означення:

e. g. *They study at the university which was founded 100 years ago.*

They study at the university founded 100 years ago.

1. I received a telegram which was sent yesterday.
2. The problem which was solved by our students is rather difficult.
3. The method which was used is very important for this experiment.
4. The decisions which were adopted at the conference are supported by our scientists.
5. The cotton which is grown here is of good quality.
6. The machines which are made at this plant are exported to many countries of the world.

4.3.1. Перекладіть ці речення українською мовою, поясніть уживання *Present Continuous*. Утворіть загальні питання та заперечні речення:

1. Those people are speaking French.
2. They are having dinner at the moment.
3. The train's stopping!
4. The climate is getting warmer.
5. My friends are playing tennis at this moment.
6. He was watching TV all evening yesterday.
7. The sun wasn't shining that day.
8. The children were not listening to their teacher.
9. We'll be watching the Olympics on TV from 6 till 10.
10. At this time tomorrow I'll be taking this exam.
11. I won't be taking

4.3.2. Розкрийте дужки, вживаючи дієслова в *Present Simple* або *Present Continuous*:

1. He (to write) a new book now.
2. It's 17p.m. I (to wait) for my friend.
3. She often (to read) magazines, but now she (to read) a biography.
4. I (to listen) to you, (to hear) you very well and (to understand) everything.
5. I (to hate) detective stories, but I (to like) this one.
6. Where you (to go)?
7. I (to think) you are right.
8. You (to know) what I (to mean)?
9. Why you (to look) at me like that?
10. You (to like) this music?
11. These shoes (to belong) to me.

4.3.3. Розкрийте дужки, поставивши дієслово у відповідній формі *Past Continuous*; утворіть загальні питання та заперечні речення:

1. At 7 o'clock yesterday he (to talk) to me on the telephone.
2. When I saw her for the first time she (to dance) with my friend.
3. At lunchtime Kate (to cook).
4. When I arrived, all the children (to sleep).
5. She (to live) in France when her grandfather died.
6. Peter (to watch) TV when Ann came in.
7. When we woke up the sun (to shine) but the birds (not to sing).

4.3.4. Розкрийте дужки, поставивши дієслово в *Past Continuous*, якщо це можливо; якщо ні – в *Past Simple*:

1. At 7.15, when you phoned, I (to have) a shower.
2. I (to think) he (to be) my best friend.
3. Suddenly she woke up. It (to rain).
4. While I (to read) the newspaper, the cat (to jump) on to the table.
5. They got married while they (to study) at Oxford University.
6. At midnight, Mary and Jack (to drive) to Scotland.
7. My farther (to work) hard all his life.
8. When I came in, they (to talk).
9. When I dropped the glass, it (to break).

4.3.5. Перекладіть ці речення українською мовою, поясніть уживання *Future Continuous*:

1. I'll be watching TV from 6 till 9.
2. This time tomorrow he 'll be skiing.
3. Will you be passing the post office when you're in town? – Buy some stamps for me, please.
4. Professor Smith will be giving another lecture at the same time next week.
5. You'll recognize Ann when you see her. She'll be wearing a yellow hat.

4.3.6. Розкрийте дужки, поставивши дієслова в *Future Continuous* чи в *Future Simple* та перекладіть речення українською мовою:

1. It's late. I think I (take) a taxi.
2. Come at 6 o'clock. I (to wait) for you.
3. I think it still (to rain) when the match finishes.
4. There is somebody at the door. – I (to open).
5. When they come back from school she still (to cook) dinner for them.
6. I'll phone you at 6 o'clock. What you (to do)?
7. The phone is ringing. I (to answer).
8. You still (to work) when I return?

4.4. Прочитайте про ліси та природно-рослинні зони України. Виконайте вправи після тексту

FORESTS AND NATURAL VEGETATION ZONES OF UKRAINE

In northern Ukraine, the abundant¹ rainfall and moderate temperatures provide favourable conditions for forest vegetation. Woodlands alternate with areas of steppe in the central region. The total area of forested land, however, originally was only about 24 million acres (9.7 million hectares), and more than one-third of this has been cleared for cultivation. Most of the rich forestlands are in the Carpathian region of western Ukraine, with forests of poorer quality in the poorly drained Polissya region in northern Ukraine. Southern Ukraine mostly consists of flat, treeless plains, many of which are under cultivation.

Three natural zones of vegetation are distinguishable from north to south: the Polissya (woodland and marsh), the Forest-steppe, and the Steppe.

The Polissya zone lies in the northwest and north, with an area of about 44,000 square miles, of which more than one-third is arable land. Nearly one-quarter of this land is covered with mixed woodland, including oak, elm, birch, hornbeam, ash, maple, pine, linden, alder, poplar, willow, and beech. About 5 percent is peat bog, a substantial portion is marshland, and the river valleys are floodplains. The Polissya contains the southernmost portions of the Prypiat Marshes, - the thickly forested basin of the Prypiat River (a major tributary of the Dniro). Ukraine has undertaken major efforts to drain these swamplands and reclaim the land for agriculture. About one-third of this region is woodland, consisting of pine, birch, alder, oak, aspen, white spruce, and hornbeam.

The 78,000-square-mile forest steppe extends south from the Polissya. The arable land of Kyiv, Poltava, Chernivtsi, Sumy, and some other provinces, covers about two-thirds of this agricultural region, with forests only about one-eighth. The natural grass and forest vegetation have been largely removed by plowing, and soil erosion is serious. Mixed forests of the region consist of oak, pine, hornbeam, and maple.

¹ *Abundant* = *syn. heavy* rains – великий, сильний, рясний (дощ).

Farther south, near the Black Sea, the Sea of Azov, and the Crimean Mountains, the forest-steppe joins the Steppe zone (89,000 square miles). The region has chiefly grass-steppe vegetation. Only on the Dnipro floodplains are there forest groves, mainly of oak².

Remnants of the natural vegetation of the Steppe are protected in nature reserves, the largest being the Askaniya-Nova reserve in Kherson region. The low annual precipitation and hot, dry summers in the semiarid Steppe zone make supplemental irrigation necessary.

Three other natural regions are found near the borders of the country: the Carpathians, the Crimean Mountains, and the southern coast of the Crimean Peninsula. In the Carpathians, the vegetation is located in zones according to altitude. The lower slopes are covered with mixed forests (beech, hornbeam, plane tree (*Platanus*), fir, oak, and the intermediate slopes (4,000-5,000 feet) with pine forests; these give way to open Alpine meadows at higher altitudes, known as “polonyny”, on the summits. In the coastal strip of the Crimean Mountains low-growing forests of oak and juniper grow. The upper strip of the Southern Crimean Coast is covered with forests mostly with beech, hornbeam, and maple. A narrow strip of land, only six miles wide, along the southern coast of Crimea constitutes a unique natural region where both deciduous and evergreen trees, grasses, and shrubs grow. The Nikitskyi Botanical Garden is located near the city of Yalta. Plants from almost every country in the world are found there. An exceptionally beautiful environment, a warm climate, and the sea make the southern shore of Crimea one of the finest vacation areas in the world.

Other natural reserves in Ukraine protect segments of the forest-steppe woodland, the marshes and forests of the Polissia, and sites of mountains and the rock coast in the Crimea. Several national parks, including the Carpathian National Park (124,000 acres) and the Shatsky National Park (80,200 acres), have also been organized recently.

Vocabulary

alternate <i>v</i>	чергуватися
vegetation <i>n</i>	рослинність
distinguish <i>v</i>	відрізняти, розрізняти
peat <i>n</i>	торф
bog <i>n</i>	болото
substantial <i>a</i>	обґрунтований, основний
marsh <i>n</i>	болото
intermediate <i>a</i>	проміжний, середній
floodplains <i>n (pl)</i>	заливні луки

² Only on the Dnieper floodplains are there forest groves, mainly of oak.

Зворотний порядок слів має місце в реченні, що починається з слова-обставини, перед яким стоїть прислівник **only**, а також таких сполучників та прислівників, як: *never, seldom, little, in vain; neither, nor; hardly, scarcely, no sooner...(than), not only...(but)*. Ф. ex. Only then did he understand it. Тільки тоді він зрозумів це.

join <i>v</i>	приєднуватися
grove <i>n</i>	гай
altitude <i>n</i>	висота
slope <i>n</i>	схил, нахил
deciduous <i>a</i>	листяний, листопадний
shrub <i>n</i>	кущ
reserve <i>n</i>	заповідник
remnant <i>n</i>	залишок,
supplemental <i>a</i>	додатковий
meadows <i>n (pl)</i>	луки
strip <i>n</i>	смужка
segment <i>n</i>	частина, частка
constitute <i>v</i>	утворювати, складати

4.4.1. Знайдіть у тексті речення, що містять дієприкметники I, II. Визначте їхні функції в цих реченнях і перекладіть.

4.4.2. До англійських слів підберіть українські еквіваленти:

- | | |
|-------------|-----------|
| 1) alder | a) бук |
| 2) ash | b) в'яз |
| 3) beech | c) дуб |
| 4) birch | d) тополя |
| 5) elm | e) ясен |
| 6) hornbeam | f) сосна |
| 7) linden | g) клен |
| 8) maple | h) береза |
| 9) oak | i) верба |
| 10) pine | j) граб |
| 11) poplar | k) вільха |
| 12) willow | l) липа |

4.4.3. Утворіть вищий і найвищий ступені порівняння прикметників:
Warm, hot, fine, dry, big, large, important, distinctive.

4.4.4. Напишіть правильні ступені прикметників:

- Trees are (large) members of the plant world.
- Shrubs are (small) than trees, with several erect, spreading stems.
- Pines are (high) than willows.
- The giant sequoias are numbered among (large) and (old) of living organisms, and some of them may be more than 2500 to 3000 years old.
- Baldcypress is (distinctive) of the United States southern conifers.
- The southern shore of the Crimea is one of (fine) vacation areas in the world.

4.4.5. Знайдіть синоніми:

- | | |
|---------------------------------|----------------------|
| 1) abundant <i>a</i> (rainfall) | a) bog <i>n</i> |
| 2) moderate <i>a</i> | b) drainage <i>n</i> |

- | | |
|---------------------------|------------------------|
| 3) provide <i>v</i> | c) rest <i>n</i> |
| 4) marsh <i>n</i> | d) heavy <i>a</i> |
| 5) draining <i>n</i> | e) temperate <i>a</i> |
| 6) broad-leaved <i>a</i> | f) spread <i>v</i> |
| 7) constitute <i>v</i> | g) altitude <i>n</i> |
| 8) extend <i>v</i> | h) additional <i>a</i> |
| 9) height <i>n</i> | i) deciduous <i>a</i> |
| 10) supplemental <i>a</i> | j) form <i>v</i> |
| 11) remnant <i>n</i> | k) supply <i>v</i> |

4.4.6. Напишіть ці дієслова у формі дієприкметника минулого часу:

- c) Standard verbs: to drain, to cover, to mix, to protect, to locate, to organize, to join, to adopt, to prepare.
- d) Non-standard verbs: to make, to find, to give, to do, to leave, to spend, to be, to see, to cut.

4.4.7. Виберіть антоніми до поданих слів:

- a) moist – fertile, arid, poor, damp.
- b) drainage – draining, irrigation, cultivation, fertilization.
- c) dry – mild, light, heavy, humid.
- d) unique – single, multinomial, numerous, sole.

4.4.8. Підберіть англійський еквівалент до цих слів:

- | | |
|-----------------|--|
| 1. Небажаний | a) undesiring
b) desired
c) undesired |
| 2. Вимогливий | a) require
b) required
c) requiring |
| 3. Очищений | a) purified
b) purify
c) purification |
| 4. Осушений | a) draining
b) drainage
c) drained |
| 5. Підрахований | a) estimation
b) estimated
c) estimating |

4.4.9. Заповніть пропуски наведеними нижче словами з тексту:

- a) Three natural zones of vegetation are ... from north to south: the Polissya, the Forest steppe and the Steppe.
- b) In northern Ukraine the ... rainfall and ... temperatures provide ... conditions for forest vegetation.
- c) About 5 percent of the Polissya zone is ... bog, a substantial portion is ..., and the river valleys are
- d) The low ... precipitation and hot, ... summers in the ... Steppe zone make ... irrigation necessary.
- e) A of land along the southern coast of the Crimea constitutes a natural region where both ... and ... trees, grasses and shrubs grow.
(narrow, unique, peat, abundant, distinguishable, moderate, marshland, dry, deciduous, semiarid, evergreen, supplemental, annual, strip, floodplain(s), favourable)

4.4.10. Заповніть пропуски необхідними прийменниками:

1. Woodlands alternate ... areas ... steppe ... the central region.
2. The total area ... forested land is only ... 14 million acres.
3. Three natural zones ... vegetation are distinguishable ... north ... south.
4. ... the late 1980s, some 11,600 square miles ... marshland had been drained, mostly ... the Polissya.
5. Three other natural regions are found ... the borders the country.
6. ... the mountainous areas the lower slopes are covered ... mixed forests.
7. ... the Carpathians the vegetation is located ... zones according ... altitude.
8. Up ... 1200m we find mixed forests ... beech, hornbeam, fir, oak.
(in, of, about, with, from, to, by, near)

4.4.11. Підберіть відповідне закінчення речення:

- | | |
|---|--|
| 1. Most of the rich forest lands are in the Carpathian region of western Ukraine, | a) the largest being the Askania-Nova reserve in Kherson region. |
| 2. Remnants of the natural vegetation of the Steppe are protected in nature reserves, | b) have also been organized recently. |
| 3. Several national parks, including the Carpathian National Park and the Shatsky National Park | c) with forests of poorer quality in the poorly drained Polissya region in northern Ukraine. |
| 4. There is very little woodland in southern Ukraine | d) which mostly consists of flat, treeless plains. |

4.4.12. Прогляньте текст і дайте відповіді на питання:

1. What are the natural conditions for forest vegetation in northern Ukraine?
2. What is the total area of forested land in our country?
3. What region of Ukraine has the richest forestlands?
4. What part of Ukraine has very little woodland?

5. How many natural vegetation zones are there in Ukraine? Where are they located on the map of the country?
6. What kinds of forests are there in the Polissya zone? What species of trees grow there?
7. What trees are indigenous to forest-steppe and steppe zones?
8. What tree species dominate in mixed forests of the Carpathians (according to altitude)?
9. What national parks and nature reserves of our country do you know? Where are they situated?

4.4.13. Перекладіть речення письмово англійською мовою:

Україна має три основні рослинно-природні зони: Полісся, Лісостеп та Степ. Карпати - найбільша територія України на лісі. Нижні схили Карпатських гір укриті змішаними лісами, вищі – хвойними, які поступаються місцем альпійським лукам, або “полонинам”, як тут їх називають. У змішаних лісах Полісся ростуть такі види листяних дерев, як: дуб, береза, в’яз, граб, ясень, клен, липа, тополя, верба, бук, осика, а також хвойних: сосна, ялина, ялиця. Вузька смуга землі на Південному узбережжі Криму є унікальним місцем, де ростуть як листяні, так і вічнозелені дерева та кущі. В Нікітському ботанічному саду ростуть дерева майже з усіх країн світу.

4.4.14. Складіть план до тексту „Forests and Natural Vegetation Zones of Ukraine” та перекажіть його.

4.4.15. Складіть діалог за зразком:

Dialogue

- Hi, Paul!
- Hi, Michael! Where have you been all this time? I haven’t seen you for ages.
- I have just come from San Francisco.
- Was it a business trip?
- Exactly.
- I hope it was successful.
- Yes, I enjoyed it. I have seen all the sights there, including the Redwood National Park in my spare time. By the way, do you know anything about redwoods?
- Yes, of course. I know they are the oldest and the tallest trees on the earth.
- You are right. And I can add that some of them are over 2000 years old and 300 feet (91 meters) tall. We had to drive through one of them. There is a tunnel cut into a tree and the road goes through it.
- Fantastic trees! I envy you a little. And what are you planning to do for your holidays?
- I haven’t yet made up my mind. And what about your plans?
- I don’t know exactly, but I’d like to go to the Carpathians. I find the nature of this place very beautiful. I always admire the slopes covered with a green carpet of

trees, bushes, and Alpine meadows. I like the Carpathian Mountains as they have both mixed and coniferous forests. Especially I like to look at the unique kind of conifers known as “smereka”.

- I see. As for me, I like the Carpathian Mountains too, but I prefer the seashore of the Crimea and particularly the places near Yalta and Alushta. The climate is always mild here and the sea is warm and beautiful. The plant life is varied too. Near the beach, we can see palms and magnolias as well as deciduous and evergreen trees. To admire the forests or meadow plants you can climb the mountains. In addition to the Nikitsky Botanical Garden, a real pearl of the Peninsula is also situated here in Yalta. There are many exotic trees, shrubs, and grasses from almost all countries of the world.
- I think you will agree with me that the Carpathians and the Crimea are the most beautiful and the best places for recreation.

4.4.16. Прочитайте додатковий текст “Forest”, користуючись словником. Перекажіть його зміст українською або англійською мовою.

FOREST

Forest is a large area of land covered with trees. But a forest is much more than just trees. It also includes smaller plants, such as mosses, shrubs, and wildflowers. In addition, many kinds of birds, insects, and other animals make their home in the forest. Millions upon millions of living things that can only be seen under a microscope also live in the forest.

Climate, soil, and water determine the kinds of plants and animals that can live in a forest. The living things and their environment together make up the forest *ecosystem*. An ecosystem consists of all the living and nonliving things in a particular area and the relationships among them.

The forest ecosystem is highly complicated. The trees and other green plants use sunlight to make their own food from the air and from water and minerals in the soil. The plants themselves serve as food for certain animals. These animals, in turn, are eaten by other animals. After plants and animals die, their remains are broken down by bacteria and other organisms, such as protozoans and fungi. This process returns minerals to the soil, where they can again be used by plants to make food.

Although individual members of the ecosystem die, the forest itself lives on. If the forest is wisely managed, it provides us with a continuous source of wood and many other products.

Before people began to clear the forests for farms and cities, great stretches of forestland covered about 60 per cent of the earth's land area. Today, forests occupy about 30 per cent of the land. The forests differ greatly from one part of the world to another. For example, the steamy, vine-choked rain forests of central Africa are far different from the cool, towering spruce and fir forests of northern Canada.

DO YOU KNOW THAT ...

Taman Negara in Malaysia is the world's oldest rainforest. It has flourished since the land rose from the sea during the Jurassic era, around 130 million years ago. Even ice ages haven't affected the forest.

Far outnumbering the human inhabitants are the flora and fauna of Taman Negara. Within the park boundaries there are tigers, Malayan tapirs, elephants, wild boar, various species of deer, leopards, sun bears, civets and wild ox, to name just a few.

Add to this between 200-300 species of birds and thousands of insects making their lives on the jungle floor. Taman Negara has one of the richest ecologies on earth, protected both by its impenetrability and Malaysian law.

Mahogany

The name mahogany has been used for a number of tropical hardwoods. Today two 'true' mahogany groups are recognized: those describing several *Swietenia* species (the 'original' mahoganies) from central and South America and the West Indies, and the related African *Khaya* species.

The best-known Cuban mahogany, *Swietenia mahogani*, was first shipped to the United Kingdom and Europe some 400 years ago. The most cherished cabinet wood in the world, this species has been so widely exploited that its significance is now largely historical. Despite its great value for furniture making, enormous numbers of smaller trees were cut from forests and used to fire the boilers of Caribbean sugar mills and steam trains, whilst many larger trees were felled for fence posts and railway sleepers. This indiscriminate use of the timber finally led the government of Cuba to ban the export of mahogany logs in 1946. Along with Honduran mahogany (*Swietenia humilis*), today the wild populations of Cuban mahogany are highly fragmented, representing a major loss of genetic diversity. However, small quantities of timber from plantations remain occasionally available on the international market.

Another species, *Swietenia macrophylla*, also known as big-leaved mahogany or bay wood, which has come to fill the position of *S. mahogani* as the commercially important species, is now, tragically, facing a similar fate. Despite a wide natural distribution from southern Mexico, through Central America and large areas of the Amazon Basin, intense demand has caused this majestic tree, which can reach a height of 45 m (148 ft), to suffer a serious decline.

In Brazil, Indian lands are - in theory - protected from illegal logging, but for years this practice has been commonplace and gone unpunished. Mahogany logging has now extended to all 15 Indian lands in the state of Para. Indians generally have no choice but to let the loggers destroy their forest. In some cases, the Indians have been obliged to sell their trees themselves. The Greenpeace report in Mahogany Crime has revealed the extraordinary profits involved for those who deal in the timber and sell the final end products. An Indian may be paid only \$30 for a tree that will be resold for about \$1,400, and which may eventually be converted to 15 large dining tables, worth some \$8,500 each when sold in London or New York.

UNIT 5 AGRICULTURE IN UKRAINE

5.1. Перфектні часи Теперішній перфектний час (The Present Perfect Tense)

Present Perfect утворюється з допоміжного дієслова **to have** у Present Indefinite та дієприкметника минулого часу (Past Participle) основного дієслова.

Число	Стверджувальна форма	Питальна форма	Заперечна форма
<i>Однина</i>	I (you) have asked He (she, it) has asked	Have I (you) asked? Has he (she, it) asked?	I (you) have not asked He (she, it) has not asked
<i>Мно- жина</i>	We (you, they) have asked	Have we (you, they) asked?	We (you, they) have not asked

Примітка: В усному мовленні вживаються переважно скорочені форми:
I've, he's, she's, it's, we've, they've, I haven't = I've not, he hasn't = he's not

Present Perfect вживається для вираження:

1. Дії, яка відбулася в минулому у невизначений час. Обставина часу в таких реченнях відсутня, оскільки важливий результат дії:

John **has travelled** around the world. (Ми не знаємо коли.)

2. Дії, що відбувалася в минулому неодноразово.

George **has seen** this movie (film) **three times**.

3. На час дії часто вказують прислівники неозначеного часу: **already** (вже), **never** (ніколи), **just** (щойно), **not ... yet** (ще... не), yet? ("вже" - в питальних реченнях) **ever** (коли-небудь), **recently** (останнім часом), **lately** (за останній час, нещодавно), а також обставини, котрі означають проміжок часу, який до цього часу ще не завершився: **today** (сьогодні), **this month** (цього місяця), **this week** (цього тижня), **this year** (цього року), **this morning** (сьогодні вранці).

Have you translated the text **yet**? – No, we **haven't finished** translating it **yet**.

The students **have written** two tests **this week**.

Студенти написали дві контрольні роботи цього тижня.

Зверніть увагу на те, що на українську мову Present Perfect перекладається минулим часом.

Минулий перфектний час (The Past Perfect Tense)

Past Perfect утворюється з допоміжного дієслова **to have** у Past Indefinite та дієприкметника минулого часу (Past Participle).

Число	Стверджувальна форма	Питальна форма	Заперечна форма
<i>Однина і множина</i>	I (you, we, they, he, she, it) had asked	Had I (you, we, they, he, she, it) asked?	I (you, we, they, he, she, it) had not asked.

Примітка: В усному мовленні вживається переважно скорочена форма: **hadn't**.

1. Past Perfect вживається для вираження дії, що відбулася раніше іншої минулої дії, позначеної дієсловом у Past Indefinite; як правило, в реченні є дві дії:

John **had gone** to the store **before** he **went** home.

1-а дія 2-а дія

Jack **told** us yesterday that he **had visited** England in 1970.

2-а дія 1-а дія

2. Past Perfect вживається переважно зі словами **before** (перед тим, як), **after** (після того як) або **when** (коли).

John **had gone** to the store **before** he **went** home.

John **went** home after he **had gone** to the store.

Before John **went** home, he **had gone** to the store.

After John **had gone** to the store, he **went** home.

Примітка: Під час переліку минулих дій у тій послідовності, в якій вони відбувалися, дієслова вживаються в Past Indefinite.

I opened the door, closed it and went into the bedroom.

3. Past Perfect вживається для вираження минулої дії, що вже закінчилася до певного моменту в минулому. Цей момент позначається такими словосполученнями: **by two o'clock** (до другої години), **by that time** (до того часу), **by the first of September** (до першого вересня), **by the end of the year** (до кінця року) тощо або ж іншою дією.

I **had done** my homework **by eight o'clock**.

4. У підрядних реченнях часу й умови Past Perfect вживається для вираження передминулої дії, що була майбутньою стосовно минулого.

She said that she would go home as soon as she **had passed** all her exams.

He said that he would show them the article after he **had written** it.

Майбутній перфектний час (The Future Perfect Tense)

Число	Стверджувальна форма	Питальна форма	Заперечна форма
Однина	I shall have asked You (he, she, it) will have asked	Shall I have asked? Will has he (she, it) asked?	I shall not have asked He will (she, it) not have asked
Множина	We shall have asked You (they) will have asked	Shall you have asked? Will you (they) have asked?	We shall not have asked You (they) will not have asked

Примітка: В усному мовленні вживаються такі ж скорочення, як і в Future Infefinite

I shall = I'll, you will = you'll, I shall not = I shan't, he will not = he won't

1. Future Perfect Tense вживається для вираження майбутньої дії, що закінчиться до певного моменту або до початку іншої дії в майбутньому. Момент, до якого відбудеться ця дія може бути вираженим такими обставинами

часу як: **by two o'clock, by that time, by the first of September, by the end of the week** тощо:

You will have forgotten me by that time.

2. У підрядних реченнях часу та умови замість Future Perfect вживається Present Perfect або Present Indefinite:

We'll get a new flat when they have built the house.

We'll have finished this work if he comes at five o'clock.

5.2. Perfect Continuous Tenses

Теперішній перфектно-тривалий час (The Present Perfect Continuous Tense)

Вживається для вираження тривалої дії, яка почалась до теперішнього моменту і ще триває на даний момент. Після підмета ставиться допоміжне дієслово to be в Present Perfect Tense, та дієприкметник теперішнього часу (Participle I) основного дієслова:

have (has) been + Participle I

John **has been living** in the same house **for twenty years**. (Він досі живе там.)

John **has been living** in the same house **since 1986**.

_____I

since (з) 1986 for 20 years (протягом 20 років) now

We **have been building** this atomic power station **for two years**.

Ми **будуємо** цю атомну станцію протягом двох років.

Заперечна форма: **have not been + Participle I**

has not been + Participle I

Питальна форма: **Have I (you, we, they) been + Participle I?**

Has he (she, it) been + Participle I?

Вживається з такими обставинами часу, як **for a month** (протягом місяця), **for an hour** (вже одну годину), **for a long time** (вже давно), **since Monday** (з понеділка), **since two o'clock** (з двох годин); в питаннях, що починаються з **how long?** (як довго?), **since when?** (з яких пір?).

Якщо мова йде про звичайну, постійну дію (а не на момент мови), поруч з Present Perfect Continuous вживається Present Perfect (підкреслюється не тривалість дії, а її факт чи результат):

They **have been living** in Kyiv for 10 years. = They **have lived** in Kyiv for 10 years.

– Вони **живуть** у Києві вже 10 років.

З дієсловами, що не вживаються в Continuous (див. урок 8), замість Present Perfect Continuous вживається Present Perfect:

He **has been** in Kyiv for two weeks. – Він **знаходиться** в Києві вже 2 тижні.

I **have known** her since 1998. – Я **знаю** її з 1998 року.

The Past Perfect Continuous Tense (Минулий перфектно-тривалий час)

Вживається для вираження тривалої дії, що почалася раніше іншої дії в минулому, вираженої в Past Indefinite і, можливо, ще продовжувалася на момент

мови в минулому. Після підмета ставиться допоміжне дієслово to be в Past Perfect та дієприкметник теперішнього часу (Participle I) основного дієслова:
 We **had been conducting** this experiment for two hours before you **came**.
 До того як ви прийшли, ми проводили цей експеримент уже протягом двох годин.

had been + Participle I

Заперечна форма: **had not been + Participle I**

Питальна форма: **Had I (he, you, we, they) been + Participle I?**

Виражає дію, що почалася у минулому і тривала протягом якогось часу до певного моменту в минулому:

Alice **had been living** in New York for ten years before **she moved** to California.

ten years moved тепер

Майбутній перфектно-тривалий час (The Future Perfect Continuous Tense)

Вживається для вираження тривалої майбутньої дії до якогось моменту в майбутньому, яка все ще триватиме в цей момент, або закінчиться безпосередньо перед ним. Утворюється за допомогою допоміжного дієслова to be у Future Perfect та дієприкметника теперішнього часу (Participle I) основного дієслова:

will (shall) have been + Participle I

Заперечна форма: **I (we) shall not have been + Participle I**

You (he, we, they) will not have been + Participle I

Питальна форма: **Shall I (we,) have been + Participle I?**

Will he (you, she, it, they) have been + Participle I?

He **will have been learning** English for half a year by June.

До червня він вивчатиме англійську мову вже півроку.

З дієсловами, що не мають форми Continuous вживається Future Perfect:

I shall not have seen the earth before we land.

Я не бачитиму землю, аж поки ми не приземлимося.

Запитання для самоконтролю

1. Яку дію означають часові форми Perfect?
2. Яка загальна “формула” утворення часових форм Perfect?
3. Для вираження якої дії вживається Present Perfect? Наведіть приклади.
4. З якими прислівниками неозначеного часу вживається Present Perfect?
5. Для вираження якої дії вживається Past Perfect? Наведіть приклади.
6. З якими словами та словосполученнями вживається Past Perfect?
7. Яку дію виражає Future Perfect і з якими обставинами часу вживається?
8. Яка часова форма використовується замість Future Perfect у підрядних реченнях часу та мети?
9. Для вираження якої дії вживається Present Perfect-Continuous?
10. З якими словами вживається Present Perfect-Continuous? Наведіть приклади.

11. Яку дію виражає Past Perfect-Continuous і з якими обставинами часу вживається?
12. Для вираження якої дії вживається Future Perfect-Continuous?
13. З якими обставинами часу вживається Future Perfect-Continuous?
14. Наведіть приклади складно-підрядних речень з Future Perfect-Continuous.
15. Яка часова форма використовується замість Future Simple у підрядних реченнях часу та мети?

Завдання для самостійного виконання

5.1.1. Складіть по п'ять речень, використовуючи слова з таблиць:

I	have	(not)	won the match
He	has		become an engineer
She			left for the USA
We			cooked breakfast
You			lost that paper
They			built a bridge

Have	I		seen this film?
Has	he		turned off the gas?
	she		lost the game?
	we		bought the coat?
	you		invited them to the party?
	they		

I	have	never	crossed the street at that place.
He	has	already	met them in the park.
She		just	been to London.
We		not ... yet	shown them our picture gallery.
You			visited the exhibition.
They			gone to the Carpathians

5.1.2. Перетворіть стверджувальні речення на заперечні та питальні:

1. Mary has switched on the light.
2. My relatives have received the parcel.
3. Our grandfather has travelled a lot.
4. The director has signed the order.
5. They have seen a new film at the cinema.
6. Robert has come back.

5.1.3. Використайте Present Perfect або Past Simple:

1. John _____ (write) his report last night.
2. Bob _____ (see) this movie before.
3. Jorge /already/ _____ (read) the newspaper.
4. He _____ (read) the newspaper yesterday.
5. We _____ (begin; negative) to prepare for the test yet.
6. Betty _____ (write) a letter last night.
7. Pete _____ (call) his employer yesterday.
8. We _____ (see; negative) this movie yet.
9. My brother _____ (travel) around the world.

5.1.4. Перекладіть англійською мовою:

1. Я залишив свій зошит удома.
2. Де Петро? – Він ще не прийшов.
3. Я не можу їхати з тобою. Я ще не склав іспиту з хімії.
4. Ми щойно прочитали його повідомлення.
5. Ми одержали телеграму вчора.
6. Я знаю його з 1996 року.
7. Ми не бачили його вже три роки.
8. Ви коли-небудь були у Лондоні? – Так, я двічі був у Лондоні.

5.1.5. Складіть по п'ять речень, використовуючи слова з таблиць:

I	had	(not)	received the message	by three o'clock.
He			swept the floor	by that time.
She			fallen asleep	before he came
We			cooked dinner	
You			finished it	
They				

Had	I	learned the poem	by Monday?
	he	decorated the building	by that time?
	she	washed the dishes	by the time you
	we	moved there	came?
	you	seen her	
	they	prepared	

I	said	that	I	had	finished school.
He	thought	if	he		built the plant.
She	wrote		she		bought a cassette
We	asked		we		recorder.
You			you		won the game.
They			they		left for the Far East.
					solved the problem

5.1.6. Перетворіть стверджувальні речення на заперечні та питальні:

1. The pupils had translated the text before the bell rang.
2. Kate had done her lessons by eight o'clock.
3. Peter had studied English before he entered the University.
4. The girls had cleaned the room by the time their mother came back.
5. We had reached the village before the sun set.

5.1.7. Використайте Past Perfect або Past Indefinite:

1. The policeman read the suspect his right after he ____ (arrest) him.
2. John _____ (wait) for him before the bus came.
3. Maria _____ (enter) the University after she had graduated from the community college.
4. We corrected our papers after we _____ (take) the quiz.
5. Jane sent a letter to her university after she _____ (receive) her scholarship check.
6. After the stewardesses had served lunch to the passengers, they _____ (sit) down.

5.1.8. Перекладіть англійською:

1. Учитель, сказав, що він перевірів наші диктанти. 2. Мій товариш переклав текст до десятої години. 3. Мій брат зателефонував і сказав, що він вже склав екзамени з біології та хімії. 4. Минулого літа її батько їздив у село, де він провів своє дитинство. 5. Вчора Аня прийшла додому о п'ятій годині. Її молодший брат виконував домашнє завдання, а батько й мати ще не повернулися з роботи. 6. До того часу я вже закінчив писати листа, але ще не виконав домашнього завдання.

5.1.9. Замініть неозначену форму дієслова на *Future Indefinite* або *Future Perfect*:

1. He (to receive) the telegram tomorrow. 2. He (to receive) the telegram by the end of the week. 3. I (to do) the exercises by seven o'clock. 4. I (to do) the exercises in the afternoon. 5. By this time you (to take) your examination. 6. You (to take) your examination next week. 7. The teacher (to correct) our exercise-books in the evening. 8. The teacher (to correct) our exercise-books by the next lesson.

5.1.10. Перекладіть англійською:

1. Я ще не написала курсової роботи з біології, але я напишу її до того часу, як Ви приїдете. 2. Вони прочитають до кінця року три книжки англійською мовою про найбільші ріки та озера. 3. Звичайно, до 10-ї години вона закінчить свою доповідь про флору та фауну України. 4. Якщо ми перекладемо цей текст до 12-ї години, то підемо в кіно.

5.2.1. Визначте, в якому з речень ужито заперечну форму майбутнього перфектно-тривалого часу:

1. I shan't still be working when you return. 2. They won't have done this exercise by two o'clock. 3. She won't finish her dinner in some minutes. 4. The builders won't have finished building this school by the 1st of September. 5. I shan't have been working here for three hours before you come.

5.2.2. Визначте, в якому з речень ужито минулий перфектно-тривалий час:

1. He was writing a letter when I came. 2. He had written a letter before I came. 3. He had been writing a letter for an hour when I came. 4. The article had been written by the end of the week. 5. The letter was being written when he came.

5.2.3. Яку форму дієслова необхідно вжити в реченні: "The plant ... cars since 1995"?

1. have produced 2. has produced 3. have been produced 4. has been producing

5.2.4. Перетворіть стверджувальні речення на заперечні та питальні:

1. We have been learning English for 8 years.
2. She has been typing the text for half an hour.
3. She has been speaking English since she was five.
4. I had been reading this book for three hours when he came.
5. It had already been raining for several hours when I went out.
6. He will have been learning German for three years when he enters the Institute.

5.2.5. Яку форму дієслова необхідно вжити в реченні: “My friend explained that he ... for it for the last two hours.”?

1. have looked 2. has looked 3. had been looking 4. has been looking

5.3. Прочитайте текст про сільське господарство України. Виконайте вправи після тексту

Agriculture in Ukraine

Farming plays an important role in the national economy. Ukraine has favourable conditions for the development of agricultural production: a temperate climate, fertile soils, adequate rainfall, and a well-developed industry processing agricultural raw materials. The land is the main wealth of the society. The lands of Ukraine exceed 60 million hectares. Arable land makes up 42 million hectares.

Crop growing and livestock breeding are the most important branches of agriculture in Ukraine.

All the principal areas of plant cultivation are grain and industrial crops, fodder plants (forage plants), fruit, and vegetable raising.

Such grain crops (cereals) as winter wheat, rye, oats, barley, and maize, among which wheat takes the first place, are widely grown in Ukraine. Winter wheat is sown mainly in the Steppe and Forest-Steppe zones. Maize is grown mostly in Transcarpathia and Steppe zones. Such cereals as buckwheat, millet, and rice are also grown in our country.

Among the industrial crops such as sugar beet, sunflower, and flax, the leading position is occupied by sugar beet. Today early varieties of sugar beet are successfully cultivated and the area under sugar beet is steadily expanding.

Close to 40 types of vegetable crops are grown in Ukraine: cabbage, tomato, cucumber, red beet, carrot, onion, garlic, etc. Potatoes occupy 6% of the total area under cultivation. Melon-growing is practiced mainly in the south.

Animal husbandry is the second largest component of agriculture. The abundance of fodder plants favours its development. Like plant cultivation, livestock production is divided into branches. The most widespread branch is cattle breeding. The most productive pedigree and dairy cattle are raised on the vast pastures of the non-black soil zone. Pig raising is another important area. Sheep farming is also practiced.

The poultry industry is spread throughout all the regions. Birds farmed include chicken, duck, goose, and turkey. There are large mechanized poultry factories to produce eggs and meat.

Fish farming is growing in importance, with carp being the most common fish.

Trout, which is to be found in the Mountain Rivers, is of commercial interest.

Bee-keeping is spread through all zones. It is extensively practiced on private plots.

Fur animal farms raise (rear) such animals as silver and blue fox, mink, and nutria.

Vocabulary

1.	adequate	достатній, адекватний
2.	process	обробляти
3.	raw materials	сировина
4.	wealth	багатство
5.	exceed	перевищувати
6.	crop growing	рослинництво
7.	livestock breeding	тваринництво
8.	plant cultivation	рослинництво
9.	grain crops	зернові культури
10.	industrial crops	технічні культури
11.	forage plants	кормові культури
12.	fodder plants	кормові культури
13.	raise	розводити, вирощувати
14.	cereals	злаки
15.	wheat	пшениця
16.	rye	жито
17.	oats	овес
18.	barley	ячмінь
19.	maize	кукурудза
20.	buckwheat	гречка
21.	millet	просо
22.	rice	рис
23.	grow	рости, вирощувати
24.	widely	широко
25.	sugar-beet	цукровий буряк
26.	sunflower	соняшник
27.	flax	льон
28.	variety	сорт, вид
29.	steadily	постійно
30.	expand	розширювати
31.	cabbage	капуста
32.	cucumber	огірок
33.	carrot	морква
34.	onion	цибуля
35.	garlic	часник
36.	melon-growing	баштанництво
37.	animal husbandry	тваринництво
38.	abundance	достаток
39.	cattle	велика рогата худоба
40.	cattle breeding	скотарство
41.	pedigree and dairy cattle	племінна та молочна худоба
42.	pig raising	свинарство
43.	sheep farming	вівчарство

44.	poultry industry	птахівництво
45.	spread	поширювати(ся)
46.	turkey	індик
47.	fish farming	рибництво
48.	carp	короп
49.	trout	форель
50.	bee-keeping	бджільництво
51.	fur	хутро
52.	silver fox	чорно-бура лисиця
53.	mink	норка
54.	nutria	нутрія

5.3.1. Дайте відповіді на запитання:

1. What are the two main branches of agriculture?
2. What conditions has Ukraine for the development of agriculture?
3. How many hectares of arable land are there in Ukraine?
4. What are the principal areas of plant cultivation?
5. What grain crops are grown in Ukraine? What is a chief grain crop among them?
6. What vegetable crops are cultivated in our country?
7. What is the most important industrial crop?
8. Does Ukraine go in for stock farming on a very large scale?
9. What favours the development of animal husbandry?
10. What sub-sectors is livestock-breeding divided into?
11. Where is the poultry industry spread?
12. What types of fish are farmed in Ukraine?
13. What types of fish are farmed in Ukraine?
14. Where is bee-keeping extensively practised?

5.3.2. Підберіть синоніми:

1) Abundant a	a) Field n, area n
2) Cultivate v	b) Grain crops n
3) Maize n	c) Farming n
4) Branch n	d) To go in for
5) Cereals n	e) Animal husbandry
6) Widely adv	f) Crop n, harvest n
7) Livestock breeding n	g) Corn n
8) Agriculture n	h) Grow v
9) Yield n	i) Rich a
10) to be engaged in	j) Extensively adv

5.3.3. Перекладіть українською:

1. Farming plays an important role in the national economy.
2. Our country has abundant agricultural resources, including favourable climate, adequate rainfall, and rich soils.

3. The lands of Ukraine exceed 60 million hectares.
4. Grain crops are widely grown in Ukraine.
5. The area under sugar beet is steadily expanding.
6. These farmers cultivate early varieties of sugar beet.
7. Ukraine goes in for stock farming on a very large scale.
8. The most productive pedigree and dairy cattle are raised in our country.
9. The abundance of fodder plants favours the development of animal husbandry.

5.3.4. Складіть план до тексту та перекажіть його.

5.3.5. Прочитайте додатковий текст “Forestry”, користуючись словником. Перекажіть його зміст українською або англійською мовою.

FORESTRY

Forestry is the science of managing forest resources for human benefit. The practice of forestry helps maintain an adequate supply of timber for the manufacture of lumber, plywood, paper, and other wood products. It also includes the management of such valuable forest resources as water, wildlife, grazing areas, and recreation areas.

In general, forests provide the greatest benefits when they are managed with the goal of providing several benefits at once. This concept is called *multiple-use forest management*. In the United States, it is applied in national forests, most state forests, and many private forests. In addition to furnishing timber, these forests may provide water for communities; food and shelter for wildlife; grazing land for livestock; and recreation areas for campers, hikers, and picnickers.

In some forests, however, the importance of one resource may outweigh that of others. For example, companies that manufacture wood products manage their forests primarily for maximum timber production. Or a forest may be protected as a park or as a wilderness or recreation area.

Most countries with forests have at least one government agency to manage forest lands and conduct research. The agency may be an independent government authority. Or it may be part of the nation's park service or agricultural service.

The goal of managing timber resources is to achieve an approximate balance between the annual harvest and the growth of wood. This balance, called a sustained yield, ensures a continuous supply of timber. It is achieved by managing forests so they have areas of trees of equal yield for each age group, from seedlings to mature trees. The science of harvesting and growing crops of trees for sustained yield is called silviculture.

MODULE TEST II

Завдання для самостійного виконання

1. Choose the right modal verb:

There are plenty of tomatoes in the fridge. You ... buy any.

- A mustn't C may not
B needn't D couldn't

2. Complete the sentence with the verb to have in the correct tense-form:

The boys ... a game of football at the moment.

3. Complete the sentence with the verb understand in the correct tense-form:

He ... it now.

4. Complete the sentence with the correct forms of the verbs to do, to visit:

- What are ... on Saturday? – We ... the Tower.

5. Choose the right modal verb:

He had been working for more than 11 hours. He ... be tired after such hard work.

- A must C could
B need D had better

6. Choose the right modal verbs:

May Need Must Can / may not needn't can't might not
... you stand on your head for more than a minute? No, I

7. Complete the sentence with the verb to watch in the correct tense-form:

Ann ... television when the phone rang.

8. Choose the right modal verbs:

needn't shouldn't need may not / must need may mustn't
You ... leave small objects lying around. Such objects ... be swallowed by children.

9. Complete the following sentence with the verb to do in the correct tense-form:

What ... you ... at 10 o'clock last night?

10. Complete the following sentence with the verb to live in the correct tense-form:

This time last year he ... in Brazil.

11. Complete the following sentence with the verbs to walk, to see in the correct tense-form:

Yesterday, while I ... along the road when I ... Dave.

12. Complete the following sentence with the verb to get in the correct tense-form:

Alex ... married next month.

13. Complete the sentence with the correct form of the verb to learn:

I ... English topics the whole evening tomorrow.

14. Choose the right modal verb:

Need shouldn't mustn't might
Take an umbrella. It ... rain later

15. Complete the sentence:

Crop growing and ... are the most important branches in the farming of Ukraine.

16. Complete the sentence:

Close to 40 types of ... crops are grown in Ukraine: cabbage, tomato, cucumber, red beet, carrot, onion, garlic, etc.

17. Complete the sentence:

Three natural zones of vegetation are distinguishable from north to south: the Polissia (woodland and marsh), the ... , and the Steppe.

18. Choose the right modal verb:

Couldn't needn't mustn't may not
People ... walk on grass

19. Choose the right modal verb:

Couldn't needn't mustn't may not
You ... take your umbrella. It is not raining.

20. Choose the right modal verbs:

Could might can must / may can must need
I ... speak Arabic fluently when I was a child and we lived in Morocco. But after we moved back to Canada, I had very little exposure to the language and forgot almost everything I knew as a child. Now, I ... just say a few things in the language.

II. Довніть речення та перекладіть українською мовою:

All the principal areas of plant 1) ... are: grain and 2) ... crops, 3) ... plants (forage plants), fruit and vegetable raising.

Such 4) ... crops (cereals) as winter 5) ... , rye, oats, barley, and maize, among which wheat takes the first place, are widely 6) ... in Ukraine. Winter wheat is sown mainly in the 7) ... and Forest-Steppe zones. Maize is grown mostly in Transcarpathia and Steppe zones. Such 8) ... as buckwheat, millet, and rice are also grown in our country. Among the 9) ... crops such as sugar beet, sunflower, and flax, the leading position is occupied by sugar beet. About 40 types of vegetable crops are grown in Ukraine: cabbage, tomato, cucumber, red beet, carrot, onion, garlic, etc. Melon-growing is practiced mainly in the south. 10) ... occupy 6% of the total area under cultivation.

Запитання для самоконтролю

1. What conditions does Ukraine have for the development of agriculture?
2. What are the two main branches of agriculture?
3. What are the principal areas of plant cultivation?
4. What grain crops are grown in Ukraine? What is a chief grain crop among them?
5. What are the most important industrial crops?
6. Does Ukraine go in for stock farming on a very large scale?
7. What sub-sectors is livestock-breeding divided into?
8. What is the total area of forested land in our country?
9. What regions in Ukraine have the richest forestlands?
10. How many natural vegetation zones are there in Ukraine? What kinds of forests are there in the Polissia zone? What species of trees grow in Ukraine regions?

MODULE III

UNIT 6 ECOLOGY

Пасивний стан дієслів (Passive Voice)

В англійській мові є два стани дієслова:

- 1) *активний (the Active Voice)*;
- 2) *пасивний (the Passive Voice)*.

Коли підмет є особою чи предметом, що виконує дію, дієслово вживається у формі активного стану: **He asked her.** – Він запитав її. (Присудок відповідає на запитання “Що зробив підмет?”).

Коли підмет є особою чи предметом, що підлягає дії іншої особи чи предмета, дієслово вживається у формі пасивного стану: **He was asked.** – Його запитали. (Присудок відповідає на запитання “Що зробили з підметом?”).

Форма дієслова у пасивному стані складається з допоміжного дієслова **to be** у відповідному часі + **Past Participle (V-ed/V₃)**.

6.1. Група простих часів у пасивному стані (Simple Passive Tenses)

Present Simple Passive: am (is, are) + done.

Many articles **are published** every year.

Багато статей публікується кожного року.

Past Simple Passive: was (were) + done.

Many articles **were published** last year.

Багато статей було опубліковано минулого року.

Future Simple Passive: will be + done.

Many articles **will be published**
next year.

Багато статей буде опубліковано
наступного року.

Якщо вказано, ким виконана дія, то використовується прийменник **by**, а якщо вказано інструмент, яким виконана дія, — прийменник **with**.

Donald Duck was created
by Walt Disney in 1936.

Каченя Дональд було створено
Волтом Диснеєм у 1936 р.

Rice is eaten **with** chopsticks in China. Рис їдять паличками у Китаї.

Час	Форма		
	Стверджувальна	Питальна	Заперечна
Теперішній простий	The letter is written	Is the letter written?	The letter is not written
Минулий простий	The letter was written yesterday	Was the letter written yesterday?	The letter was not written yesterday
Майбутній простий	The letter will be written tomorrow	Will the letter be written tomorrow?	The letter will not be written tomorrow

6.2 Група тривалих часів пасивного стану (Continuous Passive Tenses)

Часи групи Continuous (or Progressive) пасивного стану, як і активного, виражають тривалу дію, що відбувається в якийсь момент або період часу в теперішньому чи минулому часі. Майбутній час – Future Continuous – у пасивному стані не вживається.

Present Continuous Passive: A very interesting film **is being shown** on TV.

Past Continuous Passive: An ice hockey game **was being shown** on TV when he returned home.

Present (Past) Continuous Passive утворюються за допомогою допоміжного дієслова to be в Present (Past) Continuous Active Voice та дієприкметника минулого часу основного дієслова.

THE PASSIVE FORMS OF THE PRESENT AND PAST CONTINUOUS

ACTIVE	PASSIVE		
The secretary <i>is copying</i> some letters.	(a) Some letters are being copied by the secretary.	<i>am</i>	Passive form of the present progressive: + being + PAST PARTICIPLE
Someone <i>is building</i> a new hospital.	(b) A new hospital is being built .	<i>is</i> <i>are</i>	
The secretary <i>was copying</i> some letters.	Some letters were being copied by the secretary.	<i>Was</i>	Passive form of the past progressive: + being + PAST PARTICIPLE
Someone <i>was building</i> a new hospital.	(c) A new hospital was being built .	<i>Were</i>	

Як і в активному стані, дієслова, що не виражають дію як процес, як правило, не вживаються у формі Continuous. До них відносяться дієслова, що виражають відчуття (to see, to smell), волевиявлення (to refuse, to prefer), бажання (to wish, to want), почуття (to like, to hate), розумову діяльність (to know, to understand) тощо.

(Див. урок 8).

6.3 Група часів Perfect пасивного стану (Perfect Passive Tenses)

I. Часи групи Perfect пасивного стану, як і активного, виражають дію, що передує іншій дії або якомусь моменту в теперішньому, минулому або майбутньому часі. Окрім цього, перфектні часи, особливо Present Perfect Passive, вживаються для підкреслення результату дії, що відбулася.

The windows **have still not been repaired**. – Вікна ще не відремонтовані.

I was thinking of all that **had been said**. – Я думав про все, що було сказано.

The goods **have just been examined** by the customs officers. – Товари щойно оглянуті (були оглянуті) митниками.

II. Present (Past, Future) Perfect Passive утворюються за допомогою допоміжного дієслова to be в Present (Past, Future) Perfect та дієприкметника минулого часу основного дієслова:

Present Perfect Passive: I (we, you, they) have been invited.
 He (she, it) has been invited.

Past Perfect Passive: I (he, she, it, we, you, they) had been invited.

Future Perfect Passive: I (we) shall have been invited.
 He (she, you, they) will have been invited.

Future Perfect-in-the-Past Passive утворюється так само, як і Future Perfect Passive, але замість допоміжних дієслів **shall/will** вживаються відповідно **should/would**.

Future Perfect-in-the-Past Passive: I (we) should have been invited.
 He (she, you, they) would have been invited.

III. Як і в активному стані, у підрядних обставинних реченнях часу та умови для вираження майбутньої дії замість форми Future Perfect Passive вживається форма Present Perfect Passive:

After the goods **have been examined** Після того, як товари будуть
 we'll take them to the warehouse. оглянуті, ми візьмемо їх на склад.

IV. Як і в активному стані, вживання часів у підрядному реченні з дієсловом-присудком у минулому часі, узгоджується з правилами послідовності часів.

I knew that the plant **had been built** for two years. Я знав, що завод будується вже два роки.

She showed me the article which **had been translated** by her brother. Вона показала мені статтю, яка була перекладена її братом.

He said that the house **would have been built** by January. Він сказав, що будинок (вже) буде побудований (побудують) до січня.

She said that you **would have been shown** a new film before he left. Вона сказала, що вам покажуть новий фільм, до того як він піде.

V. Perfect Infinitive Passive та модальні дієслова.

Perfect Infinitive Passive вживається:

- після модальних дієслів **must** і **may** для вираження припущення, що дія вже здійснилася:

The letter **may have been sent** to the wrong address. Лист, мабуть, був відісланий за неправильною адресою.

- після дієслів **can**, **cannot** для вираження здивування, сумніву з приводу того, що дія могла здійснитися:

Can this work **have been done** in such a short time? Невже ця робота була зроблена за такий короткий строк?

- після дієслів **should**, **would**, **could**, **might**, **ought** та **was (were)** для вираження дії, яка повинна була б чи могла б здійснитися, але не здійснилася:

The goods **were to have been delivered** at the beginning of May. Товари повинні були бути доставлені на початок травня (але не були доставлені).

The windows **should have been cleaned** yesterday. Вікна слід було (потрібно було) помити вчора.

Запитання для самоконтролю

1. Наведіть приклади речень англійською мовою з двома станами дієслова.
2. З чого складається форма дієслова-присудка у пасивному стані?
3. Як утворюється форма простих часів у пасивному стані?
4. Наведіть приклади речень з формами Present Simple у пасивному стані.
5. Утворіть питальні та заперечні форми до прикладів стверджувальних речень з присудками в Past Simple пасивного стану.
6. Наведіть приклади речень з формами Future Simple у пасивному стані. Утворіть питальні та заперечні форми до них.
7. Скільки часових форм має група Continuous пасивного стану?
8. З якими обставинами часу вживаються Present і Past Continuous?
9. Як утворюються часові форми групи Perfect у пасивному стані?
10. Наведіть приклади речень з формами Present Perfect у пасивному стані.
11. З якими “показниками часу” вживається Present Perfect у пасивному стані?
12. З якими обставинами часу вживаються Past і Future Perfect?
13. Наведіть приклади речень з формами дієслів у Past і Future Perfect у пасивному стані.
14. Яка часова форма вживається у підрядних обставинних реченнях часу та умови для вираження майбутньої дії замість форми Future Perfect Passive?
15. Після яких модальних дієслів можливе вживання перфектної форми інфінітиву пасивного стану? На яку дію вказують такі словосполучення та як правильно їх перекладати?

Завдання для самостійного виконання

6.1.1. Знайдіть форму пасивного стану дієслова:

- a) send b) is sending c) was sent d) sent

6.1.2. Знайдіть форму активного стану дієслова:

- a) was bought b) will be bought c) will buy d) is bought

6.1.3. У якому реченні присудок вживається у формі простого минулого часу пасивного стану?

1. Many interesting films are often shown on TV.
2. Many interesting films will be shown on TV tomorrow.
3. Many interesting films were shown on TV last week.
4. The guide showed us a lot of interesting places there.

6.1.4. Розкрийте дужки та заповніть речення:

1. Our University ... a status of National in 1994 (to give).
2. The USA ... by the Gulf of Mexico in the South (to wash).
3. Soon our department ... a new computer (to give).

6.1.5. Знайдіть український еквівалент англійського речення: “Some new houses were built in our street last year”.

1. Декілька нових будинків буде побудовано на нашій вулиці наступного року. 2. Ми побудували декілька нових будинків на нашій вулиці минулого року. 3. Декілька нових будинків було побудовано на нашій вулиці минулого року. 4. Нові будинки будуються на нашій вулиці кожного року.

6.1.6. Виберіть правильну відповідь на питання: “Were you asked last time?”

a) Yes, it was b) Yes, I was c) No, I weren't d) Yes, they were.

6.1.7. Користуючись таблицею, визначте форми присудків:

1. wasn't translated 2. will be bought 3. won't be asked 4. will be given
5. are repaired 6. was created 7. aren't grown 8. is used 9. weren't found 10. isn't done.

6.2.1. Складіть по 5 речень, використовуючи слова з таблиць:

The factory	is being	written
The book	are being	built
The film		repaired
The houses		discussed
The letter		read

The factory	was being	discussed	at that time
The film	were being	written	when I came in
The houses		built	when he moved here
The letter		repaired	when we were here
The book		read	

6.2.2. Прочитайте та перекладіть речення. Зверніть увагу на форми часу дієслів у пасивному стані:

1. Excuse the mess, the house is being painted. 2. I felt as if I was being watched. 3. The roof is being repaired by a friend of ours. 4. A multistoried house is being built near our school. 5. The children are being taught by Mr. Rice at the moment. 6. I think the film is being shown on TV now. 7. The factory was still being built when we came to that place.

6.2.3. Підкресліть присудки в реченнях. Перетворіть речення у Passive Voice, звертаючи увагу на часову форму дієслів:

1. Some people are considering a new plan.

A new plan is being considered.

2. The grandparents are watching the children.

The children _____ by their grandparents.

3. Some painters are painting Mr. Rivera's apartment this week.

Mr. Rivera's apartment _____ this week.

4. Many of the older people in the neighbourhood were growing vegetables.

Vegetables _____ by many of the older people in the

neighbourhood.

5. Eric's cousins are meeting him at the airport this afternoon.

Eric _____ by his cousins at the airport this afternoon.

6.2.4. Утворіть питальну та заперечну форми:

1. The sick man is being operated on. 2. The room is being cleaned now. 3. This metro line was being built at that time. 4. The road is being repaired by our workers. 5. The film was being shown from 7 till 9. 6. The orchestra was being conducted by our music teacher. 7. Water-power stations are being built on the Mountain Rivers.

6.2.5. Відкрийте дужки, вживаючи дієслова у відповідній часовій формі:

1. During the family celebration, the little boy was crying because he (ignore) _____. He needed some attention, too.
2. The Clarks' living room (redecorate) _____ in blue and white. They want it to look nice for their daughter's wedding reception.
3. Jack pricked his finger while he (thread) _____ a needle.
4. Oil exploration costs a lot of money. The explorations in the southern part of the country (finance) _____ by the government.
5. The news of the victory (broadcast) _____ throughout the country over the radio and television. Everyone heard about it almost as soon as it happened.

6.2.6. Перетворіть речення, використовуючи Passive Voice:

1. Is a student pilot flying that airplane?
_____ that airplane _____ by a student pilot?
2. The pollution in the city was affecting Tim's breathing.
Tim's breathing _____ by the pollution in the city.
3. Someone is considering Jack for the job.
Jack _____ for the job.
4. The police are questioning two boys in connection with the accident.
Two boys _____ by the police in connection with the accident.
5. Look! Someone is feeding the seals.
The seals _____ . are being fed
6. They are building a new ring-road round the city.
A new ring-road _____ round the city.
7. Somebody was cleaning the room when I arrived.
The room _____ when I arrived.
8. Somebody is cleaning the room at the moment.
The room _____ at the moment.

6.3.1. Складіть 5 речень, використовуючи слова з таблиці:

The house	have	been built before we arrived
The houses	has	already been built
He said that the house	would have	been built by the end of next year
	will have	been built for 2 years before we arrived
	had	been built by January

6.3.2. Прочитайте та перекладіть речення. Зверніть увагу на Passive Voice:

1. Jim didn't know about the change of plans. He hadn't been told. 2. The room looked much better. It had been cleaned. 3. Have you heard the news? The president had been shot. 4. Have you ever been bitten by a dog? 5. I'm not going to the party. I haven't been invited. 6. The letter has just been typed. 7. The article will have been translated by six o'clock. 8. He said that he would show us the letter when it was typed. 9. This room looks different. Has it been painted since I was last here? 10. A tree was lying across the road. It had been blown down in the storm.

6.3.3. Підкресліть перфектну форму дієслова. Закінчіть речення відповідною часовою формою дієслова в пасивному стані:

They have changed the date of the meeting.

The date of the meeting has been changed.

The police have arrested three men.

Three men _____.

Brian told me that somebody had attacked and robbed him in the street.

Brian told me that he _____.

The children have scattered about a lot of things.

A lot of things _____.

They have built excellent shelters for tourists in these mountains.

Excellent shelters for tourists _____.

They have recently built a huge plant in the town of N.

A huge plant _____.

6.3.4. Перекладіть речення з Perfect Passive. Закінчіть речення відповідною часовою формою дієслова в активному стані:

1. This man has been much spoken of.

Everyone _____.

2. Invitations have been sent to all the old pupils to be present at the school's thirtieth anniversary.

They _____.

3. After the facts had been thoroughly explained to her, she no longer felt worried.

The hostess _____.

4. The papers had been looked through and corrected by the last lesson.

The professor _____.

5. New material will have been explained by the teacher by the end of the first lesson.

The teacher _____.

6.3.5. Поставте питальну та заперечну форми до речень:

1. The light has not been turned off yet. 2. He has been told everything, so he knows what to do now. 3. The door has been left open. 4. The article will have been published by the time you arrive. 5. This crop had been sown by the end of the month.

6.3.6. Перекладіть речення, звертаючи увагу на *Perfect Infinitive Passive* після модальних дієслів:

1. My bicycle has disappeared. It must have been stolen.
2. The weather was awful. The football match ought to have been cancelled.
3. Did anyone invite Ann to the party? – I don't know. She might have been invited.
4. Did anyone see you? – No, but I would have been seen if it hadn't been so dark.
5. Has someone repaired this machine? – Well, it's working again so it must have been repaired.
6. Did someone throw those old letters away? – Yes, but it was a mistake. They shouldn't have been thrown away.

6.3.7. Перетворіть речення у *Passive Voice*, звертаючи увагу на часову форму дієслів:

1. I watched while the movers were moving the furniture from my flat to a truck.
I watched while the furniture _____ from my apartment to a truck.
2. Everyone looked at the flag while they were singing the national anthem.
Everyone looked at the flag while the national anthem _____
3. According to one scientific estimate, we are losing 20,000 species of plants and animals each year due to the destruction of rain forests.
According to one scientific estimate, 20,000 species of plants and animals _____ each year due to the destruction of rain forests.
4. At the present time, the oldest house in town (restore) _____ by the Historical Society. When the restoration is finished, the house is sure to be a popular tourist attraction.
5. The logging industry in that country still uses animal power. After the trees are cut down, the logs (drag) _____ to the central camp by elephants.

6.3.8. Перекладіть речення, звертаючи увагу на особливості перекладу речень з *Passive Voice*:

- The doctor was sent for.
The new exhibition was admired.
This problem will be dealt with later.
He was addressed by a stranger.
People are influenced by the information they hear by the radio and TV.
The information is followed by 3 chapters.
The details were paid attention to.
These data were made use of in his article.

6.3.9. Перекладіть речення, звертаючи увагу на Continuous Passive. Утворіть питальну форму:

1. At present soil protective crop farming methods are being introduced in many regions of our country.
2. The production of machinery and chemicals for local soil-protective and plant-protective systems is being increased.
3. An intensive research programme is being carried out to produce basic data for new designs and procedures: this includes harvesting under difficult terrain conditions; new thinning machines, afforestation and cultivation equipment and methods.
4. Fertilization is gradually being more commonly used in order to increase the yield.
5. New farms are being organized on irrigated lands. They are being provided with up-to-date equipment and machinery.

6.3.10. Напишіть інше речення з тим самим значенням, використовуючи Passive Voice:

1. Somebody might have stolen your car if you had left the keys in it.
Your car _____.
2. An electrical fault could have caused the fire.
The fire _____.
3. They shouldn't have played the football match in such bad weather.
The football match _____.
4. They should have discussed this question at the last meeting.
This question _____.
5. He should have published the novel last year.
The novel _____.

6.3.11. Перекладіть речення англійською мовою, звертаючи увагу на часові форми дієслова пасивного стану:

1. Усі телеграми відіслані? – Ще ні. Половина телеграм була відіслана вчора. Решта, окрім трьох, надруковані. Останні зараз друкуються. Їх надрукують через двадцять хвилин. 2. Як повідомляють у пресі, переговори завершуються. Але згоди ще не досягнуто до сих пір. 3. Не заходьте в кімнату. Зараз екзаменують студента Петрова. Його екзаменують вже двадцять хвилин. 4. Це питання вже дуже давно розглядається. 5. Міст вже будували два місяці, коли ми приїхали. 6. Що зараз відбувається в бібліотеці? – Там зараз обговорюються нові книги. Їх обговорюють вже годину.

6.4. Прочитайте текст, звертаючи увагу на визначення основних термінів. Зверніть увагу на визначення основних термінів, таких як ecology, population, communities, ecosystems, succession. Виконайте вправи після тексту

ECOLOGY

Ecology is the branch of science that deals with the relationships living things have to each other and to their environment. Scientists who study these relationships are called *ecologists*.

Ecologists study the organization of the natural world on three main levels: (1) populations, (2) communities, and (3) ecosystems. They analyze the structures, activities, and changes that take place within and among these levels. Ecologists often conduct field work in isolated areas, such as islands, where the relationships among the plants and animals may be simpler and easier to understand.

For example, the ecology of Isle Royale, an island in Lake Superior, has been studied extensively. Many ecological studies focus on solving practical problems. For example, ecologists search for ways to curb the harmful effects of air and water pollution on living things.

The world includes a tremendous variety of living things, from complex plants and animals to simpler organisms, such as fungi, amoebas, and bacteria. But whether large or small, simple or complex, no organism lives alone. Each depends in some way upon other living and nonliving things in its surroundings. For example, a moose must have certain plants for food. If the plants in its environment were destroyed, the moose would have to move to another area or starve to death. In turn, plants depend upon such animals as moose for the *nutrients* (nourishing substances) they need to live. Animal wastes and the decay of dead animals and plants provide many of the nutrients plants need.

The study of ecology is important because our survival and well-being depend on ecological relationships around the world. Even changes in distant parts of the world and its atmosphere affect us and our own environment.

Although ecology usually is considered a branch of biology, ecologists must employ such disciplines as chemistry, physics, and computer science. They also rely on such fields as geology, meteorology, and oceanography to study air, land, and water environments and their interactions. This multidisciplinary approach helps ecologists understand how physical environments affect living things. It also helps them assess the impact of environmental problems, such as acid rain or the greenhouse effect.

Populations

A population is a group of the same species that lives in an area at the same time. For example, all the moose on Isle Royale make up a population, as do all the spruce trees. Ecologists determine and analyze the number and growth of populations and the relationships between each species and the environmental conditions.

Factors that control populations. The size of any population depends upon the interaction of two basic forces. One is the rate at which the population would grow under ideal conditions. The second is the combined effect of all the less-than-ideal environmental factors that limit growth. Such limiting factors may include low food supply, predators, competition with organisms of the same or different species, climate, and disease.

Factors that change populations. Population levels of a species can change considerably over time. Sometimes these changes result from natural events. For example, a change

in rainfall may cause some populations to increase and others to decrease. Or the introduction of a new disease can severely decrease the population of a plant or animal species. In other cases, changes may result from human activities. For example, power plants and automobiles release acidic gases into the atmosphere, where they may mix with clouds and fall to earth as acid rain. In some regions that receive large amounts of acid rain, fish populations have declined dramatically.

Communities

A community is a group of animal and plant populations living together in the same environment. Wolves, moose, beavers, and spruce and birch trees are some of the populations that make up the forest community of Isle Royale. Ecologists study the roles different species play in their communities. They also study the different types of communities, and how they change. Some communities, such as an isolated forest or meadow, can be identified easily. Others are more difficult to define.

A community of plants and animals that covers a large geographical area is called a biome. The boundaries of different biomes are determined mainly by climate. The major biomes include deserts, forests, grasslands, tundra, and several types of aquatic biomes.

The role of a species in its community is called its ecological niche. A niche consists of all the ways that a species interacts with its environment. It includes such factors as what the species eats or uses for energy; what predators it has; the amounts of heat, light, or moisture it needs; and the conditions under which it reproduces. Ecologists have long noted that many species occupy a highly-specialized niche in a given community. Various explanations have been proposed for this. Some ecologists think that it results from competition—that if two species try to "fill" the same "niche," then competition for limited resources will force one of the species out. Other ecologists maintain that a species that occupies a highly-specialized niche does so because of the rigid physiological demands of that particular role in the community. In other words, only one species occupies the niche not because it has out-competed other species, but because it is the only member of the community physiologically capable of playing that role.

Changes in communities occur over time in a process called ecological succession. This process occurs as a series of slow, generally predictable changes in the number and kinds of organisms in an area take place. Differences in the intensity of sunlight, protection from wind, and changes in the soil may alter the kinds of organisms that live in an area. These changes may also alter the number of populations that make up the community. Then, as the number and kinds of species change, the physical and chemical characteristics of the area undergo further changes. The area may reach a relatively stable condition called the climax community, which may last hundreds or even thousands of years.

Ecologists distinguish two types of succession—primary and secondary. In primary succession, organisms begin to inhabit an area that had no life, such as a new island formed by a volcanic eruption. Secondary succession takes place after an existing community suffers a major disruption—for example, after a climax forest community is destroyed by fire. In this example, a meadow community of wildflowers and grasses will grow first, followed by a community of shrubs. Finally, trees will reappear, and

the area will eventually become a forest once more, until it is disturbed again. Thus, the forces of nature ultimately cause even climax communities to change. Ecologists view fires and other large natural disturbances as acceptable and even desirable.

Vocabulary

1. acceptable	прийнятний, допустимий
2. acidic	кислотний, кислий
3. alter	змінювати(ся), видозмінювати(ся)
4. amoeba	зоол. амеба
5. amount	кількість
6. beaver	бобер
7. biome	біом
8. capable	здатний
9. cause	спричиняти; причина
10. community	об'єднання, комуна, спілка
11. considerably	значно
12. curb	стримувати, загнуждувати
13. deal with	мати справу, розглядати питання
14. decay	гниття (органічних речовин)
15. decline	падати, погіршуватися, зменшуватися
16. decrease	зменшувати(ся)
17. define	визначати, давати визначення
18. determine	визначати, обумовлювати
19. disruption	руйнування, розрив, розпад
20. distant	далекий, віддалений
21. disturbance	порушення
22. dramatically	помітно, значно, сильно
23. eruption	викид, виверження
24. event	подія
25. eventually	врешті-решт, з часом, згодом
26. extensively	екстенсивно, сильно
27. fungi	грибок, пліснява
28. increase	зростати, збільшувати(ся)
29. inhabit	жити, заселяти
30. moose	американський лось
31. niche	ніша, належне місце
32. nourishing	поживний
33. nutrients	поживні речовини
34. power plant	електростанція
35. predator	хижак
36. rate	темп, швидкість, ступінь
37. release	випускати

38. succession	спадкоємність, сукцесія (послідовна зміна у часі одних видів тварин та рослин на інші)
39. suffer	страждати, терпіти, зазнавати
40. supply	постачати, постачання
41. survival	виживання
42. tremendous	велетенський, гігантський
43. ultimately	врешті решт, звичайно
44. well-being	добробут, достаток

6.4.1. Знайдіть в тексті речення, що містять дієприкметник II. Визначте його функцію в цих реченнях та перекладіть їх.

6.4.2. До слів у лівій колонці підберіть синоніми з правої колонки:

1. tremendous adj	a) happen v, take place
2. amount n	b) determine v
3. affect v	c) change, modify, vary v
4. occur v	d) provide v
5. impact n	e) satisfactory, adequate, sufficient adj
6. define v	f) eventually, finally, at last, in the long run adv
7. supply v	g) quantity n
8. acceptable adj	h) enormous, huge, gigantic, giant adj
9. alter v	i) effect, influence, result n
10. ultimately adv	j) influence v

6.4.3. Підберіть визначення до наступних термінів:

1. Ecology is	a) a process of slow, generally predictable changes in the number and kinds of organisms in an area.
2. A community is	b) a group of the same species that lives in an area at the same time.
3. An ecological niche is	c) the branch of science that deals with the relationships that living things have to each other and to their environment.
4. A population is	d) a community of plants and animals that covers a large geographical area.
5. Ecological succession is	e) a group of animal and plant populations living together in the same environment.
6. A biome is	f) the role of a species in its community.

6.4.4. Доповніть речення, користуючись текстом:

1. Although ecology usually is ... a branch of biology, ecologists ... employ such disciplines as ..., physics, and computer
2. Population levels of a species ... change considerably ... time.

3. If the plants in its environment ... destroyed, the moose ... have to move to another area or starve to death.
4. Ecologists ... long ... that many species occupy a highly ... niche in a ... community.
5. The area may reach a relatively stable condition ... the *climax community*, which may last hundreds or even thousands of years.
6. The ... of different biomes are ... mainly by climate.
7. Some communities, such as an ... forest or meadow, can be ... easily.

6.4.5. З'єднайте слова у словосполучення, опираючись на текст:

natural	pollution
harmful	effect
water	conditions
tremendous	rain
environmental	world
greenhouse	activities
ideal	succession
human	variety
acid	effects
ecological	problems

6.4.6. Дайте відповіді на такі запитання:

1. What does ecology deal with?
2. What three main levels of the natural world do ecologists study?
3. Why is the study of ecology so important for our survival and well-being?
4. What does the size of any population depend on?
5. What are the factors that change the population?
6. What does an ecological niche of a species include?
7. How do changes in communities occur?

6.4.7. Випишіть із тексту всі терміни з визначеннями, що стосуються екології. Підготуйтеся до обговорення таких тем:

- 1) Ecology as a branch of science. The main tasks of ecologists. The study of ecology and its importance.
- 2) Populations – one of three main levels of the natural world organization. Factors that control and change populations.
- 3) Communities and biomes. Ecological niches. Ecological succession.

6.4.8. Напишіть анотацію до тексту “Ecology” та підготуйте його переказ.

6.4.9. Перед тим як читати текст “Applied Ecology” скажіть, які прикладні науки ви знаєте і що вони вивчають.

APPLIED ECOLOGY

Applied ecology is the use of ecological studies to achieve practical goals. These studies help us to preserve and manage natural resources and to protect the environment. Applied ecologists work with scientists from different fields to try to solve problems concerning the health and well-being of people, plants, and animals. Ecologists are concerned about the rate at which people are depleting such non-renewable resources as coal, gas, and petroleum, and about the pollution caused by their extensive use. Ecologists believe that if the human population continues to grow, such problems as depletion of fuels, pollution, deforestation, congestion, poverty, and the disruption of climate will also worsen.

An increasing concern is the loss of natural ecosystems and their many species as more forests and grasslands are converted to farmland, urban areas, and wastelands. Some people think that the studies and activities of ecologists conflict with people's economic interests. However, ecologists believe that ecological knowledge is essential for long-term economic well-being. They point out that the maintenance of natural ecosystems provides many benefits to society. For example, if air and water supplies are clean, people will be healthier, and medical costs will decrease. In addition, many ecologists think we can use the principles of ecology, such as energy flow, to understand human economies better. Ecologists believe everyone should learn about ecology and the environment so that people can live in greater harmony with the rest of the world.

• From World Book, "Ecology." Charles A. S. Hall, Ph.D., Professor of Environmental and Forest Biology, State University of New York, College of Environmental Sciences and Forestry.

Vocabulary

1. achieve	досягати
2. applied	прикладний
3. benefit	користь, перевага
4. concern	стосуватися; турбота
5. concern about	хвилюватися, піклуватися про
6. congestion	скупчення, накопичення, порушення нормального циклу
7. deforestation	вирубка лісу
8. depletion	зменшення
9. disruption	порушення
10. goal	мета
11. maintenance	підтримка, збереження

12.manage	управляти, вміло користуватися
13.point out	вказувати, звертати увагу
14.society	суспільство
15.wasteland	пустир
16.worsen	погіршувати(ся)

6.5.0. Випишіть речення з *Participle I* та *Participle II*, перекладіть їх і поясніть функцію дієприкметника в них.

6.5.1. Дайте відповіді на запитання:

1. What is applied ecology concerned with?
2. What problems does the science solve?
3. Do the activities of ecologists conflict with people's economic interests?
4. What do people have to do so they can live in greater harmony with the world?

6.5.2. Напишіть анотацію до тексту “*Applied Ecology*”.

6.5.3. Прочитайте прислів'я і назвіть їх відповідники українською мовою:

1. *Burn not your house to get rid of the mouse.*
2. *Good health is above wealth.*
3. *He laughs best who laughs last.*

6.5.4. Прочитайте текст, користуючись словником, складіть план і перекажіть його.

FOREST ECOLOGY

Forest Ecology is the scientific study of the interrelated patterns, processes, flora, fauna and ecosystems in forests. The management of forests is known as forestry, silviculture, and forest management. A forest ecosystem is a natural woodland unit consisting of all plants, animals and micro-organisms (biotic components) in that area functioning together with all of the non-living physical (abiotic) factors of the environment.

The forest ecosystem is very important. It is the study of all aspects of the ecology of wooded areas, including rainforest, deciduous and evergreen, temperate and boreal forest. It includes the community ecology of the trees and other plant and non-plant species, as well as ecosystem processes and conservation.

Forest ecology is one branch of a biotically-oriented classification of types of ecological study (as opposed to a classification based on organizational level or complexity, for example population or community ecology). Thus, forests are studied at a number of organizational levels, from the individual organism to the ecosystem. However, as the term forest connotes an area inhabited by more than one organism, forest ecology most often concentrates on the level of the population, community or ecosystem. Logically, trees are an important component of forest research, but the wide

variety of other life forms and abiotic components in most forests means that other elements, such as wildlife or soil nutrients, are often the focal point. Thus, forest ecology is a highly diverse and important branch of ecological study.

Forest ecology studies share characteristics and methodological approaches with other areas of terrestrial plant ecology. However, the presence of trees makes forest ecosystems and their study unique in numerous ways. Since trees can grow larger than other plant life-forms, there is the potential for a wide variety of forest structures (or physiognomies). The infinite number of possible spatial arrangements of trees of varying size and species makes for a highly intricate and diverse micro-environment in which environmental variables such as solar radiation, temperature, relative humidity, and wind speed can vary considerably over large and small distances. In addition, an important proportion of a forest ecosystem's biomass is often underground, where soil structure, water quality and quantity, and levels of various soil nutrients can vary greatly.

Thus, forests are often highly heterogeneous environments compared to other terrestrial plant communities. This heterogeneity in turn can enable great biodiversity of species of both plants and animals. It also affects the design of forest inventory sampling strategies, the results of which are sometimes used in ecological studies. A number of factors within the forest affect biodiversity; primary factors enhancing wildlife abundance and biodiversity are the presence of diverse tree species within the forest and the absence of even aged timber management.

Forests accumulate large amounts of standing biomass, and many are capable of accumulating it at high rates, i.e., they are highly productive. Such high levels of biomass and tall vertical structures represent large stores of potential energy that can be converted to kinetic energy under the right circumstances. Two such conversions of great importance are fires and treefalls, both of which radically alter the biota and the physical environment where they occur. Also, in forests of high productivity, the rapid growth of the trees themselves induces biotic and environmental changes, although at a slower rate and lower intensity than relatively instantaneous disturbances such as fires.

Water

Lastly, forest trees store large amounts of water because of their large size and anatomical/physiological characteristics. They are therefore important regulators of hydrological processes, especially those involving groundwater hydrology and local evaporation and rainfall/snowfall patterns.

Thus, forest ecological studies are sometimes closely aligned with meteorological and hydrological studies in regional ecosystem or resource planning studies. Perhaps more importantly the duff or leaf litter can form a major repository of water storage. When this litter is removed, or compacted (e.g. through grazing or human overuse), erosion and flooding are exacerbated as well as deprivation of dry season water for forest organisms.

Notes: connote v – означати; infinite a – нескінченний, незліченний; spatial a – просторовий; intricate a – заплутаний; heterogeneous a – неоднорідний, гетерогенний; induce v – спонукати; instantaneous a – миттєвий; duff n – лісова підстилка, гумус; leaf litter - опале листя, листяна підстилка; exacerbate v – загострювати, поглиблювати; deprivation n – позбавлення, втрата.

UNIT 7 ECOSYSTEMS

7.1. Узгодження часових форм (Sequence of Tenses)

Узгодження часів (заміна часових форм) застосовується в підрядних реченнях, якщо дієслово у головному реченні стоїть в одному з минулих часів.

Якщо дієслово-присудок у головному реченні стоїть у теперішньому або майбутньому часі, то в підрядних реченнях час уживається за змістом речення.

Основні правила узгодження часів

Часова форма присудка у підрядному реченні, необхідна за змістом:	Часова форма присудка у підрядному реченні, на яку замінюється:
<p>Present Simple I know (that) he lives in Paris. (Я знаю, що він живе в Парижі.)</p> <p>Present Continuous I think (that) she is waiting for me in the reading-room. (Я думаю, що вона чекає на мене у читальній залі)</p> <p>Present Perfect Continuous I know (that) he has been living in Paris since 1995. (Я знаю, що він живе в Парижі з 1995 р.)</p>	<p>Past Simple I knew (that) he lived in Paris. (Я знав, що він живе в Парижі.)</p> <p>Past Continuous I thought (that) she was waiting for me in the reading-room. (Я думав, що вона чекає на мене у читальній залі)</p> <p>Past Perfect Continuous I knew (that) he had been living in Paris since 1995. (Я знав, що він живе в Парижі з 1995 р.)</p>
<p>Past Simple She says, "He left Kyiv three days ago." (Вона каже: "Він виїхав з Києва три дні тому.")</p> <p>Present Perfect I think she has already written the article. (Я думаю, що вона вже написала статтю.)</p> <p>Past Perfect¹ He says, "I had worked by 8 o'clock."</p>	<p>Past Perfect She said (that) he had left Kyiv three days before. (Вона сказала, що він виїхав з Києва три дні тому.)</p> <p>Past Perfect I thought she had already written the article. (Я думав, що вона вже написала статтю.)</p> <p>Past Perfect¹ He said (that) he had worked by 8 o'clock."</p>
<p style="text-align: center;">Future Tenses:</p> <p>Future Simple She said, "I will write a letter to my brother." Future Continuous</p>	<p style="text-align: center;">Future-in-the-Past:</p> <p>Future Simple-in-the-Past She said (that) she would write a letter to my brother." Future Continuous-in-the-Past</p>

<p>He said, “I will be writing the composition the whole evening.”</p> <p>Future Perfect</p> <p>He said, “I will have done it by 6 o’clock.”</p> <p>Future Perfect Continuous</p> <p>He said, “I’ll have been translating the text for an hour when she comes.”</p> <p>(Він сказав: “Я перекладатиму текст вже годину, коли вона прийде.”)</p>	<p>He said (that) he would be writing the composition the whole evening.</p> <p>Future Perfect-in-the-Past</p> <p>He said (that) he would have done it by 6 o’clock.”</p> <p>Future Perfect Continuous-in-the-Past</p> <p>He said (that) he would have been translating the text for an hour when she <u>came</u>².</p> <p>(Він сказав, що він перекладатиме текст вже годину, коли вона прийде.”)</p>
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Примітка:

¹. Past Perfect та Past Perfect Continuous залишаються без змін.

². У підрядних реченнях часу та умови в англійській мові вживається минулий час (замість теперішнього) в українській – майбутній.

1. She said, “By 1995 I **had been working** at school for 20 years.”
2. He said, “I’**ll go** to the cinema after I have finished my work.”

- She said (that) by 1995 she **had been working** at school for 20 years.”
- He said that he would go to the cinema after he had finished his work.

Випадки, коли правила узгодження часів не застосовуються:

1. Якщо в підрядному реченні мова йде про вічні істини або загальновідомі факти – переважно вживається Present Simple:

The teacher told the children that water boils at 100 degrees centigrade.

2. Якщо в реченні точно зазначено час виконання дії (обставиною часу чи підрядним реченням часу), то ця дія виражається за допомогою Past Simple та Past Continuous:

He said that his parents **graduated** from the University in 1988.

I thought that you **were working** in the library at five o’clock yesterday.

She said that she **was working** when I rang her up.

3. Дієслово-присудок у підрядних реченнях причини, а також в означальних та порівняльних підрядних реченнях може вживатися в Present і Future:

He told me about the book which you **are reading**.

He refused to go to the theatre as he **will have** an examination in History in a few days.

He was once stronger than he **is** now.

4. Дієслова must, should та ought (to) вживаються у підрядному реченні без змін незалежно від часової форми дієслова-присудка головного речення:

She tells (told) him that he should consult a doctor.

He says (said) that I ought t visit my grand-parents.

The teacher tells (told) the children that they mustn’t cross the road against the red light.

7.2. Непряма мова (Indirect Speech)

При перетворенні прямої мови на непряму утворюється складнопідрядне речення з підрядним додатковим реченням із сполучником **that** або без нього:

He says: "I have read this book" He says (that) he has read that book.

Якщо вказано особу, до якої звернено пряму мову і вживається *to say* з прийменником *to*, то перед непрямою мовою **to say to** замінюється на дієслово **to tell**:

She says to me: "I saw him
yesterday" She tells me (that) she saw him the
day before.

При перетворенні прямої мови на непряму вказівні займенники, деякі обставини місця і часу змінюються на наступні:

this	that
these	those
now	then
here	there
today	that day
yesterday	the day before
the day before yesterday	two days before
tomorrow	the next day
the day after tomorrow	two days later
ago	before
next	the next
last (year)	the previous (year)

Непрямі запитання (**Indirect Questions**) мають структуру розповідного речення: з прямим порядком слів.

Загальні запитання замінюються підрядними реченнями із сполучниками **if** або **whether**:

We asked him: "Do you know this
girl?" We asked him **if/(whether)** he knew
that girl.

При відтворенні непрямою мовою *спеціальних запитань* – питальні слова стають сполучними словами:

He asked me: "**Where** do you live?" He asked me **where** I lived.
I asked him: "**Why have you come**
so late?" I asked him **why he had come** so
late.

Наказовий спосіб дієслова при перетворенні на непряму мову наказових речень замінюється **інфінітивом**. Дієслово **to say** замінюється на **to tell, to order**, а при проханні – на **to ask**:

She *said to him*, "**Come** at five
o'clock." She *told him to come* at five
o'clock.
He *said to me*, "**Don't go** there." He *told me not to go* there.
I *said to her*, "Please **give** me a glass
of water." I *asked her to give* me a glass of
water.

Запитання для самоконтролю

1. Що означає узгодження часових форм?
2. В яких реченнях воно застосовується: в головних чи підрядних?
3. В якому випадку застосовують узгодження часових форм: а) якщо присудок підрядного речення вжито в теперішньому часі; б) якщо присудок підрядного речення вжито в минулому часі; в) якщо присудок головного речення вжито в минулому часі.
4. Якою часовою формою замінюється присудок теперішнього часу, необхідний за змістом, у підрядних реченнях при узгодженні?
5. Якою часовою формою замінюються присудки, що вказують на минулу дію (Past Simple, Present Perfect, Past Perfect), у підрядних реченнях при узгодженні?
6. Як утворюються форми Future-in-the-Past та в яких реченнях і коли вони застосовуються?
7. Утворіть форми дієслова *to write* у Future Simple-in-the-Past, Future Continuous-in-the-Past, Future Perfect-in-the-Past, Future Perfect-Continuous-in-the-Past та наведіть для прикладу речення з цими формами.
8. В яких випадках правила узгодження часів не застосовуються?
9. Наведіть приклад речення з непрямою мовою та присудками в теперішньому часі.
10. Порівняйте, які зміни відбуваються в українській мові та в англійській?
11. Як змінюються вказівні займенники, деякі обставини часу та місця?
12. На яке дієслово замінюється *to say to* із займенником перед непрямою мовою?
13. Наведіть приклади перетворення загальних та спеціальних питань з прямої мови на непряму мову. Який порядок слів має бути при цьому в підрядних реченнях?
14. Наведіть приклади перетворення речень з наказовим способом дієслова з прямої мови на непряму.
15. Наведіть приклади перетворення прямої мови на непряму мову з узгодженням часових форм.

Завдання для самостійного виконання

7.1.1. Перекладіть речення українською мовою, визначте час присудків і поясніть уживання часових форм:

1. I didn't expect that you would come two days later. 2. The mother was angry with the children because they had been making a terrible noise since early morning. 3. He said that he was there in 1945. 4. They knocked because they didn't know that the children were sleeping then. 5. When she woke up in the morning, she saw that it had already stopped raining. 6. I learnt from this book that elephants never forget.

7.1.2. Поставте присудок головного речення в Past Simple, зробивши всі необхідні зміни в реченні:

1. I can't understand why you are doing this. 2. He doesn't like the shoes he bought last year. 3. I am surprised that you finished the work yesterday. 4. They look at the

picture she has drawn today. 5. She can't tell the time because her watch has stopped. 6. He knows that you have received a letter from Helen. 7. I know you are a person I can trust completely.

7.1.3. Розкрийте дужки, поставивши дієслово у відповідному часі та стані:

1. He posted the letter he (to write) two days before. 2. He said he (to leave) tomorrow morning. 3. I knew they (to wait) for me at the metro station and I decided to hurry. 4. He says that he (to know) the laws of the country. 5. He thought that all his dreams (to come) true very soon, when he finished school. 6. He understood why she (not to come) the previous evening. 7. She promised that she (to answer) all the questions at the conference.

7.2.1. Замініть пряму мову на непряму:

1. "I'm waiting for my parents," Nick said. 2. Mary said, "I didn't recognize him." 3. "I was here with my friends," said Jane. 4. "Do you have a photograph of your son with you?" Helen asked. 5. "You should be careful," my friend said to me. 6. "The Sun isn't a planet, it is a big star," the teacher explained. 7. "Don't make so much noise, will you?" the neighbour said to Pete. 8. "I promise I'll write to you as soon as I arrive, Jane," said Nick. 9. She asked, "Are there skyscrapers in London?" 10. "Why didn't you say that to me?" she asked her boyfriend.

7.3. Що Ви знаєте про екосистеми з уроків біології, екології? Вивчіть нові слова та прочитайте текст "Ecosystems", звертаючи увагу на визначення основних термінів:

ECOSYSTEMS

An ecosystem is the most complex level of organization in nature. It consists of the *biological* and *physical* environments of an area. The biological environment is made up of all living things in the community. The nonliving or physical environment includes climate, air, soil, water, nutrients, energy and weather. All these biological and physical factors interact within an ecosystem. They compose a network of complex relationships that control population growth. Ecologists try to link together many different physical and biological activities in an environment. They study the flow of energy and the cycling of materials through an ecosystem. They generally use powerful computers to help understand the data obtained from field research and to predict future development.

Energy flow. Ecologists categorize the elements that make up or affect an ecosystem into six main parts, based on the flow of energy and nutrients through the system: (1) the sun, (2) abiotic (non-living or physical) substances, (3) primary producers, (4) primary consumers, (5) secondary consumers, and (6) decomposers. A simplified ecosystem is illustrated in this article.

The sun provides the energy that nearly all *primary producers* need to make food. Primary producers consist mainly of green plants, such as grass and trees, which make food by the process of photosynthesis. Plants also need *abiotic substances*, such as phosphorus and water, to grow. *Primary consumers* include mice, rabbits,

grasshoppers, and other plant-eating animals. Foxes, skunks, and other *secondary consumers*—or predators—eat animals. *Decomposers*, such as bacteria and fungi, break down dead plants and animals into simple nutrients. The nutrients go back into the soil and are used again by plants.

The series of stages energy goes through in the form of food is called a *food chain*. In one simple food chain, grass is the primary producer. A primary consumer, such as a rabbit, eats the grass. The rabbit, in turn, may be eaten by a secondary consumer, such as a fox or a hawk. Decomposing bacteria break down the uneaten remains of dead grass, rabbits, foxes, and hawks, as well as animal body wastes.

Most ecosystems have a variety of producers, consumers, and decomposers, which form an overlapping network of food chains called a *food web*. Food webs seem especially complex in many tropical and oceanic ecosystems.

Some species eat many things, but others have very specific food requirements. Such primary consumers as koalas and pandas eat chiefly one type of plant. Koalas eat primarily eucalyptus and pandas eat primarily bamboo. If these plants died off, so would the animals.

Energy moves through an ecosystem in a series of transformations. First, primary producers change the light energy of the sun into chemical energy that is stored in plant *protoplasm* (cell material). Next, primary consumers eat the plants, changing the energy to a different kind of chemical energy that is stored in body cells. This energy changes again when the secondary consumer eats the primary consumer.

Most organisms have a low *ecological efficiency*. This means they are able to convert only a small fraction of the energy available to them into stored chemical energy. For example, green plants can change only about 0.1 to 1 percent of the solar energy that reaches them into plant protoplasm. Most of the energy captured by the plants is burned up during plant growth and escapes into the environment as heat. Similarly, *herbivores* (plant-eating animals) and *carnivores* (meat-eating animals) convert into their own body cells only about 10 to 20 percent of the energy produced by their food.

Because so much energy escapes as heat at each step of the food chain, all ecosystems develop a *pyramid of energy*. Plants (primary producers) form the base of this pyramid. Herbivores (primary consumers) make up the next step, and carnivores (secondary consumers) form the top. The pyramid reflects the fact that more energy passes through the plants than through the herbivores and more through the herbivores than through the carnivores. In many land ecosystems, the pyramid of energy results in a *pyramid of biomass*. This means that the total *biomass* (weight) of the plants is greater than the total weight of the herbivores, which in turn exceeds the total weight of the carnivores. In the oceans, however, the biomass of plants and animals is about the same. Small plants grow so rapidly in the oceans that they can support proportionately more animals than can the plants on land.

Ecologists have collected information on a pyramid of biomass on Isle Royale. They studied the relationship in the pyramid among plants, moose, and wolves. In one study, ecologists found that it takes 762 pounds (346 kilograms) of plant food to support 59 pounds (27 kilograms) of moose. This is the amount of moose needed to support 1 pound (0.45 kilogram) of wolf.

Cycling of materials. All living things are composed of certain chemical elements and compounds. Chief among these are water, carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulphur. All of these materials cycle through ecosystems again and again.

The cycling of phosphorus provides an example of this process. All organisms require phosphorus. Plants take up phosphorus compounds from the soil, and animals get phosphorus from the plants or other animals they eat. Decomposers return phosphorus to the soil after plants and animals die.

Changes in ecosystems occur daily, seasonally, and, as in the case of ecological succession, over periods of many years. Sometimes changes take place abruptly, as when a fire sweeps through a forest or a hurricane batters a seashore. But most of the day-to-day changes, especially in the nutrient cycles, are so subtle that ecosystems tend to appear stable. This apparent stability among plants and animals and their environment has been called the "balance of nature." In the past, this concept of balanced, largely unchanging ecosystems was thought to be especially descriptive of climax communities. But these earlier views were based on short-term studies. Now that ecologists have had an opportunity to study ecosystems over longer periods, they have had to alter some of their ideas. Biologists refer to the relative stability of each population within a community as the *balance of nature*.

Notes: **climax** - клімакс (відносно стабільний стан рослинності чи живих організмів, що знаходяться у рівновазі з навколишнім середовищем)

Vocabulary

1. abruptly	різко, раптово
2. apparent	видимий, явний, очевидний
3. available	доступний
4. batter	руйнувати
5. capture	поглинати, захоплювати
6. chain	ланцюг
7. compound	сполука споживач
8. consumer	
9. convert	переробляти, перетворювати
10. cycling	цикл розвитку, періодичність
11. decompose	розкласти на складові частини, гнити
12. efficiency	ефективність, результативність, продуктивність
13. flow	потік
14. fraction	доля, порція, частина; <i>хім.</i> фракція
15. grasshopper	цвіркун
16. hawk	яструб, сокіл

17.however	однак
18.hurricane	ураган, тропічний циклон
19.nitrogen	азот
20.nutrients	поживні речовини
21.occur	відбуватися, траплятися, мати місце
22.oxygen	кисень
23.pound	фунт (міра ваги = 453,6 г)
24.provide	забезпечувати
25.reach	досягати
26.reflect	відображати, давати відображення
27.require	вимагати, потребувати
28.skunk	скунс
29.stable	стійкий, постійний, стабільний
30.store	запасати, відкладати, зберігати
31.substance	речовина, матерія
32.subtle	тонкий, ніжний, невловимий
33.sulphur	хім. сульфур
34.support	підтримувати
35.sweep	змітати, знищувати
36.web	павутина, сітка, система
37.weight	вага

7.3.1. Знайдіть в тексті абзац, в якому мова йде про “харчовий ланцюжок”. Як ви розумієте це поняття? Наведіть свій приклад “харчового ланцюжка.” Перекладіть письмово цей та попередній абзаци.

7.3.2. З’єднайте слова у словосполучення, опираючись на текст:

simplified	substances
abiotic	of energy
food	ecosystem
decomposing	compounds
climax	stability
phosphorus	chain
Primary	of nature
relative	bacteria
balance	communities
a pyramid	consumers

7.3.3. Складіть речення з поданих слів:

1. Biological, all, physical, and, factors, interact, an, ecosystem, within.
2. Moves, energy, an, ecosystem, in, a, through, of, transformations, series.

3. Organisms, have, a, low, most, efficiency, ecological.
4. Things, are, of, certain, all, living, composed, chemical, elements, and, compounds.
5. Return, to, phosphorus, the, soil, plants, and, animals, die, decomposers.

7.3.4. Підберіть визначення до наступних термінів:

- | | |
|---------------------------|--|
| 1. An ecosystem is | a) a variety of producers, consumers, and decomposers, which form an overlapping network of food chains. |
| 2. A food chain is | b) relative stability of each population within a community. |
| 3. A food web is | c) a series of stages that energy goes through in the form of food. |
| 4. "Balance of nature" is | d) the most complex level of organization in nature which consists of the biological and physical environments of an area. |
| 5. Herbivores | e) are meat-eating animals. |
| 6. Carnivores | f) are plant-eating animals. |

7.3.5. Дайте відповіді на запитання:

1. What does an ecosystem consist of?
2. What things is the biological environment made up?
3. What does the physical environment include?
4. How do ecologists classify the elements that make up an ecosystem? (What are these six main parts?)
5. What is a food web?
6. Describe a series of transformations in which energy moves.
7. What forms the base of a pyramid of energy?
8. Do carnivores form the top of this pyramid?
9. What does a pyramid of biomass mean?
10. What do scientists call the "balance of nature"?

7.3.6. Випишіть із тексту основні хімічні елементи та сполуки, з яких складаються всі живі організми та вивчіть їх.

7.3.7. Прочитайте наступний текст і дайте відповідь на запитання: "What must farmers use to put the phosphorus back into the soil?"

In natural, undisturbed ecosystems, the amount of phosphorus remains fairly constant. But when an ecosystem is disturbed, especially by human activity, the phosphorus often "leaks out." This reduces the ability of the ecosystem to support plants. One way people alter the phosphorus cycle is by replacing forests with farmland. Without the protection of the forests, phosphorus is eroded with the soil and swept away into rivers and lakes. There, it often causes undesirable excess growth of

algae. Eventually, the phosphorus becomes locked in sediments at the bottom of lakes or the sea. Because of this loss of phosphorus, farmers must use costly fertilizers to put the element back into the soil.

Notes: **fairly** – належним чином; досить, деякою мірою; **leak out** – просочуватися; **ability** – здатність; **alter** – змінювати(ся), видозмінювати, вносити зміни; **erode** – зазнавати ерозії, вивітрюватися, вимиватися; **excess** – перевищення, надлишок; надмірний; **algae** – водорості; **lock in** – фіксувати, розмішувати; **sediment** – осад, осадкові відкладання, **bottom** – дно; **costly** – дорогий.

7.3.8. Складіть план тексту “Ecosystems” та перекажіть його зміст.

7.3.9. Прочитавши текст, дайте відповіді на запитання: 1) What is the best definition of a forest ecosystem? 2) Why Management of forests for sustainability is so important?

Definition of a Forest Ecosystem

A forest ecosystem is the basic ecologic unit in a particular forest that exists as "home" for a community of both native and introduced, classified organisms. A forest ecosystem is named for the primary tree species that form the canopy. It is defined by all the collective living inhabitants of that forest ecosystem that co-exist together in symbiosis to create a unique ecology. In other words, a forest ecosystem is typically associated with land masses covered in trees and those trees are often classified by foresters into forest cover types.

A forest ecosystem community is directly related to species diversity. Generally, you can assume that the more complex the structure, the greater is its species diversity. You should remember that a forest community is much more than just the sum of its trees. A forest is a system that supports interacting units including trees, soil, insects, animals, and man.

How a Forest Ecosystem Matures

Forest ecosystems tend to always be moving toward maturity or into what foresters call a climax forest. This maturing, also called forest succession, of the ecosystem increases diversity up to the point of old age where the system slowly collapses. One forestry example of this is growth of trees and the entire system moving toward an old growth forest. When an ecosystem is exploited and exploitation is maintained or when components of the forest begins to naturally die, then that maturing forest ecosystem goes into declining tree health.

Management of forests for sustainability is desirable when forest diversity is threatened by overuse, resource exploitation, old age and poor management. Forest ecosystems can be disrupted and harmed when not properly sustained. A sustained forest that is certified by a qualified certification programme gives some assurance that the forest is managed to allow maximum diversity while satisfying the manager's environmental and economic demands.

Scientists and foresters have dedicated their entire careers trying to understand even a small part of forest ecosystems. Complex forest ecosystems are extremely diverse, ranging from dry desert shrub land to large temperate rain forests. These natural resource professionals have categorized forest ecosystems in North America by

placing them into forest biomes. Forest biomes are broad categories of natural tree/plant communities.

This is a definition of a forest ecosystem developed by the Convention of Biological Diversity: "A forest ecosystem can be defined at a range of scales. It is a dynamic complex of plant, animal and micro-organism communities and their abiotic environment interacting as a functional unit, where trees are a key component of the system. Humans, with their cultural, economic and environmental needs are an integral part of many forest ecosystems."

A climax community by a more accepted definition is a relatively stable and undisturbed plant community that has evolved through major stages and adapted to its environment. A climax species is a plant species that will remain essentially unchanged in terms of species composition for as long as the site remains undisturbed.

MODULE TEST 3

Завдання для самостійного виконання

1. Choose the correct form of the verb to take:

Somebody ... (have taken/had taken/has taken/took) my book, I can't find it.

2. Choose the right form of the verb:

Roberta was angry at herself because she (was made/has made/had made) a stupid mistake.

3. Choose the right form of the verb:

She looked tired. She (had painted/ have been painting/ had been painting) this room all morning.

4. Choose the right form of the verb:

The book (is translating/ is being translated/ has translated/ has been translating) into Ukrainian at the moment.

5. Write the correct form of the verb to build:

A new building of our University ... 2 years ago.

6. Choose the right form of the verb:

The house ... (had built/has been built/had been built) by the end of the last year.

7. Choose the right answer:

He tried very hard but he ... write a poem.

A could C couldn't
B ought to D will be able to

8. Choose the right form of the verb:

He told me that he (was sent/ has been sent/had been sent) to school at the age of five.

9. Choose the right answer:

You ... use a mobile phone on a plane.

A may C can
B mustn't D can't

10. Choose the correct form of the verb:

I was told that he ... (went/has gone/had gone) five minutes ago.

11. Choose synonym to the underlined word temperate:

abundant purified moderate additional

12. Choose a suitable word:

Forest Ecology is the scientific study of the interrelated patterns, processes, flora, fauna and ... in forests.

deciduous / hardwoods / ecosystems / broadleaved trees

13. Which word doesn't belong in the group?

A oak C alder
B beech D spruce

14. Complete the sentence

... , the most widespread construction material, has become a universal material of great importance. It is used for manufacture of furniture, tools, musical instruments.

grass timber plastics leaves

15. Complete the sentence:

Ecologists study the organization of the natural world on three main levels: (1) populations, (2) ... , and (3) ecosystems.

16. Complete the sentence with a suitable word:

A population is a group of the same ... that lives in an area at the same time.

insects hardwoods
species coniferous

17. Choose the synonym to the word *broadleaved*:

mixed coniferous deciduous softwood

18. Complete the following sentence with the suitable word:

A community is a group of ... and plant populations living together in the same environment.

19. Complete the following sentence with the suitable word:

... consists of the *biological* and *physical* environments of an area.

20. Read the passage and choose the words that best complete the sentences

diversity unit native ecosystem inhabitants

Forest Ecosystem

A forest ecosystem is the basic ecologic (1) _____ in a particular forest that exists as "home" for a community of both (2) _____ and introduced, classified organisms. A forest (3) _____ is named for the primary tree species that form the canopy. It is defined by all the collective living (4) _____ of that forest ecosystem that co-exist together in symbiosis to create a unique ecology. In other words, a forest ecosystem is typically associated with land masses covered in trees and those trees are often classified by foresters into forest cover types. A forest ecosystem community is directly related to species (5) _____.

Запитання для самоконтролю

1. What does ecology deal with?
2. What three main levels of the natural world do ecologists study?
3. Why is the study of ecology so important for our survival and well-being?
4. What does the size of any population depend on?

5. What factors change the population?
6. What does an ecological niche of a species include?
7. How do changes in communities occur?
8. What is applied ecology concerned with?
9. What problems does this science solve?
10. Do the ecologists' activities conflict with people's economic interests?
11. What do people have to do so they can live in greater harmony with the world?
12. What does an ecosystem consist of?
13. What things is the biological environment made up of?
14. What does the physical environment include?
15. How do ecologists classify the elements that make up an ecosystem?
16. What is a food web?
17. Describe a series of transformations of energy.
18. What forms the base of a pyramid of energy?
19. Do carnivores form the top of this pyramid?
20. What does a pyramid of biomass mean?
21. What do scientists call the "balance of nature"?

Grammar Revision

1. Наведіть приклади речень з формами Present Simple у пасивному стані.
2. З чого складається форма дієслова-присудка у пасивному стані?
3. Як утворюється форма простих часів у пасивному стані?
4. Наведіть приклади речень з формами Future Simple у пасивному стані.
5. Утворіть питальні та заперечні форми до прикладів стверджувальних речень з присудками в Past Simple пасивного стану.
6. З якими обставинами часу вживаються Present і Past Continuous?
7. Скільки часових форм має група Continuous пасивного стану?
8. Як утворюються часові форми групи Perfect у пасивному стані?
9. З якими "показниками часу" вживається Present Perfect у пасивному стані?
10. Наведіть приклади речень з формами Present Perfect у пасивному стані.
11. З якими обставинами часу вживаються Past і Future Perfect?
12. Після яких модальних дієслів можливе вживання перфектної форми інфінітиву пасивного стану?
13. В яких випадках правила узгодження часів не застосовуються?
14. На яке дієслово замінюється to say to із займенником перед непрямою мовою?
15. Як змінюються вказівні займенники, деякі обставини часу та місця в непрямій мові?
8. Наведіть приклади перетворення загальних та спеціальних питань з прямої мови на непряму мову. Який порядок слів має бути при цьому в підрядних реченнях?
9. Наведіть приклади перетворення речень з наказовим способом дієслова з прямої мови на непряму.
10. Наведіть приклади перетворення прямої мови на непряму мову з узгодженням часових форм.

MODULE IV

UNIT 8

STRUCTURE OF A TREE AND WOOD

8.1 Неособові форми дієслова (Non-Finite Forms of The Verb)

Неособові форми дієслова (non-finite forms of the verb) – інфінітив (the infinitive), герундій (the gerund), дієприкметник (the participle) – не мають граматичних ознак особи, числа і способу, не виражають часу дії, тому не можуть бути присудком речення, а можуть тільки входити до його складу. Вони вказують лише на співвіднесеність у часі дії, що вони виражають, до дії присудка: одночасна вона чи передусє їй.

Герундій (The Gerund)

Герундій - це неособова форма дієслова, що має властивості дієслова та іменника. Як і інфінітив, герундій називає дію: reading — читання, seeing — бачення.

В українській мові немає форми, яка відповідала б герундію. Слова читання, бачення - іменники, що утворились від дієслів, але вони не мають граматичних ознак дієслова. Герундій перекладається іменником, інфінітивом, дієприкметником, дієсловом, підрядним реченням.

Дієслівні властивості

Герундій має такі дієслівні властивості:

- 1) герундій перехідних дієслів вживається з прямим додатком:
I like **reading books**. Я люблю читати книжки.
She began **preparing food**. Вона почала готувати їжу.
- 2) герундій може мати означення, виражене прислівником:
They continued **listening attentively**. Вони продовжували уважно слухати.
- 3) герундій має неозначену й перфектну форми, вживається в активному і пасивному стані.

<u>Форми</u>	<u>Active</u>	<u>Passive</u>
Indefinite	writing	being written
Perfect	having written	having been written

Неозначена форма герундія (Indefinite Gerund) вживається:

а) для вираження дії, одночасної з дією, вираженою дієсловом-присудком речення:

He sat without **turning** his head. Він сидів, не обертаючись,

б) для вираження дії безвідносно до якогось певного часу:

Seeing is believing. Бачити — значить вірити.

в) після дієслів to intend, to suggest, to insist та деяких інших Indefinite Gerund виражає майбутню дію по відношенню до дії, вираженої дієсловом-присудком: He insisted on **telling** her about it. Він наполягав на тому, щоб розказати їй про це.

г) для вираження дії, що передує дії, вираженої дієсловом-присудком, зокрема після дієслів to thank, to forget, to remember, to excuse, to apologize, а також після прийменників on і after:

I **don't remember seeing** her. Я не пам'ятаю, щоб я бачив її.

Перфектна форма герундія (Perfect Gerund) виражає дію, що передує дії, вираженій дієсловом-присудком речення:

Thank you for **having helped** me. Спасибі, що допомогли мені.

Герундій вживається в пасивному стані, якщо іменник чи займенник, до якого він відноситься, позначає об'єкт вираженої ним дії:

He does not come without **being invited**. Він не приходить, якщо його не запрошують.

She remembers **having been shown** this article. Вона пам'ятає, що їй показували цю статтю.

Функції герундія в реченні.

Герундій у реченні може виконувати такі властиві іменнику синтаксичні функції:

1) підмета:

Smoking is harmful. Курити - шкідливо.

2) предикатива:

His hobby is **collecting** stamps. Його улюблене заняття - колекціонувати поштові марки.

3) додатка (прямого і прийменникового):

Forgive my **saying** it. Пробач мені те, що я сказав.

She is fond of **painting**. Вона любить малювати.

4) обставини (мети, причини, умови, часу, способу дії):

She improved the text **by changing** a few sentences.

Вона покращила текст, замінивши декілька речень.

They never obtain high yields **without applying** fertilizers.

Вони ніколи не отримують високих врожаїв, не застосовуючи добрив.

Вживання

1) Після дієслів: to avoid, to finish, to suggest, cannot help, to enjoy, to excuse, to forgive, to postpone, to delay, to mind, та ін. - вживається тільки герундій (з усіх неособових форм дієслова):

We finished **dressing**. Ми закінчили одягатися.

2) Після дієслів та дієслівних словосполучень з прийменниками: to leave off, to give up, to go on, to keep on, to put off, to insist on, to agree to, to prevent from, to thank for, to be busy in, to be capable of, to be fond of, to be proud of, to be surprised at, та ін.:

Mary left off **ironing**. Мері перестала прасувати.

Fancy **going** for a walk in such weather. Уявіть собі прогулянку в таку погоду.

3) Після прикметників **worth** та **busy** (з дієсловом to be):

These fertilizers **are worth buying**. Ці добрива варто купити.
 Yesterday he **was busy working** in the garden. Вчора він був зайнятий роботою в саду.

4) Герундій або інфінітив вживається після таких дієслів, як: to begin, to start, to continue, to propose, to like, to try, to refuse, to intend, to forget, to remember, to prefer:

The children **began playing**. = The children **began to play**.

Комплекс з герундієм

Перша частина герундіального комплексу — іменник у присвійному чи загальному відмінку або присвійний займенник. Друга частина — герундій, що виражає дію, яку виконує чи зазнає особа або предмет, позначений першою частиною комплексу. Такий зворот часто перекладається підрядним реченням, де займенник чи іменник є підметом, а герундій - присудком:

I don't like **him going** here. Мені не подобається, що він іде туди.

I remember **his friend taking part** in the conference. Я пам'ятаю, що його друг брав участь у конференції.

They told us about **his coming** here. Вони сказали нам про те, що він приходив сюди.

8.2 Перфектний дієприкметник (Perfect Participle)

Perfect Participle має дві форми — активного та пасивного стану. Форма активного стану утворюється за допомогою Present Participle допоміжного дієслова to have і Past Participle основного дієслова: **having asked**.

Форма пасивного стану Perfect Participle утворюється за допомогою having been і Past Participle основного дієслова: **having been asked**. Неперехідні дієслова не мають форми пасивного стану (напр. to go):

Форми	Active	Passive
Indefinite	asking going	being asked
Perfect	having asked having gone	having been asked

Значення та вживання

Perfect Participle виражає дію, яка передує дії, вираженій дієсловом-присудком. Perfect Participle відповідає українському прислівнику доконаного виду:

Having learned about it, they stopped speaking. Дізнавшись про це, вони припинили розмову.

Perfect Participle Active вживається тоді, коли іменник чи займенник, до якого він відноситься, означає суб'єкт вираженої ним дії:

Having taken the book, he left the library. Взявши книгу, він вийшов з бібліотеки.

Perfect Participle Passive вживається тоді, коли іменник чи займенник, до якого він відноситься, означає об'єкт вираженої ним дії:

Having been invited to a party, she could not stay at home. Оскільки її запросили на вечірку, вона не змогла залишитися вдома.

Незалежний дієприкметниковий зворот (The Absolute Participle Complex)

Незалежний дієприкметниковий зворот (НДЗ) складається з дієприкметника, перед яким стоїть іменник у загальному відмінку або займенник у називному відмінку. НДЗ завжди відокремлюється від головного речення комою.

Коли НДЗ стоїть на початку речення, він перекладається **підрядним** реченням обставини за допомогою сполучників “коли”; “після того, як”; “тому що”; “через те, що”; “оскільки”; “якщо”:

The rain having stopped, we went out. Коли (після того, як) дощ ущух, ми вийшли з дому.

Weather permitting, we'll go for a walk. **Якщо** погода дозволить, ми підемо на прогулянку.

The professor being ill, the lecture was put off. **Оскільки** професор був хворим, лекцію відстрочили.

Коли НДЗ стоїть після головного речення, він перекладається **сурядним** реченням за допомогою сполучників “і”; “а”; “при цьому”; “до того ж” або без сполучника:

Farmers grow a lot of grain crops in our country, **wheat being the most important**. Фермери вирощують багато зернових, при чому пшениця є найважливішою.

They went quickly out of the house, **he accompanying her to the station**. Вони швидко вийшли з дому і він провів її до вокзалу.

Запитання для самоконтролю

1. Назвіть неособові форми дієслова англійської мови.
2. Чому вони не можуть бути присудком?
3. Властивості яких частин мови має герундій? Як можна його перекласти українською мовою?
4. Які дієслівні властивості має герундій?
5. Назвіть форми активного та пасивного стану герундія.
6. Розкажіть про функції герундія у реченні. Наведіть приклади.
7. Після яких дієслів вживання герундія є обов'язковим?
8. З яких частин мови складається герундіальний комплекс? Як правильно його перекласти українською?
9. Назвіть складні форми дієприкметника, утворених, наприклад, від дієслова to write.
10. Згадайте, які функції в реченні можуть виконувати Participle I і Participle II?
11. Як правильно перекласти українською Perfect Participle?
12. З яких частин мови складається незалежний дієприкметниковий зворот? Розкажіть про способи його перекладу.

Завдання для самостійного виконання

8.1.1. Из поданих нижче неособових форм випишіть форми Gerund: to have looked, to be looking, being looked, having looked, to have been looking; having written, to be written, to have been written, to have been writing, having been written; translating, having translated, being translated, to be translated, to have been translated

8.1.2. Перекладіть фрази з формами герундія. Визначте функції яких членів речення вони виконують:

1. Seeing and doing are two different things. 2. He likes driving a car. 3. There are many ways of doing it. 4. He stood without noticing anyone. 5. It's no good to swim after eating. 6. They began writing their exam tests. 7. He enjoys reading newspapers.

8.1.3. В якому з речень вжито форму герундія?

1. Bob and Ann are playing tennis. 2. I heard some surprising news.
3. Walking is good exercise. 4. Reading her newspaper, she fell asleep.
5. The applying of these fertilisers will not cost much money.

8.1.4. Перекладіть на українську мову, звертаючи увагу на функцію герундія в реченні та його форму:

1. He tried to avoid answering my questions.
2. My greatest pleasure remains travelling.
3. The manager has finished dictating a text to her secretary.
4. They objected to applying this method.
5. What is worth doing is worth doing well.
6. Instead of translating the article himself, he asked his friend to do it.
7. She left without saying a word.

8.1.5. Напишіть правильну форму дієслова (інфінітив чи герундій):

1. Do you remember (meet) her last year?
2. I regret (not visit) her when she was ill.
3. Do you want to go on (learn) English?
4. He's stopped (smoke).
5. He stopped (rest) for a few minutes.
6. I like (watch) TV in the evenings.
7. Do you think this book is worth (read)?
8. I can't help (worry) about it.
9. I managed (find) a taxi.
10. She suggested (go) to a movie.
11. They can't afford (buy) this car.

8.1.6. Складіть речення, користуючись таблицею:

1. Thank you for	seeing my parents next week.
2. I'm thinking of	disturbing you.

3. How about	dancing and singing.
4. I apologise for	telling me the truth.
5. I'm tired of	understanding this.
6. She's very good at	going to the cinema tonight?
7. He's not capable of	answering that child's questions.

8.1.7. Перефразуйте за зразком складнопідрядні речення, вживаючи герундій:

After he graduated from our university, he worked on a farm. — After graduating from our university, he worked on a farm.

1. After they passed their exams, they went to the Crimea.
2. Before we moved to this town we lived in Kyiv.
3. After she wrote the letter, she went to the post-office.
4. Before we changed conditions of the experiment, we had checked the temperature.
5. We met him after we walked about two miles.

8.1.8. Переробіть речення з герундієм на ідентичні з інфінітивом, вживаючи безособовий зворот, і навпаки:

1. *Finding their house wasn't difficult. - It wasn't difficult to find their house.*
2. Voting in every election is important.
3. It was exciting to meet the king and queen.
4. Hearing the other side of the story would be interesting.
5. It is unusual to see Joan awake early in the morning.
6. If you know how, it is easy to float in water for a long time.

8.2.1. Из поданих нижче неособових форм випишіть форми Participle I:

answering, being answered, having answered, to have answered, to have been answered; taken, being taken, to be taken, to take, having taken, having been taken, taking.

8.2.2. Перекладіть фрази з формами Participle. Функції яких членів речення вони виконують?

1. A person bringing good news is always welcome.
2. When writing a telegram use few words.
3. We saw a trembling dog.
4. Having read the book he gave it to me.
5. Having finished with their meal, they went for a walk.
6. Having looked through the text and having okayed it, he gave it to the secretary.
7. When reading the book I remembered my childhood.

8.2.3. В якому з речень вжито Perfect Participle?

1. While reading an interesting English story she used a dictionary.
2. Entering the room we found nobody there.
3. He looked through the newspaper received this morning.
4. Having cleaned the room they went shopping.
5. The contract signed last year is useful for both sides

8.2.4. Прочитайте та перекладіть українською:

1. Having finished the experiment, he described its results in his article.

2. Having solved many scientific and technical problems, our scientists could launch the first spaceship in outer space.
3. Having travelled about the country nearly two months, he returned to the capital.
4. The questions now being discussed at the meeting are very important.
5. Having collected all the material, she was able to write her report to the conference.
6. Having been sent to the wrong address, the letter didn't reach them.
7. Yesterday the professor told us about the experiments now being carried on in his laboratory.

8.2.5. Прочитайте та перекладіть українською речення з незалежним дієприкметниковим зворотом:

1. Many agricultural processes having been mechanized, the work of the farmers became much easier.
2. The amount of fresh water being small, we must use fresh water efficiently.
3. Rain falling to the land, soil erodes.
4. There are several combine-harvesters on this farm, five of them being new.
5. The gas being compressed, the number of molecules in each cubic centi- meter is increased.
6. The sun having risen, they continued their work.
7. It being Sunday, the post-office was closed.

8.2.6. В якому реченні незалежний дієприкметниковий зворот слід перекласти підрядним реченням зі сполучником «після того як»?

1. This crop being used for different purposes, man cultivates it all over the world.
2. Water covers nearly three fourths of the Earth, most being sea water.
3. The distribution of water on our planet varying greatly, some places get too much water or too little.
4. The experiments having been carried out, they started new investigations.
5. The bridge being destroyed, we couldn't cross the river.

8.2.7. Заповніть пропуски необхідною формою дієслова:

1. Avoid ... (to overeat) and you'll feel better soon.
2. I can't help ... (to think) about that awful accident.
3. He enjoys ... (to listen) to classical music.
4. I don't mind ... (to help) you. What do you want?
5. I'm tired of ... (to go) to work by bus every morning.

8.3. Прочитайте текст про структуру дерева та деревини стовбура. Виконайте вправи після тексту

STRUCTURE OF A TREE AND TRUNK

A tree is a woody plant with a single trunk, unbranched for at least several feet above the ground, and a more or less definite crown. Trees are the largest members of the plant world, ranging in height from 20 to 300 feet or more, according to species and conditions of growth.

A live tree may be divided into three main parts: crown, trunk, and roots. These parts fulfil different functions in its life.

Roots hold the tree in place (serve as anchors for trees); and take up from the soil water with dissolved mineral nutrients needed for the trees' growth.

The trunk serves to convey water and nutrients from the roots to the crown.

Crown has much to do with the reproduction of trees. It consists of branches and twigs, which bear buds, leaves, flowers, and fruit.

Buds may be of two sorts: 1) lateral ones bearing along the twig (in the axils of the previous season's leaves) and 2) terminal ones appearing at the apex which limit further growth in length for the season.

Leaves are temporary organs, which are concerned chiefly with the manufacture of plant food, respiration, and transpiration. They may be 1) opposite (when they are paired at the same height, on each side of the twig; 2) whorled (when more than 2 leaves are found at the same node; 3) alternate (arranged in spirals about the twig).

Flowers are reproductive organs of the plant.

A fruit may be defined as the seed-bearing organ of a plant.

The fruits of conifers are quite different in structure from those of broad-leaved trees.

Coniferous fruits may be either dry or fleshy. They are divided into 2 classes:

- those which consist of a single seed surrounded by a fleshy aril (f. ex. a fruit of yew) and

- those which are composed of a number of woody, leathery, or fleshy scales each with one or more seeds and arranged about a central axis to form a cone (fruits of pines, spruces, and firs).

The fruits of broad-leaved trees are generally described as a ripened ovary. They are classified as 1) dry fruits, which may be papery, leathery or woody, and 2) fleshy fruits. Typical fruits of some broad-leaved trees are achene of sycamore, double samara of maple, single samara of elm, acorn of oak, nut of hickory, etc.

Parts of a tree trunk.

The following main parts are distinguished in the trunk cross section: approximately in the centre there is a small pith, the main trunk part is occupied by wood (heartwood and sapwood) which is covered with bark. On the border between wood and bark there is a very thin layer of cambium. Cambium performs a very important function in a live tree, conditioning the increment of wood and bark in thickness. Bark protects the wood from external effects, i.e. sharp temperature variations, mechanical and other injuries. The inner layer of bark conducts organic nutrients, which are produced in crown leaves, downward along the tree.

Vocabulary

1. alive	живий
2. to divide	поділяти
3. crown	крона
4. trunk	стовбур
5. root	корінь
6. to fulfil	виконувати

7. to take up	вбирати
8. dissolved	розчинені
9. needed	потрібні
10.growth	ріст
11.to serve	служити
12.to convey	проводити
13.to consist of	складатись з
14.branch	гілка
15.twig	пагін, гілочка
16.bud	брунька
17.leaf (leaves)	листок (листя)
18.fruits	плоди
19.lateral (leaves)	бічні
20.terminal (leaves)	верхівкові
21.to appear	з'являтись
22.further	подальший
23.length	довжина
24.temporary	тимчасовий
25.manufacture	утворення
26.respiration	дихання
27.transpiration	випаровування
28.seed-bearing	насіненосний
29.conifers	хвойні (дерева)
30.broad-leaved	(широко)листяні
31.fleshy	м'ясистий
32.number	число, кількість
33.leathery	шкірястий
34.scale	лусочка
35.arranged	розташований
36.axis	вісь
37.cone	шишка
38.pine	сосна
39.spruce	ялина
40.fir	ялиця
41.pith	серцевина
42.wood	деревина
43.bark	кора
44.layer	шар

Словосполучення

1. may be divided (into)	може бути поділений
2. mineral nutrients	мінеральні поживні речовини
3. plant food	поживні речовини рослини
4. reproductive organs	органи розмноження
5. are composed (of)	складаються (з)

Запитання для самоконтролю

1. Are trees the largest members of the plant world?
2. What is the definition of a tree?
3. What are the three main parts of a tree?
4. What are their functions?
5. What does a crown consist of?
6. What are the functions of leaves?
7. What reproductive organs does a plant have?
8. What is the seed-bearing organ of a plant?
9. How are the fruits of broad-leaved trees described?
10. What are the main parts of a tree trunk?

Завдання для самостійного виконання

8.3.1. Знайдіть правильний переклад англійських слів:

roots	бруньки
trunk, stem	пагін, гілочка
buds	коріння
twig	зав'язь
ovary	стовбур

8.3.2. З'єднайте відповідні частини речень:

1. The trunk serves to ...	different in structure from those of broad-leaved trees.
2. A fruit may be defined ...	from external effects.
3. The fruits of conifers are quite ...	convey water and nutrients from the roots to the crown.
4. Bark protects the wood ...	as the seed-bearing organ of a plant.

8.3.3. Перекладіть слова та словосполучення англійською мовою:

поживні речовини рослини, лусочка, тимчасовий, кора, шишка, шар камбія, випаровування, виконувати, серцевина.

8.3.4. Складіть план до тексту та розкажіть тему «Структура дерева та стовбура».

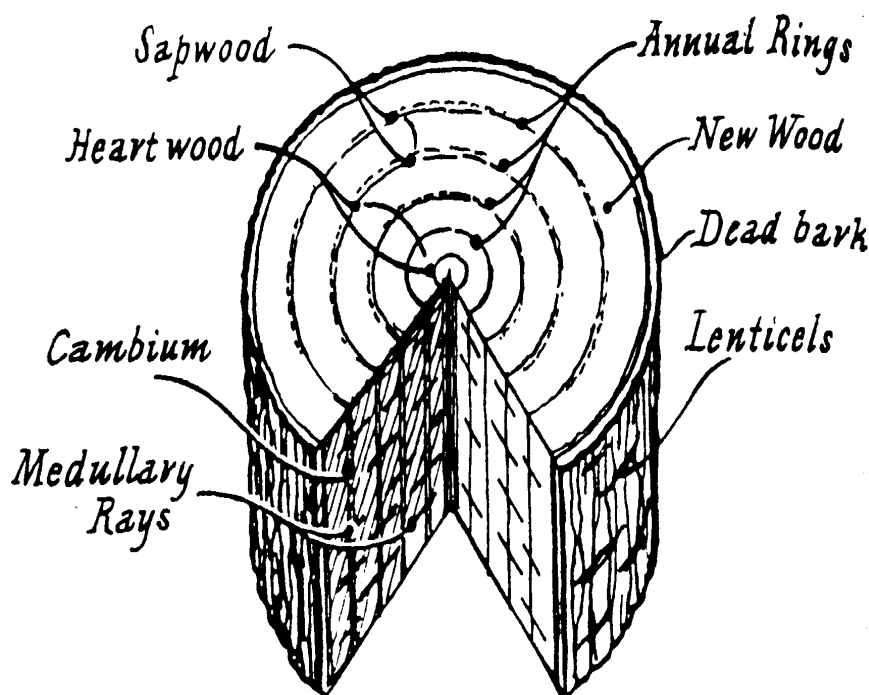
8.3.5. Прочитайте додатковий текст "Structure and Classes of Wood", користуючись словником. Перекажіть його зміст українською або англійською мовою

STRUCTURE OF WOOD

A young stem or root grows in length by new cells formed in its tip. Every spring a new length is added which is at first soft and green. By autumn it has hardened and

generally, a protective layer of cork is formed around the stem. This change is brought about by a tough material called lignin being added to the walls of certain cells. A number of these cells, packed closely together, form wood.

Each year, as a stem grows, a new layer of wood cells is added, making the stem thicker and tougher. This new wood is formed by a special ring of cells called cambium, and as the new cells are rapidly dividing they are soft-walled and delicate. The cambium layer can be seen by stripping a young twig of its bark when the cambium appears as a yellowish-green, slimy surface underneath.



In the spring trees and bushes grow rapidly and the cambium forms large cells to deal with the rise of sap. In the late summer, growth is slower and the wood cells are smaller. Wood formed in the spring is therefore lighter and softer than that formed in the autumn. Together the two layers formed in spring and autumn make up one year's growth and form what is known as an annual (yearly) ring.

These rings can be seen when a tree is cut down and if they are counted the age of the tree can be told. In the Natural History Museum in London, there is a section of a tree trunk with 1,335 annual rings. It is the trunk of a giant redwood tree from California and it started to grow 400 years before William the Conqueror was born.

It is also possible to tell something about what the climate was like in past years by studying the annual rings in the woods. In periods of drought or lack of rain, a tree grows slowly and the rings are close together. Scientists have used this method to study climate and to date the buildings of lost civilizations. Even fossil tree trunks have been used to give information about the climate of long ago.

Bark is also formed every year by cambium but no annual rings are visible. As the tree gets older and bigger the bark cracks and splits, giving the wrinkled appearance which may be seen on most tree trunks.

The diagram shows a cross-section of a trunk. Round the outside are layers of bark and cork and in the middle is a solid core of wood. The centre of this is often darker and harder than the rest and is known as the heartwood. Towards the outside of the trunk, the wood is lighter and often oozes with sap. This is called sapwood and is of little use for timber that needs to be strong.

Running through the wood, from the centre to the bark, what are known as the rays, which are mostly responsible for the lines known as *grain* in wood. In the living tree, they help to bring air into the wood.

UNIT 9 DENDROLOGY

9.1 The Infinitive (Інфінітив)

Інфінітив – це неособова форма дієслова, яка тільки називає дію і відповідає на запитання *що робити?, що зробити?* – **to read** читати; **to understand** розуміти.

В англійській мові інфінітив має одну просту і п'ять складних форм. Інфінітив перехідних дієслів має форми часу й стану, а неперехідних – тільки часу.

Форми інфінітиву	Active	Passive
Indefinite	to write to come	to be written
Continuous	to be writing to be coming	-
Perfect	to have written to have come	to have been written
Perfect Continuous	to have been writing to have been coming	-

Якщо дієслово не вживається в пасивному стані або в формі Continuous, то кількість форм інфінітива відповідно менша.

Ознакою інфінітива в англійській мові є частка **to**. Частка **not** перед інфінітивом вказує на заперечну форму.

Але слід пам'ятати, що в деяких випадках інфінітив вживається без частки to:

- 1) після модальних дієслів (окрім дієслова *ought*);
- 2) в об'єктному інфінітивному звороті після дієслів: **to see, to hear, to feel, to watch, to observe, to notice; to let, to make;**
- 3) після виразів **would rather, would sooner, had better...**

Значення і вживання форм інфінітиву

I. Інфінітив у формі **Indefinite** вживається:

1. Якщо дія, яку він виражає, одночасна з дією, вираженою дієсловом-присудком речення:

I am sorry to hear it. Мені прикро чути це.

He was glad to see them. Він був радий бачити їх.

It will be very interesting to read these books. Буде дуже цікаво прочитати ці книжки.

2. З дієсловами, що вказують намір, надію та ін. Indefinite Infinitive означає дію, майбутню щодо відношення до дії, вираженої дієсловом-присудком:

I hope to see you on Monday.

Я сподіваюсь побачитися з вами в понеділок.

I want to make a report.

Я хочу зробити доповідь.

3. З модальними дієсловами *Indefinite Infinitive* часто виражає майбутню дію:

They may come tomorrow.

Може, вони приїдуть завтра.

II. **Continuous Infinitive** виражає тривалу дію, що відбувається одночасно з дією, вираженою дієсловом-присудком:

It was pleasant to be driving a car again.

Приємно було знову вести автомобіль.

III. **Perfect Infinitive** виражає дію, що передує дії, вираженій дієсловом-присудком:

I was pleased to have done something.

Я була задоволена, що я дещо зробила.

З модальними дієсловами **should, ought, could, might** у стверджувальній формі, а також після **was/were** в модальному значенні Perfect Infinitive показує, що дія не відбулася:

He should have stayed at home.

Йому слід було залишитися вдома (але він не залишився).

He was to have done it.

Він мав зробити це (але не зробив).

Таке саме значення має *Perfect Infinitive* після минулого часу дієслів **to expect** сподіватися, чекати; **to hope** надіятися; **to intend** мати намір та ін.:

I hoped to have found him at home.

Я сподівався застати його вдома (але не застав).

IV. **Perfect Continuous Infinitive** виражає тривалу дію, що відбувалася протягом певного часу перед дією, вираженою дієсловом-присудком:

I am happy to have been living in Kyiv for 25 years.

Я щасливий, що 25 років живу в Києві.

V. Інфінітив вживається в активному стані, якщо іменник або займенник, до якого він відноситься, означає суб'єкт дії, вираженої інфінітивом:

But they don't want to play with me.

Але вони не хочуть гратися зі мною.

Інфінітив вживається в пасивному стані, якщо іменник або займенник, до якого він відноситься, означає об'єкт дії, вираженої інфінітивом:

She didn't want to be found.

Вона не хотіла, щоб її знашли.

VI. Інфінітив також вживається:

1. Після таких дієслів, як: *advise, afford, agree, appear, attempt, decide, dare, forget, fail, expect, hope, manage, offer, plan, pretend, promise, refuse, seem, tend, threaten, want, etc.*

e.g. He refused to answer my questions.

I hope to see you again soon.

He promised not to be late.

We managed to visit a lot of interesting places there.

I have no desire to go there

Інфінітивні конструкції

Складний підмет (Суб'єктний інфінітивний комплекс)

Інфінітив вживається в суб'єктному інфінітивному звороті – **Complex Subject** - ("складний підмет"), де іменник чи займенник стоїть в загальному відмінку:

а) після таких дієслів в пасивному стані, як: *say, report, think, believe, expect, consider, suppose, see, hear, feel, notice, observe, watch, order, allow, permit, etc.*

e. g. Mark was seen to cross the street. Бачили, як Марк переходив вулицю.

He was made to do it. Його примусили це зробити.

The Moon is known to be the Earth's satellite. Відомо, що Місяць - супутник Землі.

He is known to be a good poet. Кажуть, що він хороший поет.

б) після наступних дієслів в активному стані: *seem, appear (здаватися), happen, chance (тратитися), turn out, prove (виявлятися)*:

e.g. They seemed not to listen to their teacher.

Здавалося, що вони не слухали свого вчителя.

He appears to be a good psychologist.

Здається, він хороший психолог.

в) після словосполучень *to be sure, to be certain, to be likely, to be unlikely*:

e. g. They are likely to meet often.

Вони, мабуть, часто зустрічатимуться.

He is unlikely to change his mind.

Несхоже, щоб він передумав.

They are sure to win the match.

Вони обов'язково виграють цей матч.

Складний додаток (Об'єктний інфінітивний комплекс)

Інфінітив вживається в конструкції: Verb + Pro(noun) + Infinitive – в об'єктному інфінітивному звороті (**Complex Object**), де додатком (object) є іменник у загальному відмінку або особовий займенник в об'єктному відмінку, після якого вживається інфінітив, що виражає дію, яку виконує або якої зазнає особа чи предмет, позначений цим іменником або займенником.

Цей об'єктний інфінітивний зворот (Complex Object) вживається:

1) після дієслів: *consider, believe, think, find, know, expect, suppose, want, wish, desire, like, would like, dislike, hate, intend, request, ask (просити), allow, permit, recommend, cause, force, make (примушувати), let (веліти, дозволяти)*:

e. g. Mr. Lee expected them to be here at ten o'clock.

The police ordered the driver (him) to stop.

2) після дієслів to make, to let, to see, to hear, to feel, to watch, to observe, to notice – частка **to** перед інфінітивом не вживається:

e. g. I saw Mark cross the street. Я бачив, як він переходив вулицю.

They made him do it. Його примусили це зробити.

Об'єктний інфінітивний зворот перекладається на українську мову здебільшого підрядним додатковим реченням, де іменник чи займенник відповідає підмету, а інфінітив – присудку цього підрядного речення.

For+ Інфінітив

Інфінітив вживається також в прийменниковому інфінітивному комплексі – в конструкції “for + noun/pronoun + infinitive” (де займенник вживається в об’єктному відмінку):

e. g. They asked for the data (them) to be published.

Вони просили, щоб ці данні були опубліковані.

For this work to be done successfully conditions must be favourable.

Для того щоб ця робота була виконана успішно, необхідні сприятливі умови.

Цей інфінітивний зворот може знаходитися в будь-якій частині речення. На українську мову частіше за все перекладається підрядним реченням з сполучником "щоб/для того щоб".

Функції інфінітива в реченні

1. Інфінітив може вживатися в реченні в ролі підмета:

e. g. To apply fertilizers is very important for growing crops in this region.

Вносити добрива (внесення добрив) – дуже важливо для вирощування врожаїв в цьому регіоні.

2. Інфінітив може вживатися в ролі предикатива (іменної частини складного присудка):

e. g. The point is to achieve the aim. Головне – досягти мети.

3. Інфінітив може вживатися в ролі частини дієслівного складного присудка:

а) з модальними дієсловами:

e. g. They must do it at once.

б) з дієсловами, що вживаються з інфінітивом іншого дієслова (to want, to wish, to try, to intend, to expect, to hope та ін.):

e. g. He wants to read a newspaper.

в) з дієсловами, що означають початок або продовження дії (to begin, to start, to continue та ін.):

e. g. She began to look through the journals on her speciality.

4. Інфінітив може вживатися в ролі додатка до дієслів та прикметників:

e. g. She asked me to speak loudly.

I'll be happy to accept your invitation.

5. Інфінітив може вживатися як обставина мети:

e.g. We often use heating (in order) to increase the reaction rate.

Ми часто використовуємо нагрівання для того, щоб підвищити швидкість реакції.

e. g. To open the door he must have an extra key.

Для того щоб відчинити двері, у нього повинен бути запасний ключ.

6. Інфінітив також вживається як означення:

e.g. He described some phenomena to be observed there only in winter.

Він описав деякі явища, які можна спостерігати тільки взимку.

Запитання для самоконтролю

1. Назвіть складні форми інфінітиву (на прикладі дієслова to read).

2. В яких випадках інфінітив вживається без частки to?

3. Після яких дієслів обов'язкове вживання інфінітиву?
4. Яка конструкція об'єктного інфінітивного звороту (Complex Object)?
5. Після яких дієслів в Complex Object інфінітив вживається без частки to?
6. Наведіть приклад речення з суб'єктним інфінітивним зворотом?
7. Після яких дієслів в пасивному стані вживається інфінітив? Наведіть приклади.
8. Після яких дієслів в активному стані вживається інфінітив? Наведіть приклади.
9. Наведіть приклади речень з конструкцією "for + noun/pronoun + infinitive". В якому відмінку вживається займенник?
10. Які функції інфінітив виконує в реченні?

Завдання для самостійного виконання

9.1.1. Перекладіть українською, звертаючи увагу на форму інфінітиву:

1. She wants to be invited to the party.
2. They must be working in the garden.
3. We expect them to have returned.
4. She is said to have been working at school for many years.

9.1.2. Поставте дієслова у відповідній формі інфінітиву. Перекладіть речення українською:

1. This film turned out (show) ... in our club last month.
2. He is expected (take part) ... in the conference next week.
3. Pluto is known (discover) ... in 1930.
4. We expect them (return) ... in 2 days.
5. This question is likely (discuss) ... tomorrow.
6. We know this phenomenon (explain) ... by astronomers in the distant past.

9.1.3. Поставте частку to перед інфінітивом там, де це необхідно:

1. I think you ought ... apologize.
2. Make him ... speak louder.
3. Help me ... carry this bag.
4. My son asked me ... let him ... go to the theatre.
5. I must ... go to the country.
6. He said that she might ... come in the evening.
7. She was made ... repeat the song.

9.1.4. Прочитайте та перекладіть наступні речення з об'єктним інфінітивним комплексом. Зверніть увагу на вживання або відсутність частки to перед інфінітивом:

1. We expected her to return.
2. He allowed me to use his car.
3. I expect you to be on time.
4. The doctor told me to take these pills.
5. I want you to be happy.
6. I saw my friend run down the street.
7. I heard the rain fall on the roof.
8. I heard a famous opera star sing at the concert last night.

9. She watched the children play in the yard.
10. His parents intended him to go with them to the farm.

9.1.5. Доповніть речення, поставивши, де необхідно, частку to перед інфінітивом та займенники в об'єктному відмінку:

1. The teacher made ... (he/ to learn) the poem by heart.
2. I wanted ... (they/ to work) here.
3. They expect ... (we/ to answer) the letter at once.
4. You noticed ... (she/ to approach) the river.
5. I heard ... (he/ to read) it aloud.
6. His parents want ... (he/ to become) an agronomist.
7. We watched ... (they/ to play) in the yard.
8. You forced ... (he/ to do) the exercise again.
9. I let ... (she/ to leave) the room.
10. The rain made ... (we/ to go) home.

9.1.6. Перефразуйте наступні складнопідрядні речення в прості, вживаючи Complex Subject (суб'єктний інфінітивний зворот). Зверніть увагу на форму інфінітиву:

e.g. It is reported that the delegation arrived in Paris on the 10th of September. –
The delegation is reported to have arrived on the 10th of September.

1. It is known that he works hard.
2. It is said that she has been teaching chemistry at our University for thirty years.
3. It seems that our students are working in the field.
4. It is believed that this house was built in the 19th century.
5. It is supposed that his article will be published next week.
6. It turned out that the translation was very difficult.
7. It was supposed that the weather would be fine in May.

9.1.7. Перекладіть речення українською мовою та визначте функцію інфінітиву:

a) 1. To explore that small island was the chief aim of our expedition. 2. The expedition is to explore that island in summer. 3. The chief aim of the expedition was to explore that island. 4. The expedition began to explore this island in spring. 5. These plants are to be found only in the south of our country. 6. They decided to discuss this question at the next meeting. 7. Here is the article to be discussed today. 8. This method is good enough to be used in our work.

b) 1. Everyone had a wish to say something. 2. He decided to go alone. 3. We must work hard to live. 4. The question must be answered. 5. It was difficult to believe. 6. This is my bench, and you have no right to take it away from me. 7. Nothing could be done before morning.

9.1.8. Складіть по п'ять речень з кожної таблиці:

He	is	reported	to know this language.
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She	are	said	to be interested in chemistry.
You	was	expected	to have entered the University.
They	were	supposed	to have arrived in Kyiv.
We		known	to have been teaching for five years.

They	seem(s)		to understand spoken English.
He	appeared		to have recognized me.
She	happened		to play volley-ball very well.
We	proved		to know the city very well.
	chanced		to meet them at the exhibition.

9.1.9. Поставте дієслова, що в дужках у формі інфінітиву (з часткою to чи без) та перекладіть речення українською мовою:

1. I am writing ... (invite) you to my birthday party next Sunday.
2. Could I ... (ask) you ... (help) me with the preparations?
3. Please write back soon and let me ... (know) if you can make it.
4. We had better ... (hurry up) if we want to get there before dark.
5. I expect you ... (pass) the test.
6. I was advised ... (buy) a flat.
7. We're going out for dinner. Would you like ... (join) us?
8. Fred didn't have any money, so he decided ... (find) a job.
9. We want him ... (speak) about his experiments at the conference.
10. They don't let me ... (play) music loud.
11. My parents make me ... (study) hard.
12. She advised me ... (wait) a little.

9.2. Прочитайте текст про класифікацію рослин з погляду такої науки, як дендрологія. Виконайте вправи після тексту

DENDROLOGY

Literally “dendrology” means “the study of trees”, but the term has been variously defined and now it signifies the taxonomy of woody plants including trees, shrubs and vines. Taxonomy is concerned with the classification, nomenclature and identification of natural objects. Besides the taxonomy of woody plants, dendrology includes tree habits morphology, ecology and geographical ranges of forest trees.

Woody plants differ from herbaceous plants in having an aerial stem, which persists for more than one season, and in most cases, a cambium layer for periodic growth in diameter.

A tree may be defined as woody plant with a single trunk, unbranched for at least several feet above the ground, and with a more or less definite crown. Trees are the largest plants in the world.

Shrubs, in contrast, are smaller and usually have several erect, spreading stems and a general bushy appearance.

Woody lianas are climbing vines; plants of this sort are extremely numerous in the rain-drenched forests of the tropics, although a few species such as wild grape, the moonseed, and the Virginia creeper are indigenous to temperate regions.

Botanical classification places forest trees into two large groups: gymnosperms and angiosperms. The criterion most frequently used for separating them is the presence in the angiosperms of an ovary, which encloses the ovules.

The gymnosperms, in contrast, exhibit a naked seed, which is commonly subtended by a scale. The gymnosperms consist exclusively of trees and woody shrubs, whereas the angiosperms include trees and shrubs as well as grasses and herbaceous plants.

Vocabulary

define v	визначати
habit n	властивість, особливість
habitat n	місце проживання, місце розповсюдження, ареал
taxonomy n	систематика, класифікація
vine n	повзуча, в'юнка або така, що стелеться рослина
nomenclature n	термінологія
herbaceous plants	трав'янисті рослини
aerial stem	надземний стовбур
persist v	залишатися, продовжувати існувати
layer n	шар
exhibit v	виставляти напоказ
climb v	витися (про рослини)
creeper n	повзуча рослина
moonseed n	канадський плющ
indigenous adj	місцевий, аборигенний
gymnosperms n (pl)	голонасінні
angiosperms n (pl)	покритонасінні
ovary n	зав'язь
ovule n	сім'ядоля
juniper n	ялівець
bald cypress	туя, кипарис болотний
alder n	вільха
hemlock n	тсуга канадська
subtend v	стягувати

9.2.1. Дайте відповіді на запитання:

1. What does the term “dendrology” mean?
2. What is taxonomy concerned with?
3. Does dendrology include the study of tree habits and their geographical ranges?
4. What is the definition of trees (shrubs, woody lianas)?
5. What are the main groups of all woody plants?
6. What is the difference between gymnosperms and angiosperms?

7. What characteristic trees of gymnosperms do you know?
8. What groups are angiosperms classified into?

9.2.2. Перекладіть слова та словосполучення, складіть з ними речення:

Rain-drenched (forests), gymnosperm, aerial (stem), taxonomy, wild grape, persist, erect stems, angiosperm, indigenous (plant), creeper, ovary, habit, nomenclature.

9.2.3. Чи правильні наступні ствердження:

1. Literally “dendrology” means “the study of plants”.
2. Taxonomy is concerned with the classification, nomenclature and identification of natural objects.
3. Dendrology doesn't study geographical ranges of forest trees.
4. Herbaceous plants have, in most cases, a cambium layer for periodic growth in diameter.
5. Shrubs are smaller than trees and usually have several erect, spreading stems and a general bushy appearance.
6. Woody lianas are indigenous to temperate regions.
7. Botanical classification places forest trees into 2 large groups: gymnosperms and angiosperms.
8. The angiosperms have an ovary, which encloses the ovules.
9. The angiosperms consist exclusively of trees and woody shrubs.
10. All gymnosperms are evergreen.

9.2.4. Заповніть пропуски наведеними нижче словами:

1. The term “dendrology” has been ... defined and now it ... the taxonomy of woody plants including trees, shrubs, and vines.
2. Dendrology includes tree ... morphology, ecology and geographical ... of forest trees.
3. Woody plants differ from ... plants in having an aerial stem, and in most cases, a ... layer for periodic growth in diameter.
4. A tree is ... plant with a single trunk, unbranched for at least several feet above the ground, and with a more or less ... crown.
5. Shrubs have several ... , spreading stems and a general ... appearance.
6. Woody lianas are ... vines. Wild grape, the moonseed, and the Virginia ... are to temperate regions.
7. The criterion most ... used for separating them is the presence in the angiosperms of an ... , which encloses the ovules.

(ranges, bushy, herbaceous, variously, indigenous, climbing, woody, cambium, habits, definite, signifies, creeper, frequently, erect, ovary)

9.2.5. Доповніть речення:

1. Dendrology means a) the study of herbaceous plants.
b) the taxonomy of woody plants including trees, shrubs, and vines.
c) landscape gardening.

2. Taxonomy is concerned with _____
 - a) the plant physiology and entomology
 - b) the science of wood
 - c) the classification, nomenclature, and identification of natural objects.
3. Dendrology includes _____
 - a) tree habits and ranges
 - b) geology and soil science
 - c) the biological aspects of forestry
4. A tree is a woody plant with _____
 - a) spreading or prostrate stems
 - b) several erect stems
 - c) a single stem, unbranched for at least several feet above the ground, and a more or less definite crown.
5. _____ are the largest members of the plant world
 - a) woody lianas
 - b) shrubs
 - c) trees
6. Woody lianas are extremely numerous _____
 - a) in deserts
 - b) in temperate regions
 - c) in the rain-drenched forests of the tropics
7. All woody plants are divided into _____ large groups.
 - a) 3
 - b) 2
 - c) 4
8. The angiosperms have _____
 - a) a naked seed subtended by a scale
 - b) an ovary which encloses the ovules
 - c) a number of woody, leathery, and fleshy scales

9.2.6. Перекладіть наступну інформацію українською та використайте її у своїх розповідях:

Among the gymnosperms, the most important and numerous forest trees are the coniferous, also known as softwoods. This group includes the well-known pines, spruces, firs, cedars, junipers, hemlocks and sequoias. Except for larches and bald cypress, all gymnosperms are evergreen.

Angiosperms include a large variety of broadleaf trees, most with a deciduous leaf habit but some that are evergreen. The angiosperms, in turn, are divided into monocots (monocotyledonous) and dicots (dicotyledonous).

The monocots include principally the palms and bamboos.

The dicotyledonous broad-leaved species form three characteristic types of forests: temperate deciduous, subtropical evergreen, and tropical evergreen. Characteristic trees of temperate deciduous forests are oaks, beeches, ash trees, elms, alders, and sweet chestnuts.

Typical trees of subtropical evergreen forests are the evergreen oaks, the madrone, species of Eucalyptus, etc.

<i>Notes:</i> monocotyledonous	односім'ядольні рослини
dicotyledonous	двосім'ядольні рослини
madrone n	суничне дерево

9.2.7. Складіть план та напишіть анотацію до тексту «Дендрологія».

9.2.8. Прочитайте текст та перекажіть його.

9.2.9. Прочитайте додатковий текст “Hardwoods and Softwoods”, користуючись словником. Перекажіть його зміст українською або англійською мовою.

HARDWOODS AND SOFTWOODS

The wood of trees can be divided into two classes, the hardwoods and the softwoods. The hardwoods come from trees such as oak, beech, elm, sweet chestnut, willow, walnut and a number of tropical trees such as mahogany and teak.

Each of the hardwoods is different and each has its own special uses. Oak is particularly well known for its strength and long-lasting quality and it has a handsome grain. People in past centuries built their roofs, panelled their rooms and made their furniture of oak, and in old houses this oak work can still be seen. The first ships to sail round the world were made of oak. Today ladders, barrels, gate-posts, mill-wheels and other objects that need to be hard-wearing are made of oak.

Beech is a clean white wood with a tough grain, and chair-legs, handles and broom-backs are generally made of it. Elm, which is very long-lasting and does not split easily, is much used by wheelwrights, boat and coach builders and coffin makers. Walnut is used for cabinetmakers and carving. Mahogany is one of the finest of all hardwoods, with a close grain and good colour.

Softwoods generally come from cone-bearing trees such as pines, firs, spruces, redwoods and larches. They are less hard and tough than the hardwoods. Timber merchants call some softwoods deal; red deal is the wood of the Scots pine and white deal comes from the spruce. Softwoods are easily worked by sharp tools and can be cut into almost any shape by machines. They are largely used in the building trade. Boxes, railway sleepers, telegraph posts, furniture, paper and toys are some of the many things that are made from softwoods.

More than 90% of the timber used today is the softwood kind. This is because softwood trees are much easier to grow than hardwood ones. They grow rapidly, and useful small timber may be cut from them after the first 20 to 30 years. The Forestry Commission has planted large new forests of softwood on some of the poorer mountain soils of Great Britain, and already the landscape in some parts, particularly Scotland, has been changed because of this. Forests of pine and spruce now grow where there were once only barren moorlands.

UNIT 10 PULP AND PAPER INDUSTRY

10.1 Умовний спосіб (The Subjunctive Mood)

Умовний спосіб виражає дію не як реальну, а як таку, що могла б відбутися за певних умов, а також необхідну, бажану або нереальну, нездійсненну.

В англійській мові вживаються чотири форми умовного способу: the Conditional Mood, the Suppositional Mood, Subjunctive I, Subjunctive II.

The Conditional Mood.

3 types of Conditional Sentences (3 типи умовних речень).

Conditional Mood утворюється з допоміжних дієслів *should* або *would*, у другій і третій особах – *would*. За формою Conditional Mood збігається з Future-in-the-Past дійсного способу, але відрізняється від нього за значенням.

Conditional Mood вживається для вираження дії, яка відбулася б за певних умов у теперішньому, минулому або майбутньому часі, але не відбудеться з якихось причин:

If she knew his address (now), she would write to him. Якби вона знала його адресу, вона б написала йому.

Conditional Mood має дві часові форми: present і past.

Present Conditional утворюється з допоміжних дієслів *should* і *would* та інфінітива основного дієслова без частки *to* (збігається з Future Simple-in-the-Past):

I (we) **should/would work**

He (she, it, you, they) **would work**

Present Conditional виражає дію, що за певних умов могла б відбутися в теперішньому або майбутньому часі.

Past Conditional утворюється з допоміжних дієслів *should* і *would* та перфектної форми інфінітива основного дієслова без частки *to* (збігається з Future Perfect-in-the-Past):

I (we) **should/would have worked**

He (she, it, you, they) **would have worked**

Past Conditional виражає дію, що за певних умов могла б відбутися в минулому, але через відсутність цих умов не відбулася.

If she had gone to the library she **would have seen** him.

Якби вона пішла в бібліотеку, вона побачила б його.

У цьому прикладі дії головного і підрядного речень стосуються минулого часу.

У реченнях реальної умови, що стосуються майбутнього часу, в підрядному реченні іноді вживається Suppositional Mood, що надає припущенню меншої імовірності:

If I should find this stamp, I shall buy it. Якщо я все ж таки знайду цю марку (в чому я сумніваюсь), я куплю її.

У реченнях нереальної умови присудок підрядного речення виражає дію, що суперечить дійсності, малоімовірну або й зовсім нездійсненну. На українську

мову речення нереальної умови перекладаються умовним реченням з дієсловом в умовному стані:

If it *were* summer now, we **should bathe in the river.**

Якби зараз було літо, ми купалися б у річці.

If Jack **came** back tomorrow, he **would help** us.

Якби Джек приїхав завтра, він допоміг би нам.

If I *were* ten years younger, I **would enter a Polytechnic Institute.**

Якби я був на десять років молодший, я вступив би до політехнічного інституту.

3 типи умовних речень

I тип	Реальна умова, що відноситься до теперішнього або майбутнього часу	1) If Present Simple; Present Simple. 2) If Present Simple; Future Simple.	If I <u>have</u> enough time, I <u>visit</u> granny every week. If the weather <u>is</u> fine tomorrow, we' <u>ll go</u> to the country.
II тип	Малоймовірна умова, що відноситься до теперішнього або майбутнього часу	If Past Simple; Future-in-the-Past ²	If he <u>were</u> ¹ here, he would help us. If I <u>saw</u> my friend tomorrow, I <u>should ask</u> him about it.
III тип	Нереальна умова, що відносяться до минулого часу	If Past Perfect; would + Perfect Infinitive	If I <u>had seen</u> him yesterday, I <u>should have asked</u> him about it.

Примітка:

¹Дієслово *to be* має форму **were** в 1-ій та 3-ій ос. однини, оскільки вживається у формі Past Subjunctive.

²В умовних реченнях II типу в головному реченні може вживатися сполучення **could** або **might** з Indefinite Infinitive.

Аналогічно, в умовних реченнях III типу в головному реченні може вживатися сполучення **could** або **might** з Perfect Infinitive. На українську перекладається – міг би, могли б з інфінітивом:

He could do it if he tried.

Він міг би це зробитиб якби

He could have done it if he had tried.

постарався.

Умовні речення з дієсловом WISH

Має відношення до майбутнього часу	I wish you <u>would read</u> more in future. I wish we <u>would (could) meet</u> next summer.	Як би мені хотілося, щоб ви читали більше в майбутньому. Як би мені хотілося, щоб ми зустрілися (змогли зустрітися) наступного літа.
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Має відношення до теперішнього часу	I wish I <u>had</u> time. I wish I <u>could speak</u> German.	Шкода, що в мене немає часу. Мені б хотілося розмовляти німецькою.
Має відношення до минулого часу	I wish I <u>had had</u> more time yesterday. I wish you <u>hadn't done</u> this. I wish he <u>had been</u> here then	Шкода, що вчора я мав мало часу. Шкода, що ти це зробив. Шкода, що його тоді тут не було.

Підрядні умовні речення (Adverbial Clauses of Condition) найчастіше з'єднуються з головним реченням за допомогою сполучника **if** *якщо, якби*:

Якщо я побачу цю марку, я куплю її.

У реченнях реальної умови, що стосуються майбутнього часу, в підрядному реченні іноді вживається *Suppositional Mood*, що надає припущенню меншої імовірності:

If I should find this stamp, Якщо я все ж таки знайду цю марку
I shall buy it. (в чому я сумніваюсь), я куплю її.

У реченнях нереальної умови присудок підрядного речення виражає дію, що суперечить дійсності, малоімовірну або й зовсім нездійсненну. На українську мову речення нереальної умови перекладаються умовним реченням з дієсловом в умовному стані:

If it *were* summer now, we **should bathe** in the river.

If Jack **came** back tomorrow, he **would help** us.

If I were ten years younger, **I would enter** a Polytechnic Institute.

Якби зараз було літо, ми купалися б у річці.

Якби Джек приїхав завтра, він допоміг би нам.

Якби я був на десять років молодший, я вступив би до політехнічного інституту.

У реченнях нереальної умови вживається *Conditional Mood* у головному реченні і *Subjunctive II* — в підрядному.

Якщо дія підрядного речення стосується теперішнього або майбутнього часу, в ньому вживається *Present Subjunctive II*, якщо минулого — *Past Subjunctive II*. У головному реченні вживається *Present Conditional*, якщо дія стосується теперішнього або майбутнього часу і *Past Conditional*, якщо дія стосується минулого часу:

What **would** your father **do**
if he heard you say that?

Що зробив би ваш батько,
якби він почув, що ви це кажете?

Тут дія головного і підрядного речень стосується теперішнього часу.

If she had gone to the library, she **would have seen** him.

Якби вона пішла в бібліотеку, вона побачила б його.

У цьому прикладі дії головного і підрядного речень стосуються минулого часу.

10.2 Складнопірядне речення (The Complex Sentence)

Складнопірядне речення складається з головного речення (**the Principal Clause**) і одного або кількох пірядних (**Subordinate Clauses**). Пірядні речення граматично залежать від головного, виконуючи в ньому функцію одного з членів речення. Залежно від цього вони поділяються на підметові, присудкові, додаткові, означальні і обставинні.

Пірядні підметові речення (Subject Clauses) виконують функцію підмета головного речення і приєднуються до головного речення сполучниками **that що, if, whether чи** та сполучними займенниками і прислівниками **who, whom, whose, what, which, where, when, how, why**:

What she wanted was sea air. Що їй було потрібно — це морське повітря.
Which side wins does not concern - Яка з сторін виграє, нас не турбує.
us here.

Пірядне підметове речення може стояти після присудка головного речення. У цьому випадку, на початку речення вживається **it**:

It seemed to him **that all** Йому здавалося, що все буде
would be well. добре.

Пірядні присудкові речення (Predicative Clauses) виконують функцію не всього присудка, а лише іменної частини складеного присудка-предикатива. Вони приєднуються до головного речення сполучниками **that що; if, whether чи; as if, as though наче, ніби; lest щоб не** та сполучними займенниками і прислівниками:

That is **why I have come to** you. Ось чому я прийшов до вас.
That's **what I wanted to ask** you. Ось що я хотів запитати вас.
That's **where the money comes from.** Ось звідки приходять гроші.
His first thought had been Його першою думкою було
that she was ill. те, що вона хвора.
He felt **as if he were merely** У нього було таке відчуття,
coming back from a day-excursion ніби він тільки повертається
to Manchester. з одноденної екскурсії в Манчестер.

Пірядні додаткові речення (Object Clauses) виконують функцію додатка до дієслова або прикметника в головному реченні. Вони приєднуються до головного речення сполучниками **that, if, whether, lest**, сполучними займенниками та прислівниками **who, whose, what, which, where, when, how, why**, а також безсполучниковим способом:

I knew **that you would under** Я знав, що ви зрозумієте мене.
stand me.
I asked **if she saw the lock.** Я запитав, чи вона бачить замок.
We did not know **what had happened.** Ми не знали, що трапилось.
I know **where I left it.** Я знаю, де я залишив його.

Сполучник **that** у додаткових підрядних реченнях часто випускається (особливо в розмовній мові).

They said **they** knew every thing.

Вони сказали, що знають усе.

I thought **you** were his friend.

Я думав, що ви його друг.

He knew **I would come** to see him.

Він знав, що я прийду до нього.

Якщо підрядне додаткове речення залежить від дієслова, що вимагає прийменникового додатка, то відповідний прийменник ставиться перед сполучним займенником або прислівником, який з'єднує підрядне речення з головним:

He was thinking of **what** he would do.

Він думав про те, що він робитиме.

It depends on what you mean.

Це залежить від того, що ви маєте на увазі.

Якщо присудок головного речення стоїть у минулому часі, то присудок підрядного додаткового речення повинен стояти в одному з минулих часів відповідно до правил узгодження часів.

I thought you were asleep.

Я думала, що ти спиш.

I thought you had left Moscow.

Я думав, що ви виїхали з Москви.

I thought he would never come.

Я думав, що він ніколи більше не приїде сюди.

Підрядні додаткові речення можуть відноситися не лише до присудка головного речення, а й до неособових форм дієслова — інфінітива, герундія, дієприкметника:

Seeing **that the baby was** sleepy, mother put it to bed.

Побачивши, що дитина сонна, мати поклала її в ліжко.

Підрядні означальні речення (Attributive Clauses) виконують роль означення до іменника або займенника головного речення і з'єднуються з ним за допомогою сполучних займенників **who, whose, which, that**, сполучними прислівниками where, when, а також безсполучниковим способом:

The woman **who** lives **here** has gone shopping.

Жінка, яка тут живе, пішла в магазин.

The boy whose bicycle I took is my friend.

Хлопець, велосипед якого я брав, мій товариш.

The village **where** he was born has changed very much.

Село, де він народився, дуже змінилося.

There were periods **when** they did not see him for a week at

Бували часи, коли вони не бачили його по тижню. a time.

The boy opened the book **he held in his hand.**

Хлопець розгорнув книжку, яку тримав у руках.

Підрядні означальні речення поділяються на обмежувальні (Limiting), класифікуючі (Classifying) і описові (Descriptive).

Обмежувальне означальне речення уточнює, про який саме предмет іде мова. Іменник, до якого відноситься обмежувальне означальне речення, вживається з означеним артиклем:

The house **in which** we live

Будинок, у якому ми живемо,

is in the centre of the town.

знаходиться в центрі міста.

Підрядне означальне речення **in which we live** — обмежувальне. Воно вказує, про який саме будинок говориться в цьому реченні.

Класифікуюче означальне речення вказує, до якої групи або класу належить предмет, позначений іменником, до якого відноситься підрядне речення. Такий іменник вживається з неозначеним артиклем (у множині — без артикля). Якщо випустити класифікуюче означальне речення, зміст речення міняється або зовсім порушується:

A polygon **which has three sides** is called a triangle.

Многокутник, що має три сторони, називається трикутником.

Тут підрядне означальне речення є класифікуючим — мова йде про підклас многокутників, що мають три сторони. Випущення підрядного речення призвело б до невірної твердження, нібито всякий многокутник є трикутником.

Описове означальне речення містить додаткові відомості про особу або предмет, позначений іменником, до якого відноситься підрядне речення. Якщо таке речення випустити, зміст усього речення не зміниться:

Our institute, **which was founded 150 years ago**, is one of the - oldest educational establishments in Ukraine.

Наш інститут, який був заснований 150 років тому, один - із найстаріших навчальних закладів на Україні.

Без підрядного означального речення зміст висловлювання не змінюється, у ньому нема лише додаткових відомостей (про час заснування інституту), виражених підрядним реченням.

Іменник, до якого відноситься описове підрядне означальне речення, може вживатися з означеним і неозначеним артиклем або без нього за загальними правилами вживання артикля.

В англійській мові обмежувальні і класифікуючі підрядні означальні речення не виділяються комами; описові означальні речення звичайно виділяються комами.

It was raining all day long,

Весь день ішов дощ, що нам

which we did not like at all.

зовсім не подобалось.

Підрядні обставинні речення (Adverbial Clauses) виконують функцію різних обставин головного речення і поділяються на підрядні речення часу, місця, причини, наслідку, мети, способу дії, а також умовні та допустові речення.

Підрядні речення часу (Adverbial Clauses of Time) з'єднуються з головним реченням за допомогою сполучників **when** коли; **after** після того як; **before** перш ніж, перед тим як; **while** у той час як, поки; **as** коли, в той час як, в міру того як; **till, until** поки; **whenever** кожного разу, коли; **as soon as** як тільки; **as long as** поки, **since** з того часу як:

They stopped talking **when she came in.**

After she was out of sight, he turned and entered the house.

I was there **before** I came **here.**

You'll sleep here **while** we stay.

There were tears in his eyes **as he went downstairs.**

Then wait **till I get one or two things.**

Вони перестали розмовляти, коли вона увійшла.

Після того, як її не стало видно, він повернувся і увійшов у будинок.

Я був там, перш ніж прийти сюди.

Ти будеш спати тут, поки ми тут перебуватимемо.

Коли він спускався по сходах, в очах його були сльози.

Тоді зачекай, поки я дістану одну-дві речі.

В англійських підрядних реченнях часу не вживається майбутній час дієслова, замість нього вживаються відповідні форми теперішнього часу.

Підрядні речення місця (Adverbial Clauses of Place) з'єднуються з головним реченням за допомогою сполучників **where де, куди; wherever де б не, куди б не:**
She stood **where I had left her.** Вона стояла там, де я залишив її.

Підрядні речення причини (Adverbial Clauses of Cause) приєднуються до головного речення здебільшого за допомогою сполучників **because бо, тому що; as, since оскільки, тому що; for через те що:**

I believe you because I **know you.**

Я вірю вам, бо знаю вас.

As **it is wet**, we shall stay at home.

Через те що зараз сира погода, ми залишимося дома

Since you feel tired, you should rest.

Оскільки ви стомилися, вам треба відпочити.

She returned to his room again,
for she was tired.

Вона повернулася знову до своєї кімнати, через те що була стомлена.

Підрядні речення наслідку (Adverbial Clauses of Result) з'єднуються з головним за допомогою сполучника **so that так що, тож.** Якщо **so** стоїть всередині головного речення, то підрядне речення набуває ще додаткового значення міри або ступеня:

That boy used to get ill about twice a week, **so that he couldn't go to school.**

This ball was **so large that the child couldn't hold it.**

Той хлопець майже кожного тижня двічі хворів, тож він не міг ходити до школи.

М'яч був такий великий, що дитина не могла тримати його.

Якщо **so** стоїть на початку речення, то в головному реченні вживається часткова інверсія: допоміжне або модальне дієслово ставиться перед підметом:

So quickly had she come and gone in the mass of people **that he had not been able to make sure.**

Так швидко вона з'явилась і зникла в натовпі, що він не міг бути певним. ...

У розмовній мові замість сполучника **so that** у підрядних реченнях наслідку вживається також сполучник **so:**

The snow blew in our faces
so we could hardly see.

Сніг бив нам в обличчя,
тож ми ледве могли бачити.

Підрядні речення мети (Adverbial Clauses of Purpose) з'єднуються з головним за допомогою сполучників **so that, that, so, in order that** *щоб; lest щоб не*.

У підрядних реченнях мети вживається сполучення **may (might)** з інфінітивом, а також **Suppositional Mood** з інфінітивом. У реченнях, які вводяться сполучником **lest**, вживається лише **Suppositional Mood**:

Write to him at once **so that he may know our plans**.

I gave him the book **so that he should study the subject**.

I'll ring her up **lest she should forget about it**.

Напиши йому зараз же, щоб він знав про наші плани.

Я дав йому книжку, щоб він вивчав цей предмет.

Я подзвоню їй, щоб вона не забула про це.

Якщо присудок головного речення стоїть у минулому часі, вживається форма **might**:

The parents of these children went	Батьки цих дітей
It was raining all day long,	Весь день ішов дощ, що нам
which we did not like at all.	зовсім не подобалось.

Підрядні обставинні речення (Adverbial Clauses) виконують функцію різних обставин головного речення і поділяються на підрядні речення часу, місця, причини, наслідку, мети, способу дії, а також умовні та допустові речення.

Підрядні речення часу (Adverbial Clauses of Time) з'єднуються з головним реченням за допомогою сполучників **when** *коли; after* *після того як; before* *перш ніж, перед тим як; while* *у той час як, поки; as* *коли, в той час як, в міру того як; till, until* *поки; whenever* *кожного разу, коли; as soon as* *як тільки; as long as* *поки, since* *з того часу як*:

They stopped talking **when she came in**.

After she was out of sight, he turned and entered the house.

I was there **before** I came **here**.

You'll sleep here **while** we stay.

There were tears in his eyes **as he went downstairs**.

Then wait **till I get one or two things**.

Вони перестали розмовляти, коли вона увійшла.

Після того, як її не стало видно, він повернувся і увійшов у будинок.

Я був там, перш ніж прийти сюди.

Ти будеш спати тут, поки ми тут перебуватимемо.

Коли він спускався по сходах, в очах його були сльози.

Тоді зачекай, поки я дістану одну-дві речі.

В англійських підрядних реченнях часу не вживається майбутній час дієслова, замість нього вживаються відповідні форми теперішнього часу.

Підрядні речення місця (Adverbial Clauses of Place) з'єднуються з головним реченням за допомогою сполучників **where** *де, куди; wherever* *де б не, куди б не*:
She stood **where I had left her**. Вона стояла там, де я залишив її.

Підрядні речення причини (Adverbial Clauses of Cause) приєднуються до головного речення здебільшого за допомогою сполучників **because** *бо, тому що*; **as, since** *оскільки, тому що*; **for** *через те що*:

I believe you because I **know you**.

Я вірю вам, бо знаю вас.

As **it is wet**, we shall stay at home.

Через те що зараз сира погода, ми залишимося дома

Since you feel tired, you should rest.

Оскільки ви стомилися, вам треба відпочити.

She returned to his room again,

Вона повернулася знову до

for she was tired.

своєї кімнати, через те

що була стомлена.

Підрядні речення наслідку (Adverbial Clauses of Result) з'єднуються з головним за допомогою сполучника **so that** *так що, тож*. Якщо **so** стоїть всередині головного речення, то підрядне речення набуває ще додаткового значення міри або ступеня:

That boy used to get ill about twice a week, **so that he couldn't go to school**.

This ball was **so large that the child couldn't hold it**.

Той хлопець майже кожного тижня двічі хворів, тож він не міг ходити до школи.

М'яч був такий великий, що дитина не могла тримати його.

Якщо **so** стоїть на початку речення, то в головному реченні вживається часткова інверсія: допоміжне або модальне дієслово ставиться перед підметом:

So quickly had she come and gone in the mass of people **that he had not been able to make sure**.

Так швидко вона з'явилась і зникла в натовпі, що він не міг бути певним. ...

У розмовній мові замість сполучника **so that** у підрядних реченнях наслідку вживається також сполучник **so**:

The snow blew in our faces

Сніг бив нам в обличчя,

so we could hardly see.

тож ми ледве могли бачити.

Підрядні речення мети (Adverbial Clauses of Purpose) з'єднуються з головним за допомогою сполучників **so that, that, so, in order that** *щоб*; **lest** *щоб не*.

У підрядних реченнях мети вживається сполучення **may (might)** з інфінітивом, а також **Suppositional Mood** з інфінітивом. У реченнях, які вводяться сполучником **lest**, вживається лише **Suppositional Mood**:

Write to him at once **so that he may know our plans**.

I gave him the book **so that he should study the subject**.

I'll ring her up lest she should forget about it.

Напиши йому зараз же, щоб він знав про наші плани.

Я дав йому книжку, щоб він вивчав цей предмет.

Я подзвоню їй, щоб вона не забула про це.

Якщо присудок головного речення стоїть у минулому часі, вживається форма **might**:

The parents of these children went

Батьки цих дітей

hungry **that their children might eat well.** голодували, щоб їх діти могли добре їсти.

Підрядні речення способу дії та порівняння (Adverbial Clauses of Manner and Comparison) з'єднуються з головним за допомогою сполучників **as як, as...as так. ...як; not so... as не так...як; than чи; the...the чим...тим, as if, as though наче, ніби:**

I shall do **as I like.**

Я робитиму так, як мені подобається.

I couldn't have done any more

Я не міг зробити

than they did.

більше, ніж вони.

Чим більше я бачу світ, тим більше він мені не подобається.

The more I see of the world, the more I am dissatisfied with it.

У порівняльних реченнях, що вводяться сполучниками **as if, as though,** вживається Subjunctive II.

You just go out as though **you were going for** a walk.

She looked at both these men **as though she had never seen them before.**

Ви просто виходьте, наче йдете на прогулянку.

Вона подивилася на обох цих людей, ніби ніколи не бачила їх раніше.

Підрядні допустові речення (Adverbial Clauses of Concession) з'єднуються з головним реченням за допомогою сполучників **though, although хоч, хоча; as хоч; whoever хто б не; whatever що б не; whichever який би не; however як би не** та ін.:

She did not cry though the tears were often in her eyes.

Вона не плакала, хоч сльози часто були в її очах

Whatever it may be she has my full consent to.

Що б не було, я з нею цілком погоджуюсь.

Запитання для самоконтролю

1. Яку дію виражає умовний спосіб?
2. Назвіть чотири форми умовного способу англійської мови.
3. Як утворюється Present і Past Conditional Mood?
4. Наведіть приклади 3 типів умовних речень.
5. Наведіть приклади двох підрядних (Adverbial Clauses of Condition) речень з реальною та нереальною умовою.
6. Якими сполучниками та сполучними займенниками приєднуються підрядні підметові речення до головного?
7. Які є види підрядних обставинних речень?
8. Назвіть сполучники, що з'єднують підрядні речення часу (Adverbial Clauses of Time) з головним реченням.
9. У яких підрядних реченнях вживається сполучення may (might) з інфінітивом, а також Suppositional Mood з інфінітивом?
10. Які інші підрядні речення з сполучниками ви знаєте?

Завдання для самостійного виконання

10.1.1. Розкрийте дужки, поставте дієслово у відповідному часі:

1. She (to buy) the dress tomorrow but the shop will be closed.
2. She (to buy) the dress but the shop was closed.
3. The teacher was absent today, so class was canceled. If she (be) absent again tomorrow, class (cancel) tomorrow, too.
4. If she (to learn) English, I (to buy) her this book.
5. If my brother (to have) time now, he (to help) us.
6. I am not an astronaut. If I (to be) an astronaut, I (to take)_my camera with me on the rocket ship next month.
7. I (to do) the same if I (to be) in your shoes.
8. It is expensive to call across the ocean. However, if transoceanic telephone calls (be) cheap, I (call) my family every day and (talk) for hours.

10.1.2. Розкрийте дужки, вживаючи потрібну форму умовного речення після wish. Перекладіть українською:

1. I wish you (to come) with us.
2. I wish you (to be) with us yesterday.
3. I wish we (to meet) again next summer.
4. I wish I (to be) at yesterday's party: it must have been very merry.
5. If only she (to tell) me the truth then.
6. I wish you (not to be) so impatient. It wasn't wise of you.
7. They wished they (not to see) this horrible scene again.
8. I wish you (to phone) me last Sunday.
9. I wish I (to have) a season ticket to the Philharmonic next winter.
10. I wish you (not to speak) on the telephone so much.
11. I wish you (to send) word as soon as you arrive
12. They wish they (not to quarrel) with their neighbours a year ago.

10.1.3. Виберіть правильну форму з двох запропонованих:

1. She wishes she bought/had bought those gloves. They were beautiful.
 1. I'm going to France in summer. I wish I spoke /had spoken French.
 2. It's always difficult to get there by bus, I wish I have/had a car.
 3. I wish you weren't/hadn't been so sad now.
 4. We had a wonderful holiday in France. I wish we will go/went there again next summer.
 5. We wish you hadn't failed/didn't fail your examination last summer.
 6. Peter had a terrible headache yesterday. He wishes he drank/had drunk less at the party.
 7. I wish they didn't make/hadn't/made so much noise.It made me so tired.
 8. Will your sister come to the party? I wish she meets/would meet some of my friends.

9. I wish I hadn't spent/ didn't spend so much money. Now I have to borrow some from my parents.

10.1.4. Перефразуйте речення за зразком, використовуючи відповідні часові форми умовного способу:

Model: If my brother has time, he will help them.

If my brother had time, he would help them.

1. If there is much snow in January, they will go skiing every day.
2. If you've spoken the truth, you won't have anything to complain about.
3. If the rain stops, the children will go for a walk.
4. If I send the money at once, my dog will be returned alive and well.
5. If the water is warm, we shall have a picnic.

10.1.5. Перефразуйте речення за зразком, використовуючи відповідні часові форми умовного способу відносно минулого часу:

Model: If he saw his friend, he would ask him about it

If he had seen his friend (yesterday), he would have asked him about it.

1. If she were attentive, she wouldn't make so many mistakes.
2. If he were here, he would help us.
3. If he knew the number of her telephone, he would ring her up.
4. She would buy that book, if she had money with her.
5. If Nick worked hard, he would pass his examination.
6. If we had time, we would play chess.
7. If she came in time, she would join us.

10.2.1. Прочитайте та перекладіть речення. Визначте тип складносурядних та складнопідрядних речень, випишіть сполучники:

1. I left very early because I was to go to meet a friend at the station.
2. That exercise is not only too long but also too difficult.
3. I shall not go to the country unless the weather is fine.
4. I needn't tell you anything as he has told you all about it already.
5. The sun is shining and there are very few clouds, but I am sure it is going to rain.
6. You must leave at once, or you will miss the train.
7. He always left house at eight o'clock in order that he might not miss the train.
8. We decided to go further in spite of the fact that the road was so bad.
9. That needs no explanation since it is self-evident.
10. We shall order the machine provided that the price is reduced by 10 per cent.
11. He was both tired and thirsty, for it was very hot.
12. You can use my mobile phone on condition that you are very careful with it.

10.2.2. Прочитайте та перекладіть речення. Визначте тип складнопідрядних речень (підметові, присудкові чи додаткові):

1. The doctor's advice was that my brother should go to the south immediately.
2. That the matter should have taken such a turn is not surprising.

3. We have never discovered who did it.
4. You may rely upon what he says.
5. I think he is in the library.
6. I shall ask him whether he will arrange it for me.
7. He isn't what he pretends to be.
8. I cannot understand why he did it.
9. I am not satisfied with what I have written.
10. The question is whether they will arrive in time to take part in this work.
11. Whether a friendly settlement of the dispute between the sellers and the buyers can be arrived at is doubtful.

10.2.3. Доповніть підрядні означальні речення сполучниками *who, whose, which, that*:

1. Our University, ... was founded 110 years ago, is one of the oldest educational establishments in Ukraine.
2. Do you know the man ... lives next door?
3. He works for a company ... makes typewriters.
4. The girl ... was injured in the accident is now in hospital.
5. She looked at the watch ... lay on the table.
6. The woman ... lives here has gone shopping
7. The boy ... bicycle I took is my friend.
8. A polygon ... has three sides is called a triangle.
9. Everything ... happened was my fault.
10. The house in ... we live is in the center of the town.
11. A dictionary is a book ... gives us the meanings of words.
12. A customer is someone ... buys something from a shop.

10.2.4. Закінчіть речення, зберігаючи наскільки можливо значення попередньої фрази:

1. It was late and I was exhausted, so I went straight to bed.
Because _____
2. There will have to be a change in his attitude or he won't continue to work here.
In order for _____
3. From the way he talked, I thought he owned the restaurant.
He talked _____
4. Finish your homework, then you can go out.
You
can't _____
5. I know he's your friend, but he can't sleep here.
Even _____
6. We left half an hour earlier than necessary because we didn't want to be late.
So as _____
7. There wasn't any butter. We used margarine instead.
Instead _____

8. You can only get dishes and bowls with this design in Poland.

Only _____

9. Flooding causes most of the damage in spring.

It's _____

10.3. Прочитайте текст про виготовлення целюлози та виконайте вправи після нього

PULP PREPARATION

Wood is the main source of pulp. Pulp is the raw material from which paper, paper-board, some plastics and many other products are made. There are several types of pulp preparation: mechanical, chemical, semichemical, thermomechanical. The method depends upon the type of wood and the requirements of the end-product.

Any process of pulp preparation begins with *barking*. Bark is removed in big steel cylinders called barking drums. The logs tumble against each other and the bark is stripped. Another common method is using powerful jets of water. If the bark is not removed—the pulp is darker and dirtier. In this case the pulp is bleached.

After barking (in the mechanical process) the grinding stones grind logs in large quantities of water and reduce the logs into the fibrous state.

In the chemical pulp-making processes, wood fibers are separated from their lignin binder by cooking chips in any of the chemical solutions. The most common chemical processes are: the sulphite process, the sulphate process and the soda process. Then wood pulp requires additional treatment: *washing*, *screening* and sometimes *bleaching* – before it can be made into paper and other products.

Washing removes chemicals and nonfibrous substances. Screening removes dirt, uncooked or unbroken pieces of wood and separates fibers according to size. Bleaching gives pulp the desired degree of whiteness.

All these processes take place in the pulp mill. Pulp not used immediately may be stored. In this case, most of the water is removed from it and pulp can be made into sheets. Then it may be shipped to a paper mill and converted into useful products.

Vocabulary

barking n	знімати кору
barking drum	барабан для обдирання кори
log n	колода
tumble v	падати, <i>тут</i> бити
strip v	обдирати
jet n	струмінь
bleach v	відбілювати
grinding stone	дефибрерний камінь
grind v	подрібнити, перемелювати
fibrous a	волокнистий
state n	стан
lignin n	лігнін
bind v	зв'язувати

chip n	тріска, стружка
solution n	розчин
sulphite process	сульфітний процес
sulphate process	сульфатний процес
soda process	натронний спосіб
treatment n	обробка
washing n	промивання
screening n	сортування
sheet n	полотно
store n	складати, зберігати
ship v	завантажувати, відправляти
convert v	переробляти, перетворювати

10.3.1. Дайте відповіді на запитання

1. What is the main raw material for paper, paperboard, plastics, and many other products?
2. What types of pulp preparation are there?
3. What process does the pulp preparation begin with?
4. What methods of barking are there?
5. Describe the mechanical type of the pulping process.
6. What are the most common chemical processes?
7. What do the chemical pulp-making processes do with the wood fibers?
8. What are the additional types of wood pulp treatment? Why are they necessary?
9. Where do all these processes take place?
10. Why is pulp made into sheets?

10.3.2. Перекладіть слова та словосполучення англійською мовою:

целюлоза, кора, знімати кору, завод, колода, барабан для обдирання кори, перемелювати, волокнистий, відбілювати, стружка, обробка, сортування, промивання, сульфатний процес, натронний спосіб, переробляти.

10.3.3. Складіть план та перекажіть тему «Виготовлення целюлози».

10.3.4. Прочитайте додатковий текст “Forest Products”, користуючись словником. Розкажіть про види продукції деревообробних підприємств українською або англійською мовою

FOREST PRODUCTS

Forest products have long provided people with food, shelter, clothing, and fuel. Prehistoric people ate berries and nuts that grew in forests. They built shelters from the branches of trees and wore clothing made of plant materials. About 1 1/2 million years ago, they began using wood as a fuel to make fire.

Today, wood is one of our most important raw materials. It is used in making thousands of products, from building materials, to paper, to photographic film. Despite its usefulness as a raw material, the chief use of wood throughout the world is as a fuel.

There are thousands of forest products. Most can be classified into one of five main groups: (1) wood products, (2) wood-based composite products, (3) fiber products, (4) chemical products, and (5) fuel products. Wood products are made from solid wood. Wood-based composite products contain wood and at least one other material. Manufacturers use wood fibers to produce fiber products. Chemical products are made by breaking down wood and wood fibers and chemically treating them. Such chemical products as cellophane, lacquer, and rayon are made from wood but do not feel or look like wood. Fuel products include logs, wood pellets, and charcoal. Other forest products come from the bark, fruit, gum, leaves, and sap of trees.

Popular wood products: dangerous glues

While markets for wood-based panel products have been increasing for some uses, concern has arisen over the formaldehyde resins commonly used (in chipboard, plywood and MDF, for example) as a bonding agent. Emitting formaldehyde gas, which is toxic, adverse health effects include irritation of the mucous membranes, such as eyes, lungs and nose, even at very low levels, and cold-like symptoms. European manufacturers have, however, been steadily decreasing the formaldehyde content of their products.

Panel products from trees

New ways of using our most versatile building material are constantly being found. An example is 'glulam', glue-laminated timber, which comprises boards made up of small cross-sections of wood glued together in layers under pressure so that the grain of adjacent boards is parallel. First developed in Germany at the beginning of the 20th century, large pieces of any size or shape can be made. Important features of glulam include its resistance to chemical attack and its impressive strength to weight ratio as it is able to take greater stresses than solid timber boards. Popular in Scandinavia for beams, columns and rafters, it was recently used to construct the girders, deck and piers of a motorway bridge in northern Denmark, as well as the new terminal building at Oslo airport. With a combined length of 136 m (446 ft), sections of glulam joined together on the ground and then hoisted into place form what may be the longest piece of wood ever positioned in one piece for building work. Glulam is just one of an enormous range of products available for use in house construction and interior work that are made by sticking or bonding strips, veneers, chips, flakes or fibres of wood together in different combinations.

Plywood

Perhaps the best-known panel product is plywood, which is made by sticking thin sheets or veneers of wood together in layers so that the grains are at right angles to one another, producing a very strong, inflexible board. The Egyptians made crude forms of plywood by bonding wood veneers together with glues made from animal bones and blood albumin. Today, standard plywood veneers are produced with the help of a peeling machine, which peels logs rather like a pencil sharpener. The finished product - available in various strengths and thicknesses and with different specifications - is useful for large, uninterrupted surfaces. Resistant to splitting, its thermal properties are

similar to those of timber, and it can be bent without cracking to form smooth curves. Numerous softwoods such as Douglas fir and pines from the USA and Canada, as well as tropical or temperate hardwoods, are used in different combinations to make plywood. A significant proportion of the plywood used in Britain, the fifth largest importer of plywood in the world in 1999, is made from tropical hardwoods, the largest supplier to the UK being Indonesia, which is then followed by Brazil.

More plants for panels

It is not just trees that are providing panelling for our homes and other buildings. A number of agricultural by-products, as well as waste paper (recycled newsprint), are being put to good use in some parts of the world, for wall panels, ceilings and door interiors. In the USA, straw is being used by several companies for boards. The Good Wood Guide reports that it has been calculated that if just a quarter of the USA's wheat straw were to be used in this way, it could satisfy the entire American demand for particle board. Hemp, flax fibres and shive (waste woody matter separated from flax fibres during processing), kenaf, bagasse (fibrous residue left after sugar has been pressed from sugar cane stems) and sugar cane residues are also being turned into panel products. Flaxboard, for example, is cheap to produce, lightweight and fire-retardant.

Chipboard and particle board

As its name suggests, chipboard is made from chipped wood residues including forest trimmings and shavings from board mills, and post-consumer waste. These wood particles are dried and blended with synthetic resins before being pressed into mats, in a highly-automated process. Chipboard is increasing in popularity for panelling, flooring, cladding and furniture - sometimes coated with a melamine foil veneer.

Cement-bonded particle board also uses woodchips, but in a mixture with either Portland or magnesite cement. Oriental strand board (OSB) is similar to chipboard, but stronger, and is increasingly being used instead of plywood in flooring, roofing and beams.

Fibreboards

The main types of fibreboard include hardboard, medium board, soft board and medium density fibreboard (MDF). They are differentiated by the size and type of wood fibres used, their method of drying, the bonding agent used and the way in which they are pressed into shape. MDF and hardboard are the two most commonly used types.

To make hardboard, softened wood fibres are suspended in water, to which a number of other ingredients may also be added (such as resins, drying oils, preservatives and fire-resistant chemicals). The water is removed by gravity, suction and special rollers, which, by exerting high pressure at a very high temperature, produce a mat in which the fibres are interlocked or felted. Less dense than hardboard, MDF is made using a drying process at lower temperatures and with synthetic bonding agents rather than the natural resins in the wood. Around 67% of Britain's fibreboard is imported from European producers, the rest coming from a number of other countries, including the USA, Canada, Malaysia and the Baltic States.

MODULE TEST 4

Завдання для самостійного виконання

1. Choose the correct form of the verb to take:

Somebody ... (have taken/had taken/has taken/took) my book, I can't find it.

2. Choose the correct form of the verb:

Roberta was angry at herself because she (was made/has made/had made) a stupid mistake.

3. Choose the correct form of the verb:

She looked tired. She (had painted/ have been painting/ had been painting) this room all morning.

4. Choose the correct form of the verb:

The book (is translating/ is being translated/ has translated/ has been translating) into Ukrainian at the moment.

5. Write the correct form of the verb to build:

A new building of our University ... 2 years ago.

6. Choose the correct form of the verb:

The house ... (had built/has been built/had been built) by the end of the last year.

7. Choose the right answer:

He tried very hard but he ... write a poem.

A could C couldn't
B ought to D will be able to

8. Choose the right form of the verb: He told me that he (was sent/ has been sent/had been sent) to school at the age of five.

9. Choose the right word:

You ... use a mobile phone on a plane.

A may C can
B mustn't D can't

10. Choose the correct form of the verb:

I was told that he ... (went/has gone/had gone) five minutes ago.

11. Choose the synonym to the word indigenous:

abundant native moderate additional

12. Complete the sentence with the suitable word:

... generally come from cone-bearing trees such as pines, firs, spruces, redwoods and larches.

Deciduous / Hardwoods / Softwoods / Broadleaved

13. Which word doesn't belong in the group?

A birch C larch
B beech D hornbeam

14. Complete the sentence

... is the raw material from which paper, paper-board, some plastics and many other products are made.

Grass Turpentine Pulp Tar

15. Complete the sentence with the suitable word:

... trees lose their leaves each winter and grow new ones each spring.

Coniferous / Deciduous / Evergreen / Gymnosperm

16. Complete the sentence with the suitable word:

The ... come from trees such as oak, beech, elm, sweet chestnut, willow, and walnut.

gymnosperms hardwoods

softwoods coniferous

17. Find the correct synonym to the word coniferous:

mixed broadleaved deciduous softwood

18. Complete the following sentence with the suitable word:

... forests of the Polissia zone include pines, beeches, spruces, hornbeams, birches.

19. Complete the following sentence with the suitable word:

The ... , such as firs, pines and larches, reproduce by means of tiny winged seeds which are in their cones.

hardwoods / broadleaved / conifers / deciduous

20. Read the passage and choose the words that best complete the sentences:

Bark, layer of cambium, trunk, organic, function

Structure of a tree trunk

The main parts of a tree (1) _____ are: approximately in the centre there is a small pith, the main trunk part is occupied by wood which is covered with bark. On the border between wood and bark there is a thin (2) _____. Cambium performs a very important (3) _____ in a live tree, conditioning the increment of wood and bark in thickness. (4) _____ protects the wood from external effects, i.e. sharp temperature variations, mechanical and other injuries. The inner layer of bark conducts (5) _____ nutrients, which are produced in crown leaves, downward along the tree.

Запитання для самоконтролю

1. Назвіть часові форми англійського дієслова активного стану на прикладі дієслова to write.
2. Які функції в реченні виконують Participle I, Participle II? Наведіть приклади.
3. Як утворюються форми пасивного стану? Скільки часових форм має Passive?
4. Провідмініайте дієслово to ask в усіх часових формах пасивного стану.
5. Коли застосовується «узгодження часових форм»? Назвіть схему необхідних заміні. Наведіть приклади.
6. Розкажіть про загальні характеристики модальних дієслів. Назвіть їх еквіваленти. Коли потрібно вживати саме їх еквіваленти?
7. Які неособові форми дієслова є в англійській мові? Назвіть складні форми герундія, інфінітива, дієприкметника теперішнього часу.
8. Наведіть приклади вживання інфінітивних зворотів, герундіального комплексу, незалежного дієприкметникового звороту.

PART II

SUPPLEMENTARY READING

HOW A TREE GROWS

A tree grows in three directions: trunk and branches grow upward, roots grow downward, and all grow laterally, that is in diameter. As with all living things, trees are made up of cells, and growth occurs by means of cell division. Vertical growth is of little interest, because the most part of the wood in the tree trunk is formed by lateral growth. Growth in diameter, also called secondary growth, takes place in a very narrow zone between the wood of a tree trunk and the bark. This area, called cambium, is only a few cells thick, but it produces all the different types of cells in both the wood and the bark. The cambium itself consists of a layer only one cell thick, but as the cells divide and mature, there is a region on each side of the cambium which contains living cells in various stages of development.

When a wood cell is mature, it is technically dead, for it contains no nucleus or protoplasm. Thus, even the wood of a living tree is made up mainly of dead cells, although certain kinds of cells in the sapwood remain alive longer than others.

During a normal growing season, the cambium produces millions of cells, and a layer of new wood is formed. Since the cambium is a cover surrounding the tree trunk, the layer of wood produced each year is in the same form, and when the tree is only a year or two old, the layer of wood is a cone as high as the tree. During each successive growing season, another cone-shaped layer of wood is added around underneath. Thus, in order to find the age of a tree by the time-honoured method of counting growth rings, one must cut the tree very near the ground or the first year or two is missed.

During each growing season, a layer of bark is also added, but it is added to the inside of the bark. It would seem, then, that since a tree enlarges in diameter each year, the outer layers of bark must stretch. But what actually happens is that the outer layers of bark become dry and, instead of stretching, they crack. This accounts for the scaly appearance of the bark of most trees.

On a cross-sectional surface we can see the growth rings (or annual rings). These are the concentric layers of wood added each season to the diameter of the trunk. The rings are usually quite distinct because in the temperate climates, the wood formed during the early part of the growing season is different from the wood formed later. The wood formed in the spring when growth is more rapid is called earlywood or springwood, and is characterized by cells which are larger and thin-walled, making a rather porous layer of wood. Slower growth later in the growing season produces latewood or summerwood, which has smaller thick-walled cells, forming relatively more dense wood.

Besides, on the surface of hardwoods, fine lines can be seen radiating from the centre of the tree outward. These are wood (medullary) rays, made up of cells oriented horizontally in the tree instead of vertically, as the majority of the cells are. The horizontal orientation of ray cells helps to conduct food materials laterally in the tree.

The materials upon which a tree feeds are derived from the soil and the air. The amount of water taken up by the roots is usually much larger than is required in the chemical processes which go on in the leaves. The tree gives away this unused water by a process known as transpiration. Great quantities of water vapour tend to keep the air in the forests humid and favourable to growth.

In the leaves the food necessary for the trees' growth is manufactured. The raw food materials which reach the tree through the roots and the leaves are digested in the leaves. They are then sent to all living parts of the roots, stem and crown where they are either used at once or stored away for later use.

Like all other plants and like animals, trees breathe. The breathing is done through the leaves and the bark. The pores through which a leaf breathes are surrounded with tiny cells which serve to open and close the pores as the weather changes and as moisture and life vary. Respiration is the factor supplying the energy with the aid of the green matter² in the leaves. The energy is supplied by sunlight; the plant takes up carbon dioxide gas of which there is always a small amount in the atmosphere. The carbon is used to elaborate the organic compounds. The carbon assimilation is a most important biochemical process. The air would deteriorate rapidly if plants did not take up carbon dioxide and give off oxygen.

Vocabulary

occur v	відбуватися
narrow adj	вузький
mature v	дозрівати, цілком розвинутися
contain v	містити в собі
nucleus n	ядро
thus adv	таким чином, отже
even adv	навіть
sapwood n	заболонь
remain v	залишатися
cover n	покриття
cone n	конус
underneath adv	під, знизу, нижче
inside	усередині, усередину
outer adj	зовнішній
stretch v	розтягуватися
crack v	тріскатися, розколюватися
account for	пояснювати
scaly	лускатий, пошарпаний, шаруватий
distinct adj	чіткий, виразний, відмінний
digest v	засвоювати
assimilation n	засвоєння, асиміляція
deteriorate v	погіршувати(ся), псувати(ся)

I. Find Ukrainian equivalents of the following English words:

sapwood	ядро
annual rings	рання деревина
nucleus	клітина
earlywood	заболонь
wood (medullary) ray	піздня (осіння) деревина
latewood	річні кільця
cell	серцевинний промінь деревини

II. Say whether the following statements are true or false. Correct the false ones

1. A tree grows in two directions: trunk and branches grow upward, and roots grow downward.
2. Trees are made up of cells, and growth occurs by means of cell division.
3. The most part of the wood in the tree trunk is ... formed by vertical growth.
4. Growth in diameter, also called secondary growth, takes place in a very wide zone between the wood of a tree trunk and the bark.
5. The cambium is only a few cells thick, but it produces all the different types of cells in both the wood and the bark.
6. When a wood cell is mature, it is technically dead, for it contains no nucleus or protoplasm.
7. During each growing season, a layer of bark is also added, but it is added to the outside of the bark.
8. On a cross-sectional surface we can see the growth rings which are the concentric layers of wood added each season to the diameter of the trunk.

III. Fill in the blanks with suitable words given below

1. The rings are usually quite ... because in the temperate climates, the wood formed during the early part of the growing season is different from the wood formed later.
2. Earlywood or springwood is characterized by cells which are larger and ... , making a rather ... layer of wood.
3. Latewood or summerwood has smaller ... cells, forming relatively more ... wood.
4. On the surface of hardwoods, fine lines can be seen radiating from the centre of the tree
5. The horizontal orientation of wood ray cells helps to conduct food materials ... in the tree.

(Porous, distinct, thin-walled, dense, thick-walled, laterally, outward)

IV. Answer the following questions:

1. How many directions of tree growth are there?
2. Which growth forms the most part of the wood in the tree trunk?
3. Where does the secondary growth take place in the wood?

4. What does a cambium produce?
5. Why does each side of the cambium contain living cells in various stages of development?
6. When is a wood cell technically dead?
7. In what part of the wood do cells remain alive longer than others?
8. What method do people use to find the age of a tree?
9. Why does the bark of most trees have a scaly appearance?
10. The growth rings on a cross-sectional surface are quite distinct, aren't they? Why?
11. Does earlywood differ from latewood?
12. What are wood rays? What is their function?

STRUCTURE AND CLASSES OF WOOD

The earlier structure of wood is known as heartwood (the dark-coloured central portion) and the outer bright zone, (later sections) as sapwood. The difference is in the moisture content and ageing.

All species in early age have only sapwood and in the course of time the heartwood is formed in some species. Transition from sapwood to heartwood may be sharp or gradual. With age the dimensions of heartwood increase due to the transition of a part of sapwood into heartwood. Heartwood is found in all species of coniferous trees such as pine, fir, spruce, larch and in certain deciduous trees, for example, in oak, ash, elm, poplar, as well as in tropical trees.

In a live tree the sapwood serves for conducting water upward along the trunk (from the roots to the crown) and for depositing reserve nutrients.

The process of heartwood formation consists of the dying off wood living cells, clogging of water-conducting tissues, resin and calcium carbonate deposits, impregnation with tannin and dyestuffs as a result of which the colour of heartwood changes, its volume weight increases, its resistance to decay increases and the mechanical properties improve.

Dead or heartwood trees no longer perform a function in the living tree. Hence, if the tree is injured by fire, the heartwood trees are in greater danger; the sapwood trees have greater resistance to fungus attack owing to their nature and content. On the other hand, when a tree has been cut and the timber seasoned the heartwood trees are more resistant to fungi and insect pests.

Trees grow from the top and in diameter; the side growth is also called secondary growth. Wood has layers of growth which appear as circles around the centre. They are actually elongated cells and cluster of tubes. This makes it possible to split the wood vertically and prevent splitting across the grain.

In cross section the wood of certain broad-leaved species (e.g. oak, walnut) has small holes of vessels. Wood vessels are the thin "tubes/pipes" that transport the water in the stem (trunk) of a woody plant. They consist of many linked empty cells which have perforations in the ends and link together to form long tubes, the wood vessels. Wood vessels carry water and minerals from the roots of a woody plant (a tree, for instance) to the leaves. Broad-leaved species are divided into ring-porous

and diffuse porous due to the distribution of vessels. Ring-porous species has the ring of large vessels in the early zone of annual rings. Ring-porous trees are oak, ash, elm, cork-tree and others. Diffuse porous species are the species in which the vessels, irrespective of their size, are distributed along the annual ring more or less uniformly. Most of the broad-leaved species are diffuse porous.

The presence of resin ducts is characteristic for coniferous species. These ducts are thin passages filled with resin and are present in wood of pine, larch, cedar, and spruce; in fir, juniper and yew wood there no resin ducts. The total volume of resin ducts is quite small. Due to insignificant volume the resin ducts by themselves cannot affect the properties of wood, but the resin in them increases the resistance of wood against rotting.

Wood varies in weight and in specific gravity. Some wood is heavier than water as, for example, the black iron in Florida, which will sink in water. With a few exceptions dry wood is lighter than water, but the moisture content of wood greatly affects its weight.

Vocabulary

heartwood n	ядрова деревина
bright adj	яскравий, світлий
perform v	виконувати
clog v	перешкоджати, засмічувати
resin n	смола, каніфоль, камедь
impregnation n	насичування
tannin n	танін, дубильна речовина
dyestuff n	барвник
decay n; v	гниття, розкладання; гнити, розкладатися
hence adv	отже
injure v	пошкодити
season v	витримувати, сушити (деревину)
resistant adj	стійкий
fungi (pl) n (fungus)	гриби
cluster n	скупчення
tube n	трубка, <i>тут</i> судина
split v	розколювати
ring-porous	кільце-пористий
diffuse porous	розсіяно-пористий
irrespective of	незалежно від
uniformly adv	рівномірно
resin duct	смоляний прохід, канал
rotting n	ГНИТТЯ
specific gravity	питома вага
black iron n	залізне дерево, кругіодендрон залізний

I. Complete the sentences with suitable words given below:

1. The earlier structure of wood is known as ... (the dark-coloured central portion) and the outer bright zone, (later sections) as
2. In a live tree the sapwood serves for conducting water upward along the trunk (from the roots to the crown) and for depositing reserve
3. The process of heartwood formation consists of the dying off wood living cells, clogging of water-conducting tissues, ... and calcium carbonate deposits, impregnation with ... and dyestuffs.
4. When a tree has been cut and the timber seasoned the heartwood trees are more ... to fungi and insect pests.
5. The vessels are a characteristic element of the wood structure of ... species.
6. The presence of resin ducts is characteristic for ... species.
(nutrients, resin, sapwood, heartwood, resistant, coniferous, tannin, broad-leaved)

II. Find Ukrainian equivalents of the following English words:

decay	сушити
injure	перешкоджати
season	проводити
split	гнили, розкладатися
clog	пошкодити
conduct	відмирати
dye	розколювати
die	забарвлювати

III. Answer the following questions:

1. What structure of wood is known as heartwood?
2. What does the sapwood serve for in a live tree?
3. What does the process of heartwood formation consist of?
4. Which trees (heartwood or sapwood trees) have greater resistance to fungus attack?
5. What makes it possible to split the wood vertically and prevent splitting across the grain?
6. What are wood vessels? What is their main function? Which group of tree species are they found?
7. What is the difference between ring-porous and diffuse-porous species?
8. What tree species have resin ducts?

GYMNOSPERMS. CONIFERS

Gymnosperm (Gymnospermae) is a group of seed-bearing plants with ovules on scales, which are usually arranged in cone-like structures.

The term "gymnosperm" comes from the Greek word gymnospermos, meaning "naked seeds" and referring to the unenclosed condition of the seeds, since, when they are produced, they are found naked on the scales of a cone or similar structure.

This group includes many of the world's most interesting and useful trees whose importance, especially in the temperate forest, can hardly be overemphasized. Gymnosperms are divided into 4 orders, of which the conifers is the most noteworthy.

Conifers are the most abundant group of gymnosperms with six to eight families, 65-70 genera and 600-630 species (696 accepted names). These are the most important of modern gymnosperms.

"Pine" and "Evergreen" are often used as general terms for trees having cones and needlelike leaves, but botanists prefer the word *conifer*, which is Latin for "cone-bearing." Pines actually compose only one genus, or group, of conifers, and evergreen refers to any tree, conifer or broadleaf, that remains green during the winter. Most conifers are evergreen, of course, but some, such as the larches and bald cypress, have leaves that turn colour and drop every autumn.

Besides the obvious dissimilarities in foliage and the method of branching, conifers differ from broadleaf trees in that their reproductive organs are borne in cones instead of flowers. Both the male, or pollen, cones and the female, or seed, cones are produced in spring, and in some species they are brightly coloured when they first emerge. Usually both types occur on the same tree, but in a few species, such as the redcedar, they appear on separate trees. The male cones fall from the tree not long after they have shed their pollen, but the female cones continue to grow and develop and may remain on the tree for several years.

Conifers are the largest and most important surviving branch of an ancient line of seed plants called the gymnosperms. Yews and the ginkgo, which are planted as ornamentals, represent two other branches of the gymnosperm line. Their pollen is produced in small cones, as is the case with conifers, but their seeds are attached individually to the branches. Representatives of other gymnosperm lines occur in deserts and tropical forests, and others are known only from fossils.

Conifers are of primary value in the production of forest products. Besides the large amount of timber produced, the conifers furnish such products as turpentine and resin, and serve to control erosion. They are also used for ornamentals, Christmas trees, windbreaks, wildlife plantings, and reforestation. Seeds of conifers are eaten by many kinds of birds and small mammals. Often gymnosperms are used for economical uses and as folk medicines. Some common uses for them are as soap, varnish, lumber, paint, food, and perfumes.

Vocabulary

genus n (genera – pl)

ovule n

naked p.p.

overemphasize v

noteworthy a

dissimilarity n

emerge v

occur v

рід

сім'ядоля, насіння

голий, відкритий, без покриву

надавати особливо великого значення,

підкреслювати

заслуговуючий на увагу

несхожість, відмінність

з'являтися

траплятися, зустрічатися, попадатися

fossil n	окам'янілість
furnish v	постачати, давати, доставляти
turpentine n	скипидар
resin n	смола, камідь, каніфоль
windbreak n	захисна смуга

I. Complete the sentences:

1. The term "gymnosperm" comes from the Greek word gymnospermos, meaning _____.
2. The word *conifer* is Latin for _____.
3. Most conifers are evergreen, but some, such as the _____ have leaves that turn colour and drop every autumn.
4. Conifers differ from broadleaf trees in that their reproductive organs are borne _____ instead of flowers.
5. Both the male, or pollen, cones and the _____, or _____, cones are produced in spring.
6. _____, which are planted as ornamentals, represent two other branches of the gymnosperm line.
7. The conifers furnish such products as _____ and _____, and serve to control erosion.

II. Find Ukrainian equivalents of these English words:

- | | |
|---------------|--------------|
| 1. species | a) рід |
| 2. larch | b) скипидар |
| 3. ovule | c) тис |
| 4. genus | d) модрина |
| 5. turpentine | e) лусочка |
| 6. yew | f) вид |
| 7. scale | g) сім'ядоля |

III. Answer the following questions:

1. What does the term "gymnosperm" mean?
2. How many orders are gymnosperms divided into?
3. Which order is the most noteworthy?
4. What does the word "conifer" mean?
5. What trees are evergreen?
6. Are the larches and bald cypress evergreen trees?
7. What is the difference in the reproductive organs of conifers and broadleaf trees?
8. How are the conifers used?

BROADLEAF TREES

Broadleaf trees comprise the larger of the two principal groups of trees on earth today. Broad-leaf trees provide shade for our homes, fuel for our fireplaces, lumber for

the manufacture of fine furniture, and much of our locally grown fruit. Their colourful blossoms liven the landscape in spring and their turning leaves attract thousands of admirers to the outdoors every autumn.

Leaves of broadleaf trees have a variety of shapes and sizes, but all are much broader than the needlelike leaves of the conifers. They also differ from conifer needles in having a conspicuous network of branching vascular bundles or *veins*. Conifer leaves have vascular bundles too, but theirs are unbranched and best seen with the aid of a microscope. These structures serve as the "plumbing" of the leaf, transporting water and mineral nutrients into the leaf and sugars out of it.

Almost all broadleaf trees are deciduous; that is, they lose their leaves every autumn. However, the terms *broadleaf and deciduous* are not necessarily synonymous. For example, species of oaks, hollies, magnolias, and other genera are evergreen; and such a conifer as the European larch is deciduous. Even some of the most common trees, notably the white oak and ironwood, tend to retain their dried, brown leaves throughout the winter.

Broadleaf trees are often called *hardwoods* since the wood of most species is harder and heavier than that of the conifers, or *softwoods*. However, the woods of several common species of broadleaf trees, including the cotton-wood, black willow, and basswood, are considerably lighter and softer than the wood of some conifers. A more reliable distinction between the two groups of trees is the presence of *vessels* or *pores*, as they are commonly known, in the woods of broadleaf trees. Coniferous wood never has vessels.

Though the broadleaf trees are not universally deciduous or hard wooded, all bear flowers sometime during the growing season. Most species bloom in spring, either before or at about the same time their leaves appear. Many of smallest trees, such as the redbud and crab apple, bloom so spectacularly that they are cultivated solely for that purpose. On the other hand, the flowers of most large shade and forest trees are so tiny, drab, and inconspicuous that few people notice them. This disparity in the size and colour of tree flowers is due to the different ways in which their pollen is spread. Showy, fragrant blossoms are pollinated by bees and other insects whereas small, drab flowers are usually pollinated by the wind.

Another common feature of broadleaf trees is the production of fruit. Botanists consider a fruit to be the ripened, seed-bearing ovary of a flower. According to the botanical definition, the pod of the honey locust and acorn of the oak are fruits just as are apples and plums. Similarly, the "seeds" of ashes and maples, the nuts of walnuts and hickories, and the tiny capsules of willows and poplars are all properly considered to be fruits. The cones of conifers and the plumlike seed of the ginkgo, despite their similarity to fruits, do not qualify as such because they are not derived from flowers.

Vocabulary

comprise v

lumber n

liven v

conspicuous a

включати, охоплювати, вміщувати

будівельний ліс, колоди; *амер.*

пиломатеріали

збадьорити, додати жвавості

помітний

vascular a	судинний
bundle n	пучок, вузол
vascular bundle	судинно-волоконистий пучок
vein n	жилка, прожилка
holly n	бот. падуб
cotton-wood	тополя канадська
basswood	липа американська
crab apple	дика яблуня, кислиця
disparity	невідповідність, нерівність
showy	яскравий
fragrant	духмяний, запашний, ароматний
pollinate	опилювати
ripen	достигати, стигнути, дозрівати
ovary	зав'язь
pod	біб (акації)

I. Complete the sentences:

1. Leaves of broadleaf trees differ from conifer needles in having a conspicuous network of branching _____ or veins.
2. Almost all broadleaf trees are _____; that is, they lose their leaves every autumn.
3. Species of oaks, hollies, magnolias, and other genera are _____; and such a conifer as the European _____ is deciduous.
4. Broadleaf trees are often called _____ since the wood of most species is harder and heavier than that of the conifers, or _____.
5. A more reliable distinction between the two groups of trees is the presence of _____ or _____, as they are commonly known, in the woods of broadleaf trees.

II. Find Ukrainian equivalents of these English words:

- | | |
|---------------|----------------|
| 1. deciduous | a) листяний |
| 2. ovary | b) опилювати |
| 3. coniferous | c) прожилка |
| 4. broadleaf | d) колоди |
| 5. vein | e) зав'язь |
| 6. pollinate | f) листопадний |
| 7. lumber | g) хвойний |

III. Answer the following questions:

1. Why broad-leaf trees are so important in our life?
2. How do their leaves differ from conifer ones?
3. Are the terms broadleaf and deciduous synonymous?
4. Which species of broadleaf trees are softwoods?
5. What is a more reliable distinction between the two groups of trees (broadleaf and coniferous)?

6. How is the pollen of different trees spread?
7. What is the fruit of a broadleaf tree according to the botanical definition?

PINE

I. Look through the text and 1) give the definition of a conifer; 2) say what species of pines grow in Ukraine.

The only pine tree, which has always grown in Ukraine, is the Scots pine. The bark is reddish brown or orange and the leaves are dark blue-green. They are needle-shaped and grow in pairs, each pair being wrapped round the very short stalk by a few papery scales.

All pines can be recognized by their long, needle-shaped leaves which grow in bundles that fall off together when they are two or three years old. Each bundle is really a dwarf shoot and it may consist of one, two, three or more leaves. The dwarf shoots are like tiny branches of the long shoots. The long shoots grow from buds on the branches of the tree.

Pines belong to a large group of plants (mostly trees) called conifers, which means “cone bearers”. Pinecones are the flowers and they are either male or female, the male cones being smaller than the female. It takes two to three years for the seeds to ripen after the female flowers have been fertilized. By the time they are ripe the cone has become woody. It opens, and the seeds, which are winged, are blown away.

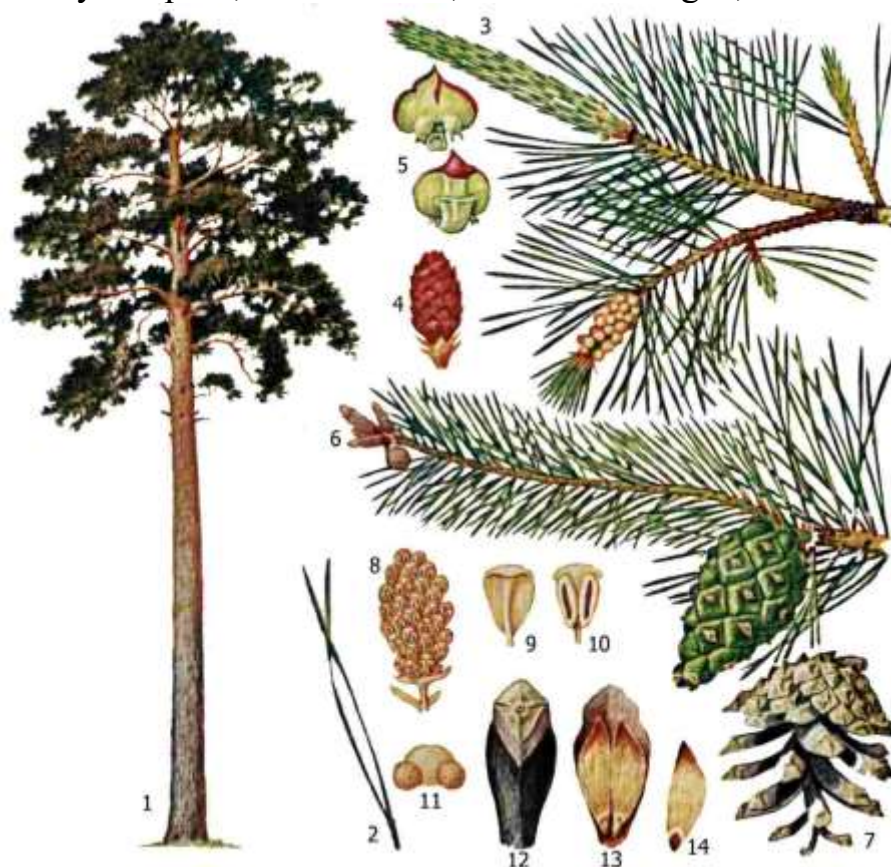


Figure I Scots Pine Tree (1), Needles (2), Branch line (3), Female cone (4), Seed scales (5), Branch with winter&formed cones (6), Opened ripe cone (7), Male spike (8), Microspores (9,10), Pollen (11), Wooden seed scale (12), Wooden seed scale with two winged seeds (13), Winged seed (14).

Among the many kinds of conifers planted in Ukraine, the Scots pine has the most unpredictable habit of growth.

Young trees look much like other species of pines, but as they mature, each takes on a personality of its own. The crown may vary from round, compact, and symmetric to irregular and picturesque, but it seldom fails to be interesting. Planting a seedling Scots pine can be a real adventure, because one can never be certain what the outcome will be.

Another striking feature of the Scots pine is the flaky orange bark that clothes its upper trunk and largest limbs. Many other common pines have at least some orange colour in their bark, but always on a background of grey or black. The more uniform orange of the Scots pine's bark is visible from quite a distance and provides the easiest and quickest means of identifying the tree.

Scots pine was for many years a rather trouble-free species, but in recent years it has proved susceptible to pine wilt disease and Zimmerman pine moth. Pine wilt has several causes including pine wood nematodes, blue-stain fungi, shot-hole beetles, and unfavourable environmental conditions. Affected trees may decline and die suddenly. There is no known cure, but spread of the disease can be slowed through proper cultural practices and by promptly removing and destroying dead trees.

Jack pine also grows in Ukraine, especially in the Steppe zone, though it is not native to our country. It is typically a small and rather unattractive tree, with unusually short leaves and a crown that is sparse and misshapen. This pine tolerates dry, sandy soils that are inhospitable to most other trees. Jack pine is not recommended for general conservation plantings because most Ukraine soils are fertile enough to support larger and more valuable conifers as well as deciduous trees, but it is sometimes used for reforestation projects on severely eroded lands. A pioneer species, it rapidly invades lands that have recently burned or logged.

The unusual cones of the jack pine are its most interesting feature. They are asymmetrically shaped and may remain closed long after the seeds are mature. Unopened cones sometimes persist on the trees for so long – 20 years or more – which they become embedded in the wood of the branches. Jack pine, like most other pioneer species, is intolerant of shade and requires an open, sunlit area to reproduce itself.

In Ukraine the most important pine timber is that from the Scots pine, as this species occupies most of forest areas - about 25%. The timber, when sawn up, is known as red or yellow deal. It is used in building, and for telegraph poles and railway sleepers, as well as for making furniture and plywood.

Vocabulary

Wrap *v* загортати, закутувати

Stalk *n* стебло

Bundle *n* вузол, пучок

Dwarf *n* карлик

Shoot *n* пагін, паросток

Cone-bearers *n (pl)* дерева-шишконосії

Ripen <i>v</i>	дозрівати, достигати
Unpredictable <i>a</i>	непередбачений
Habit <i>n</i>	властивість, особливість; стан (рослини)
Susceptible <i>a</i>	сприйнятливий, схильний до захворювань
Wilt <i>v</i>	в'янути
Pine moth <i>n</i>	шовкопряд
Nematode <i>n</i>	нематода
Blue-stain <i>n</i>	синява, синь (фаут деревини)
Fungus <i>n</i> (<i>Pl</i> fungi)	грибок, плісень
Shot-hole beetle <i>n</i>	короїд, червиця
Affected <i>a</i>	пошкоджений (хворобою)
Cure <i>n</i>	ліки, курс лікування
Promptly <i>adv</i>	відразу, швидко, точно
Sparse <i>a</i>	рідкий, розкиданий
Misshapen <i>a</i>	деформований
Tolerate <i>v</i>	терпіти, переносити
Erode <i>v</i>	роз'їдати, руйнувати; вивітрювати, розмивати
Deal <i>n</i>	дільс (дошка L=12 фунтів)
Pole <i>n</i>	стовп, жердина, щогла
Railway sleeper <i>n</i>	шпала, поперечина

I. Translate the sentences paying attention to the Absolute Participle Construction and to the functions of the Infinitive

1. Scots pines are needle-shaped and grow in pairs, each pair being wrapped round the very short stalk by a few papery scales.
2. Pinecones are the flowers and they are either male or female, the male cones being smaller than the female.
3. Jack pine, like most other pioneer species, is intolerant of shade and requires an open, sunlit area to reproduce itself.
4. Jack pine is not recommended for general conservation plantings because most Ukraine soils are fertile enough to support larger and more valuable conifers as well as deciduous trees.
- 5.

II. Complete the following sentences according to the text

1. All pines can be recognised by their long, needle-shaped leaves which grow in
2. The dwarf shoots are like
3. The long shoots grow from

4. It takes two to three years for the seeds to ripen
5. The crown of the Scots pine may vary from round, compact, and symmetric to
6. Scots pine was for many years a rather trouble-free species, but in recent years it has proved susceptible to
7. Jack pine is typically a small and rather unattractive tree, with unusually short leaves and
8. This pine tolerates dry, sandy soils that are
9. The cones of Jack pine are asymmetrically shaped and may remain closed long after
10. Unopened cones sometimes persist on the trees for so long – 20 years....

III. Read the text once again and answer the questions:

1. How can all pines be recognized by their leaves?
2. What are the flowers of pines?
3. What diseases is Scots pine susceptible to?
4. Where does Jack Pine grow in Ukraine?
5. What is the most interesting feature of Jack Pine? Describe its cones.
6. What species has the most important timber?
7. How is the timber of pines used in our country?

SPRUCE

I. Look through the text and 1) say what each of paragraphs is about; 2) find the sentences with the description of this conifer; 3) find the information relating to the diseases of spruces.

Spruces are among the hardiest of conifers and have compact, symmetrical silhouettes. The popularity of individual species has changed through the years, but spruces as a group have long rivalled pines as the most important of the large conifers for landscaping.

Spruces develop a columnar crown under forest competition and their lower branches prune naturally; but when the trees are grown in the open their lower branches persist and spread horizontally, producing a broadly pyramidal crown. The presence of these branches near the ground enhances the beauty of the tree, although they take up considerable space.

Although spruces are usually trouble-free if properly sited and maintained, they may be bothered by any of several diseases and insects, especially when stressed by old age, overcrowding, or drought. Pests include spider mite, spruce needle miner, scale insects, and others. The most widespread and serious diseases are Cytospora

canker, which kills the branches, and *Rhizosphaera* needle-cast, which causes the older, inner needles to turn reddish brown or purplish brown and fall prematurely. Both of these diseases usually start near the base of the tree and progress upwards. Neither is easy to control, and they are best prevented by promoting tree health through proper cultural practices.

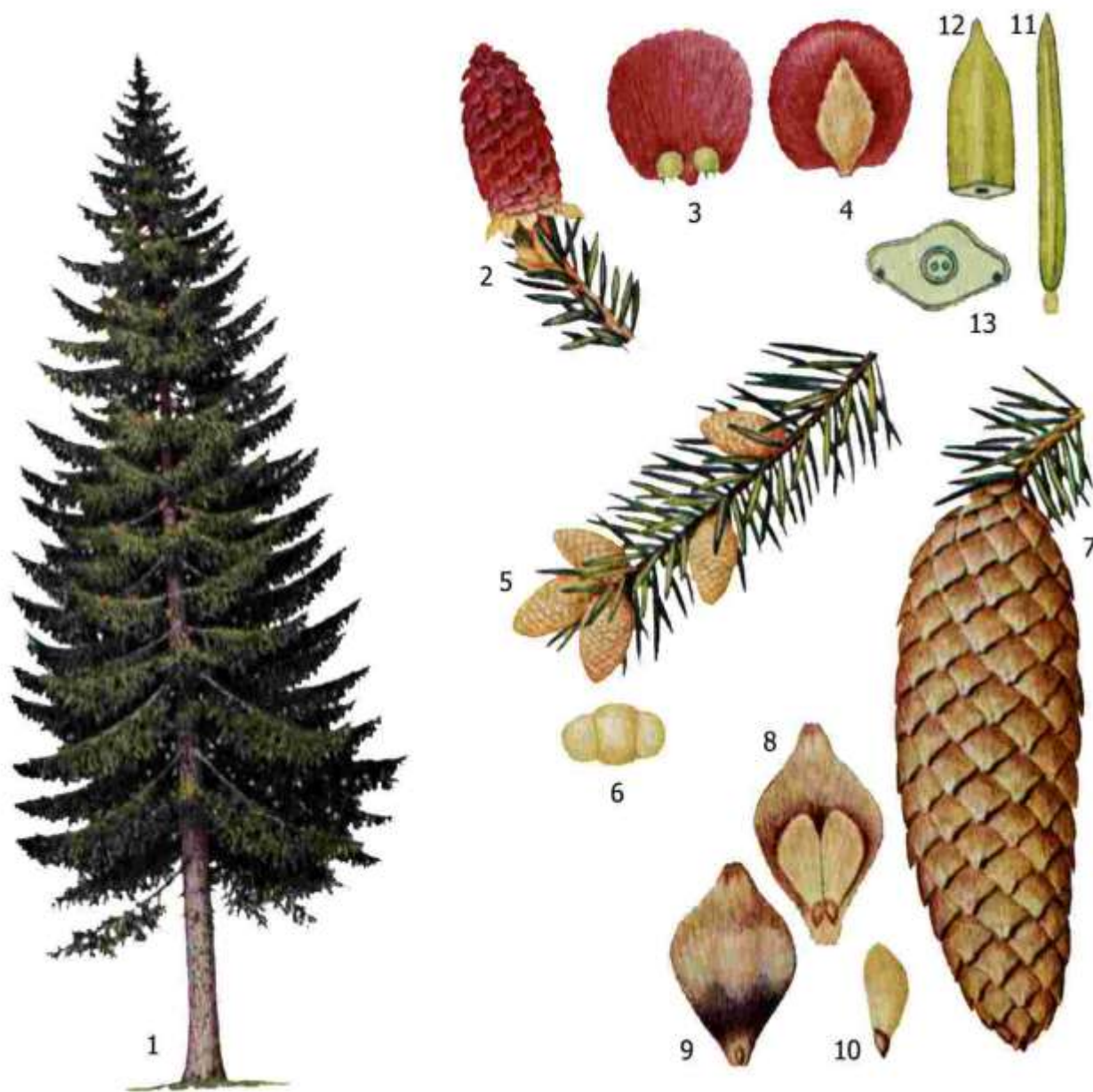


Figure II Norway Spruce tree (1), Macro-strobilus (2), Covering scale with two seed-buds (3), Seed&covering scales (4), Microstrobilus (5), Pollen (6), Ripe cone (7), Seed scale with two ripe seeds (8), Outside 8 (9), Seed (10), Needle (11), Top of needle (12), Cross-section of needle (13)

Norway spruce is one of the tallest native trees in Ukraine and is an important constituent of the forests in the Carpathians. It is the fastest growing and most gracefully shaped of the spruces, developing long, drooping branchlets as it ages. Its needles are $\frac{3}{8}$ to 1 inch long, dark green. Cones are 4 to 6 inches long; scales are dull brown, very rigid, with finely toothed margins. Its wood is light and soft but fairly strong for its weight. Its principal use is for paper pulp; it is also used for lumber, boxes,

crates, and many other products. Burgundy pitch, a resin obtained from the bark of this species, is used in the manufacture of certain varnishes and medicinal compounds.

Vocabulary

Rival	<i>v</i>	суперничати, змагатися
Columnar	<i>a</i>	колоноподібний
Prune	<i>v</i>	підрізати (гілки), обрізати прибирати зайве
Persist	<i>v</i>	продовжувати існувати, зберігатися
Enhance	<i>v</i>	збільшувати, підвищувати ціну
Bother	<i>v</i>	турбувати(ся), непокоїтися, хвилюватися
Overcrowd	<i>v</i>	переповнювати, товпитися, скупчуватися
Spider	<i>n</i>	павук
Mite	<i>n</i>	кліщ
Canker	<i>n</i>	червоточина
Prematurely	<i>adv</i>	передчасно
Promote	<i>v</i>	сприяти, допомагати
Constituent	<i>n</i>	складова частина
Drooping	<i>a</i>	похилий, схилений
Branchlet	<i>n</i>	гілочка, невеликий пагін
Rigid	<i>a</i>	твердий, жорсткий, негнучкий
Dull	<i>a</i>	тьмянний
Fairly	<i>adv</i>	достатньо
Lumber	<i>n</i>	будівельний матеріал
Crate	<i>n</i>	каркасний ящик
Pitch	<i>n</i>	дьоготь, смола, терпентин
Resin	<i>n</i>	смола
Varnish	<i>n</i>	лак
Compound	<i>n</i>	суміш, сполука

I. Fill in the blanks with the suitable word combinations given below

1. Spruces develop a columnar crown ... and their lower branches prune naturally.
2. The presence of these branches near the ground enhances the beauty of the tree, although they ... considerable space.
3. these diseases usually start near the base of the tree and progress upwards.

4. Neither is easy to control, and they are best presented ... tree health through proper cultural practices.
5. Its principal use is for paper pulp; it is also ... lumber, boxes, crates, and many other products.
6. Burgundy pitch, a resin obtained from the bark of this species, is ... the manufacture of certain varnishes and medicinal compounds.
7. a) both of; b) used in; c) under forest competition; d) used for; e) by promoting: f) take up.

II. Say whether the following statements are true or false. Correct the false ones

1. Spruces are among the lightest of conifers and have compact, symmetrical silhouettes.
2. When the trees are grown in the open their lower branches persist and spread horizontally.
3. Although spruces are usually trouble-free if properly sited and maintained, they may be bothered by any of several diseases and insects, especially when stressed by old age, overcrowding, or drought.
4. Norway spruce is one of the smallest native trees in Ukraine.
5. Cones are 2 to 4 inches long; scales are green, very rigid, with finely toothed margins.

III. Answer the following questions

1. Are spruces the hardest of conifers and do they have symmetrical silhouettes?
2. What crown do they usually develop?
3. When do spruces have a broadly pyramidal crown?
4. What pests of spruces do you know?
5. What are the most widespread and serious diseases of the spruce?
6. What species of coniferous trees is an important constituent of the forests in the Carpathians? Describe the most gracefully shaped of the spruces, please (its branches, needles, cones).
7. How is its wood used?

FIR

1. Look through the text and 1) find the paragraph where the differences between firs and spruces are described; 2) say what information relating to this coniferous species you have got.

The word fir is sometimes used for any conifer, or cone-bearing tree. Before about 1800 it generally meant pine, and the Scots pine is still known also as the Scotch fir. Nowadays the word fir is used specially for the silver firs, which belong to a group called *Abies*.

Silver firs are tall trees, which may attain a height of 150 feet. They are very like pines and spruces but their needles, as the narrow leaves are called, grow in single rows along the twig, whereas pine needles grow in groups out of sheaths. Fir needles are also shorter and flatter than pine needles. Silver firs can be told from spruces by their cones, for those of the spruces hang down while fir cones stand up. Pinecones take two to three years to ripen and fir cones only one.



Figure III Silver fir tree (1), Branch with male strobilus (2), Branch with female strobilus (3), Seed scale with two seed-buds (4), Ripe cone (5), Rod of collapsed cone (6), Seed (7)

Silver firs form forests in cool and mountainous regions. They are attractively shaped and relatively free of diseases and insect pests. Like the other conifers, firs are important for the timber, resin and turpentine obtained from them. Its wood is used for pulp, lumber, boxes, crates, doors, and window sash.

One of the legends about the fir tells how the Christ Child came to a German forester at Christmas time. The forester, hearing a knock at the door, opened it and

found a child outside, hungry and shivering. He took Him in and looked after Him. Soon after midnight the family woke to the sound of singing; it was a choir of angels praising the Christ Child. When the visitor left in the morning He broke off a branch from a fir tree and planted it near the door, promising that His hosts should never be in need.

The Christmas tree we know today, however, is not a fir but the Norway spruce.

Vocabulary

Meant	<i>-p.p. від</i>	mean	<i>v</i>	означати
Row	<i>n</i>			ряд
Sheath	<i>n</i>			оболонка, листкова пазуха
Flat	<i>a</i>			плаский, рівний
For	<i>cj</i>			оскільки, тому що
Knock	<i>n</i>			стук
Shiver	<i>n</i>			тремтіти, дрижати
Woke	<i>-p.p. від</i>	wake	<i>v</i>	прокидатися
Choir	<i>n</i>			хор
Angel	<i>n</i>			ангел
Praise	<i>n</i>			похвала
Host	<i>n</i>			господар
Christ				Христос
Christmas	<i>n</i>			Різдво
Sash	<i>n</i>			віконна рама
Sash-door	<i>n</i>			скляні двері

I. Complete the following sentences according to the text

1. Nowadays the word fir is used specially for the silver firs, which belong to
2. Silver firs are tall trees, which may be
3. They are very like pines and spruces but their needles, as the narrow leaves are called, grow ... whereas pine needles grow
4. Cones of the spruces hang down while fir cones
5. Pinecones take two to three years to ripen and fir cones
6. Silver firs form forests in cool and
7. They are attractively shaped and relatively free of

II. Translate the sentences paying attention to the functions of the Participle I and the Participle II

1. Like the other conifers, firs are important for the timber, resin and turpentine obtained from them.
2. It was a choir of angels praising the Christ Child.
3. The forester, hearing a knock at the door, opened it and found a child outside, hungry and shivering.

4. When the visitor left in the morning, He broke off a branch from a fir tree and planted it near the door, promising that His hosts should never be in need.

III. Read the text and answer the questions

1. What differs a fir from pines and spruces?
2. Where do Silver Firs form forests?
3. Are they relatively free of diseases and insect pests?
4. Are they important for timber, resin, and turpentine?
5. How is their timber used?
6. Retell an old legend about the fir.
7. What coniferous tree do we know as the Christmas tree: a fir or a spruce?

IV. Read and translate the English sentences into Ukrainian, then give their English version again.

Nowadays the word fir is used specially for the silver firs, which belong to a group called Abies.

Silver firs are tall trees, which may attain a height of 150 feet. They are very like pines and spruces but their needles, as the narrow leaves are called, grow in single rows along the twig, whereas pine needles grow in groups out of sheaths. Fir needles are also shorter and flatter than pine needles. Silver firs can be told from spruces by their cones, for those of the spruces hang down while fir cones stand up. Pinecones take two to three years to ripen and fir cones only one.

EUROPEAN LARCH

1. Look through the text and 1) say what group of trees does it belong to: Deciduous or Coniferous; 2) find the paragraph with the description of leaves.

The European larch, the only deciduous conifer growing in Ukraine, has as many faces as there are seasons. In winter it is as bare and lifeless as any broadleaf tree; but its small, upright cones; tall, tapered trunk; and horizontal branches are distinctly coniferous. When spring arrives, its branches are decorated with tiny, bright red cones, which nicely complement the soft, light green leaves that emerge from overwintering buds. The cones are $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, with 40 to 50 thin scales, held upright on the twigs and persisting for several years. Its leaves are linear but very slender, without petioles, $\frac{3}{4}$ to $\frac{1}{4}$ inches long, deciduous; spirally arranged on twigs, tufted at ends of spur shoots on branchlets.

In summer the larch's foliage takes on a darker hue and its pyramidal crown resembles that of other cone-bearing trees; but its long drooping twigs and slender leaves give it a graceful, fine-textured appearance that can be easily recognized from a distance. Finally, in late October or early November, long after most broadleaf trees

have lost their leaves, the larch turns a brilliant gold, providing a last blaze of colour before the onset of winter.

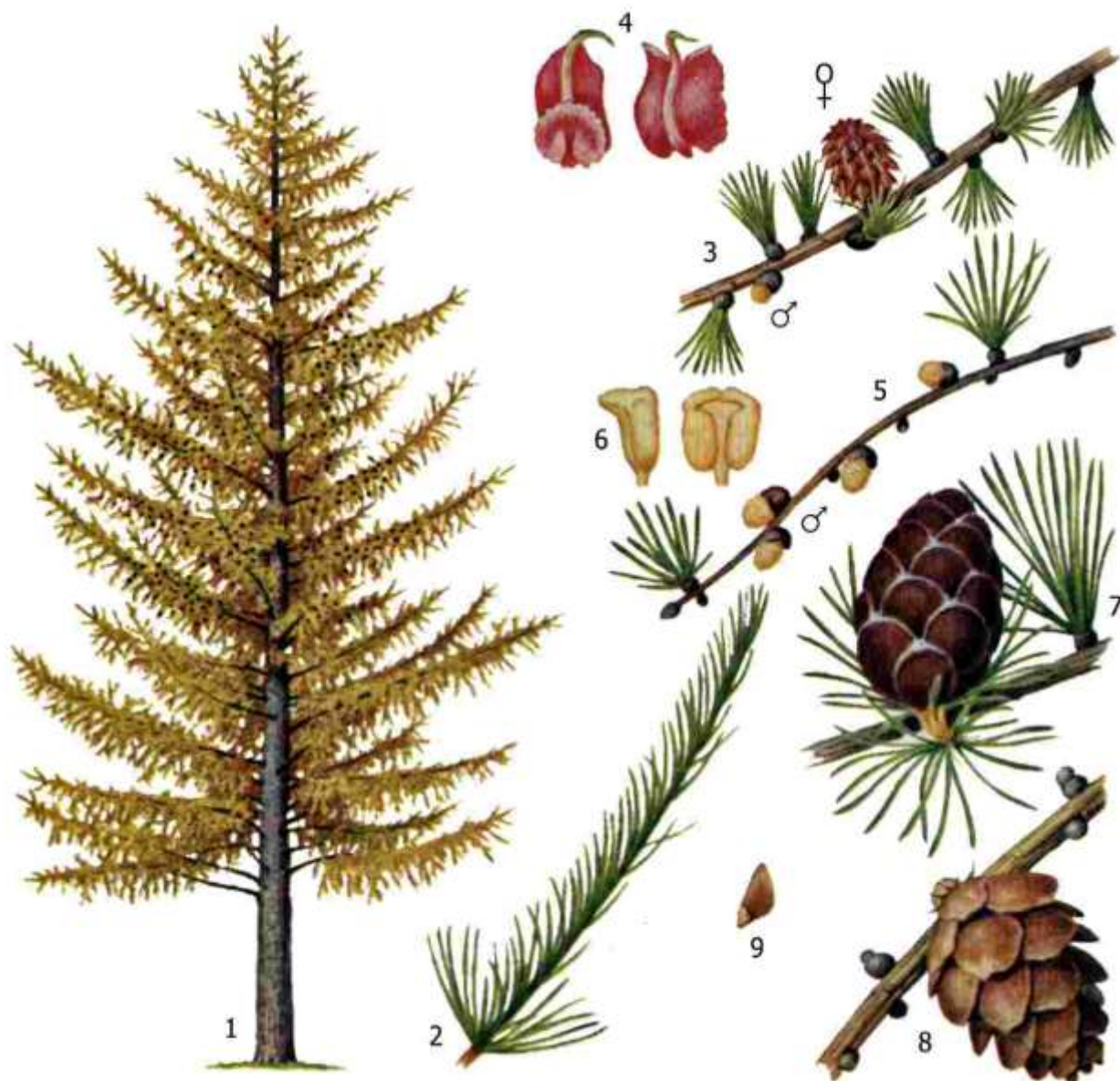


Figure IV Larch tree (1), Elongated sprout (2), Branch with spurs&needles (3), Macrostrobilus (4), Branch with microstrobilus (5), Microstrobilus (6), Formed cone (7), Ripe cone (8), Seed (9)

The European larch has many qualities that recommend it for landscaping and conservation plantings. It grows faster than most other conifers when planted in the open on moist, well-drained soils, often exceeding a height of 40 feet in 20 years. Larch is also wind-firm, is relatively free of disease, and grows well on moderately calcareous soils. However, it should not be planted on wet, extremely dry, or highly calcareous soils; and it is sensitive to soil compaction and drought. Its height at maturity may be 75 feet or more.

The larch is native to the Carpathians and forms stands in the forest-steppe zone. Its wood is hard, heavy, strong, and durable; it is used for poles, posts, and boats.

Vocabulary

Linear <i>a</i>	подібний до лінії – вузький і довгий
Slender <i>a</i>	тонкий, стрункий, слабкий
Petiole <i>n</i>	черешок (листка)
Tufted <i>p.p.</i> від tuft	пучкуватий, пучковидний
Spur <i>n</i>	паросток, укорочений пагін
Held <i>p. p.</i> від hold	тримати, держати, вміщувати
Upright <i>adv</i>	вертикально, сторчма
Vare <i>a</i>	голий
Taper <i>v</i>	звужувати, загостряти, звужуватися на кінці
Compliment <i>v</i>	доповнювати
Emerge <i>v</i>	несподівано з'являтися, виникати
Hue <i>n</i>	відтінок
Graceful <i>a</i>	граційний, граціозний
Texture <i>n</i>	текстура, структура
Blaze <i>n</i>	полум'я, спалах, виблиск
Onset <i>n</i>	натиск, напад, початок
Wind-firm <i>a</i>	вітростійкий
Calcareous <i>a</i>	вапнистий (грунт)

I. Complete the following sentences according to the text

1. In winter the European larch is as ... as any broadleaf tree.
2. When spring arrives, its branches are decorated ... cones.
3. The European larch has many qualities that recommend it for ...
4. It grows ... than most other conifers when planted in ... soils, often exceeding a height of ... feet in ...years.
5. Larch is also ..., is relatively ... disease, and grows well ...soils.
6. However, it should not be planted on ..., or highly ... soils; and it is sensitive to soil ... and

II. Make up questions based on the main facts and figures mentioned in the text

III. Say whether the following statements are true or false. Correct the false ones

1. When spring arrives, its branches are decorated with large, brown cones.
2. Its leaves are oval and very wide, without petioles, 3/4 to 1/4 inches long,

deciduous; spirally arranged on twigs.

3. The European larch is not recommended for landscaping and conservation plantings.
4. It grows slowly than most other conifers when planted in the open on moist, well-drained soils.
5. Larch should be planted on wet, extremely dry, or highly calcareous soils; and it is not sensitive to soil compaction and drought.

IV. Answer the questions

1. Is the European larch deciduous or coniferous tree?
2. What gives a graceful fine-textured appearance to the European larch in summer?
3. What soils should it be planted on?
4. Where does the European larch grow in Ukraine?

OAK

Look through the text and 1) say what information concerning this tree you can get from it; 2) find the paragraph where flowers of oaks are described; 3) find the information about their sensibility to changes in the woodland environment.

No tree is better known or more admired in Ukraine than the Common oak, which has grown there since before history began. It is widely distributed across the northern part of our country: in the Polissia and the forest-steppe zones.

The oak belongs to a family, which includes the sweet chestnut and beech and is of the genus, or group, *Quercus*.

No other group of trees is more important to people and wildlife. Acorns, the nuts of oaks, are a dietary staple of animals and songbirds. Pheasants, quail, wood ducks, squirrels, wild boars, jays, nuthatches and several kinds of wood peckers are a few of the species that depend on acorns for a significant part of their diet. These trees are also valuable as shelter and nesting cover.

The tiny green or yellowish flowers of oaks appear when the leaves are unfolding in spring. Male and female flowers grow on the same oak, the males being clusters of catkins. The female flowers, which are located in the axils of the leaves, occur singly or in small clusters. Wind carries pollen from the male flowers to the female ones, which later form the acorns. Both sexes of flowers may occur on the same twigs. The flowers come out at the same time as the wavy-edged leaves. Oak leaves come in a variety of shapes and sizes. Their shapes may also vary from tree to tree within a species and even on a single tree, so identification must often be based on buds and acorns.

The bark of young oaks is smooth, but with the passing years it becomes thick and furrowed. It is hard to realize while looking at a magnificent oak, well over 100 feet tall and measuring 12 feet or more round the trunk that it grew from an acorn.

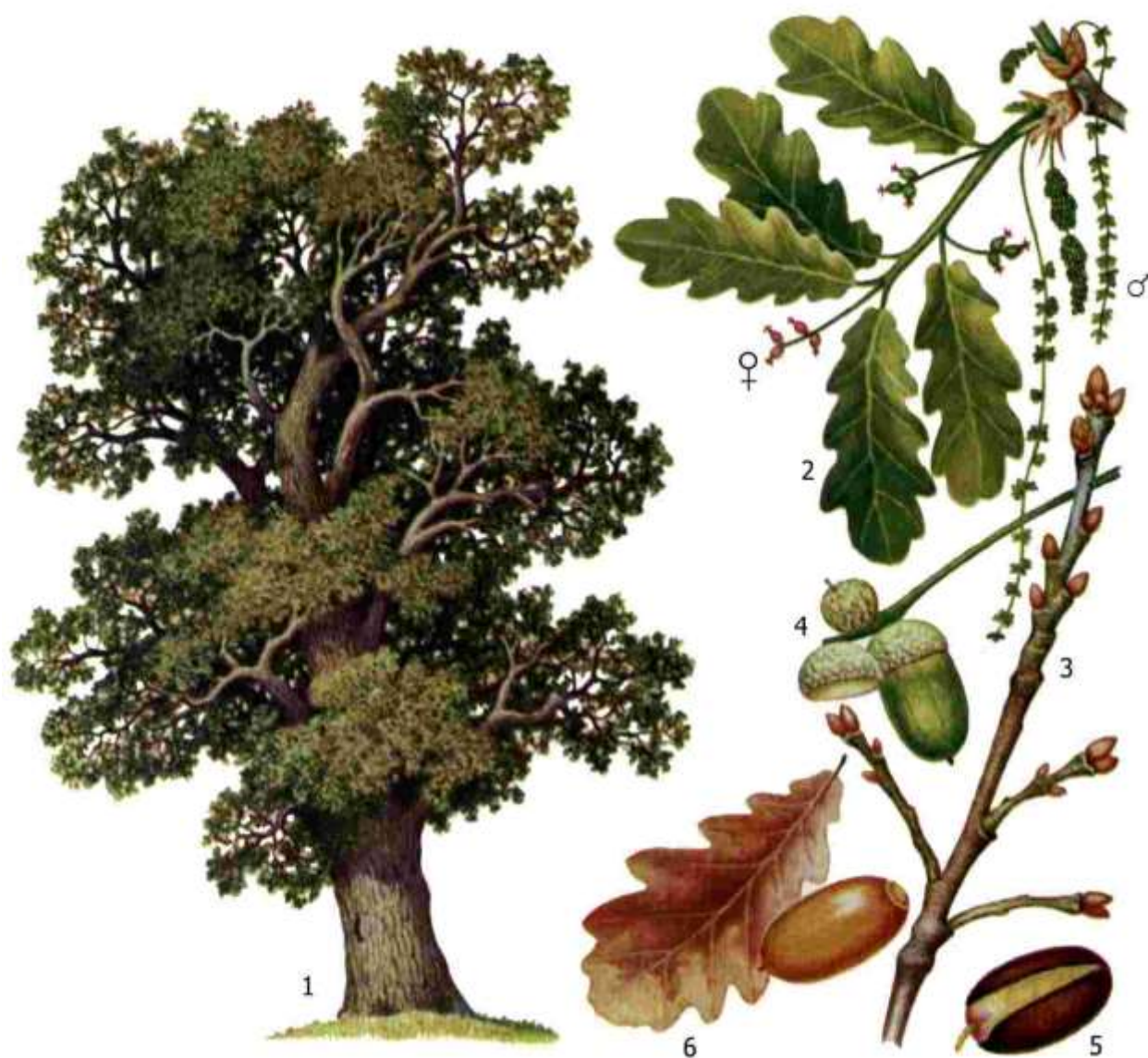


Figure V Common Oak tree (1), Blooming branch (2), Spring sprout (3), Acorns with stem (4), Germinated acorn (5), Leaf (6)

It is said that oak trees can live 2000 years. An oak in the village of Cow Thorpe in Yorkshire is said to be as old as Christianity. Although these trees are normally long-lived and durable they can be very sensitive to changes in their woodland environment. When buildings and roads are constructed in wooded areas containing oaks, it is especially important to minimize disturbance to the forest soil. Injury to the root system through digging, filling, or soil compaction can cause the decline and even death of a mature tree, even if no harm is done to the trunk and branches.

The commercial importance of oaks is due to their hard, strong and heavy wood. The list of products manufactured from oak is almost endless; its most important uses include furniture, veneer, railroad ties, mine timbers. Oak is also an excellent fuel.

Vocabulary

Acorn <i>n</i>	жолудь
Dietary <i>a</i>	дієтичний
Staple <i>n</i>	основний продукт
Pheasant <i>n</i>	фазан
Quail <i>n</i>	перепел
Nuthatch <i>n</i>	поповзень
Jay <i>n</i>	сойка
Wild boar <i>n</i>	дикий кабан
Cluster <i>n</i>	китиця (суцвіття)
Catkin <i>n</i>	сережка (форма суцвіття)
Pollen <i>n</i>	пиллок
Wavy <i>a</i>	хвилястий
Edge <i>n</i>	край
Smooth <i>a</i>	гладенький, рівний
Furrow <i>v</i>	борознити, зморщувати
Magnificent <i>a</i>	пишний, розкішний
Christianity <i>n</i>	християнство
Disturbance (of soil) <i>n</i>	порушення (структури ґрунту)
Injury <i>v</i>	пошкодження
Dig <i>v</i>	копати
Filling <i>n</i>	навантаження, насип
Compaction <i>n</i>	уцільнення
Barrel staves <i>n</i>	дошки для діжок
Flooring <i>n</i>	настил, підлога
Tie <i>n</i>	шпала
Durable <i>a</i>	міцний, стійкий, тривкий
Cause <i>v</i>	спричиняти
Decline <i>n</i>	погіршення, нахил

I. Fill in the blanks with the appropriate words from the list given below

1. Acorns, the nuts of oaks, are a dietary ... of animals and songbirds.
2. These trees are also ... as shelter and nesting cover.
3. Male and female flowers grow on the same oak, the males being ... of The female flowers, which are located in the ... of the leaves, occur singly or in small clusters.
4. The flowers come out at the same time as the ... leaves.
5. The bark of young oaks is smooth, but with the passing years it becomes thick and ...
6. Injury to the root system through ..., filling, or soil ... can cause the ... and even death of a mature tree.
(axils, furrowed, staple, catkins, valuable, clusters, compaction, decline, digging, wavy-edged)

II. Find the sentences with the Absolute Participle Construction and Complex Subject in the text.

III. Answer the following questions

1. Where does the Common oak grow in our country?
2. What genus does it belong to?
3. Is the oak very important to people and wildlife? Give your reason.
4. When do the flowers of oaks appear? Do male and female flowers grow on the same oak?
5. How are the acorns formed?
6. What is the shape of leaves?
7. How long do oaks live?
8. Is their root system very sensitive to the soil compaction?

BEECH

Look through the text and 1) say what each of paragraphs is about; 2) find the sentences about its root system.

The name “beech” has a very ancient origin and signifies “book”. It is said that the early writings of the Germanic peoples were inscribed upon tablets of this wood. Gutenberg printed the first Bible from movable type carved from beech wood.

The beech is one of the most distinctive trees of the hardwood forest in the Polissya; its smooth blue-grey trunk is easily recognized, even at some distance. Beech trees eventually attain a height of 70 to 80 feet. The root system is shallow and extensive and has a tendency to produce sprouts. The tree requires much more moisture for growth and transpiration than many other hardwoods. Beech trees are not usually

found on soils where the surface layers dry out quickly or are subject to prolonged flooding. They may do very well in a cool, sheltered location where the soil is moist but well drained. However, even under the best conditions growth is slow. Large crops of seed may be produced at 2- to 3-year or longer intervals. This tree may attain an age of 300 to 400 years, but old trees are usually affected by butt rot.

There is no forest tree richer in leaves than the beech. They make a canopy so thick that few plants can get enough light to grow underneath, although there is a special kind of fungus which grows among the roots. The young leaf-blades have silky hairs and the female flowers, which grow on the same trees as the pollen-bearing male ones, but higher up, form what is known as beech mast—three-sided dark brown nuts which fall from their prickly husks in the autumn. Beech fruit, or beech mast, is used in Europe for fattening hogs and as a source of vegetable oil.

Beech wood is hard, heavy, and strong but not naturally durable. It is used for the bent parts of furniture, food barrels, charcoal, pulp, and many other products.



Figure VI Beech Tree (1), Spring branch with male&female spikes (2), Summer branch (3), Opened fruitbearer (4), Fruits (5)

Vocabulary

Beech <i>n</i>	бук
Origin <i>n</i>	походження

Signify <i>v</i>	означати
Inscribe <i>v</i>	надписувати, писати, креслити (на дереві)
Tablet <i>n</i>	дощечка (з надписом)
Bible <i>n</i>	біблія
Movable <i>a</i>	рухомий, переносний
Type <i>n</i>	<i>полігр.</i> набір, шрифт
Carve <i>v</i>	вирізати (з дерева)
Eventually <i>adv.</i>	в кінці кінців, з часом
Shallow <i>a</i>	мілкий, поверхневий
Extensive <i>a</i>	розлогий
Sprout <i>n</i>	паросток, пагін
Transpiration <i>n</i>	випаровування
Flooding <i>n</i>	повінь, повідь
Drain <i>v</i>	дренажувати, осушувати (грунт)
butt rot <i>n</i>	комлева гниль
Canopy <i>n</i>	полог крони
Underneath <i>adv</i>	внизу, під
Fungus <i>n</i>	грибок
Leaf-blade <i>n</i>	листова пластина
Silky <i>a</i>	шовковистий, м'який
Mast <i>n</i>	насіння лісових дерев, придатних для відгодівлі
Prickly <i>a</i>	колючий
Husk <i>n</i>	шкаралупа, лущпиння
Fatten <i>v</i>	відгодовувати

I. Complete the following sentences according to the text

1. It is said that the early writings of the Germanic peoples ... upon ... of this wood.
2. Beech trees ... a height of 70 to 80 feet. The root system is ... and ...and has a tendency to produce sprouts.
3. Beech trees are not usually found on soils where the surface layers dry out quickly or are subject to prolonged
4. This tree may ... an age of 300 to 400 years, but old trees are usually ... by
5. They make a ... so thick that few plants can get enough light to grow ...

6. The young ... have silky hairs and the female flowers, which grow on the same trees as the ... ones.

II. Ask questions to which these sentences are the answers

The beech is one of the most distinctive trees of the hardwood forest in the Polissya; its smooth blue-grey trunk is easily recognized, even at some distance. Beech trees eventually attain a height of 70 to 80 feet. The root system is shallow and extensive and has a tendency to produce sprouts.

Large crops of seed may be produced at 2- to 3-year or longer intervals. This tree may attain an age of 300 to 400 years, but old trees are usually affected by butt rot.

III. Answer the questions

1. What does the name "beech" signify?
2. Where does this tree grow in our country?
3. Is it easily recognized in the forests? Why?
4. What soils do beeches usually grow on?
5. How is the beech fruit named? Describe it.
6. How is its wood used?

BIRCH

Look through the text and 1) say what new information you have got; 2) provide each paragraph with a suitable heading.

One of the most graceful of the woodland trees is the birch, which belongs, like the alder, to the Betulaceae family. It is widely distributed throughout the country, especially in the Polissya and forest-steppe zones. The beautiful, chalky white bark of this tree is its most distinctive feature.

Birch leaves are golden in spring, very green during the summer and yellow in the autumn, after which they fall and make good leaf-mould. The flowers are in the form of catkins and the male ones stay on the tree during the winter to scatter their pollen in the wind the following spring when the female flowers are out to receive it. The females then produce tiny winged fruits, often called seeds, and these are sometimes carried long distances by the wind, which is one reason why birches are found in so many places.

The bark's strength, lightweight, and ability to repel water were greatly appreciated by Native Americans in the Great Lakes states, who used it for making birch bark canoes. The bark is also prized because it can be used to start a campfire when everything is wet. It is excellent firewood. Unlike most of the other woodland trees the silvery-white bark peels off in thin layers round the trunk. However, peeling the bark from living birches makes their trunks turn black and may injure the trees. The twigs of the white birch are smooth and hairy but those of the silver birch are warty.

If they have room to grow, silver and white birches will rise to a height of 60 or 70 feet, but a third kind, the dwarf birch, is only a shrubby, creeping plant found on open mountainsides.

The wood of birches is used for pulp, lumber, and small articles such as toothpicks, spools and handles. The trunk, being waterproof, can be made into piles for supporting bridges; when skilfully used it also makes an excellent charcoal. There are many kinds of birch in the world and the wood of some can be polished until it looks like mahogany.

Birch wood is also used in the making of plywood.

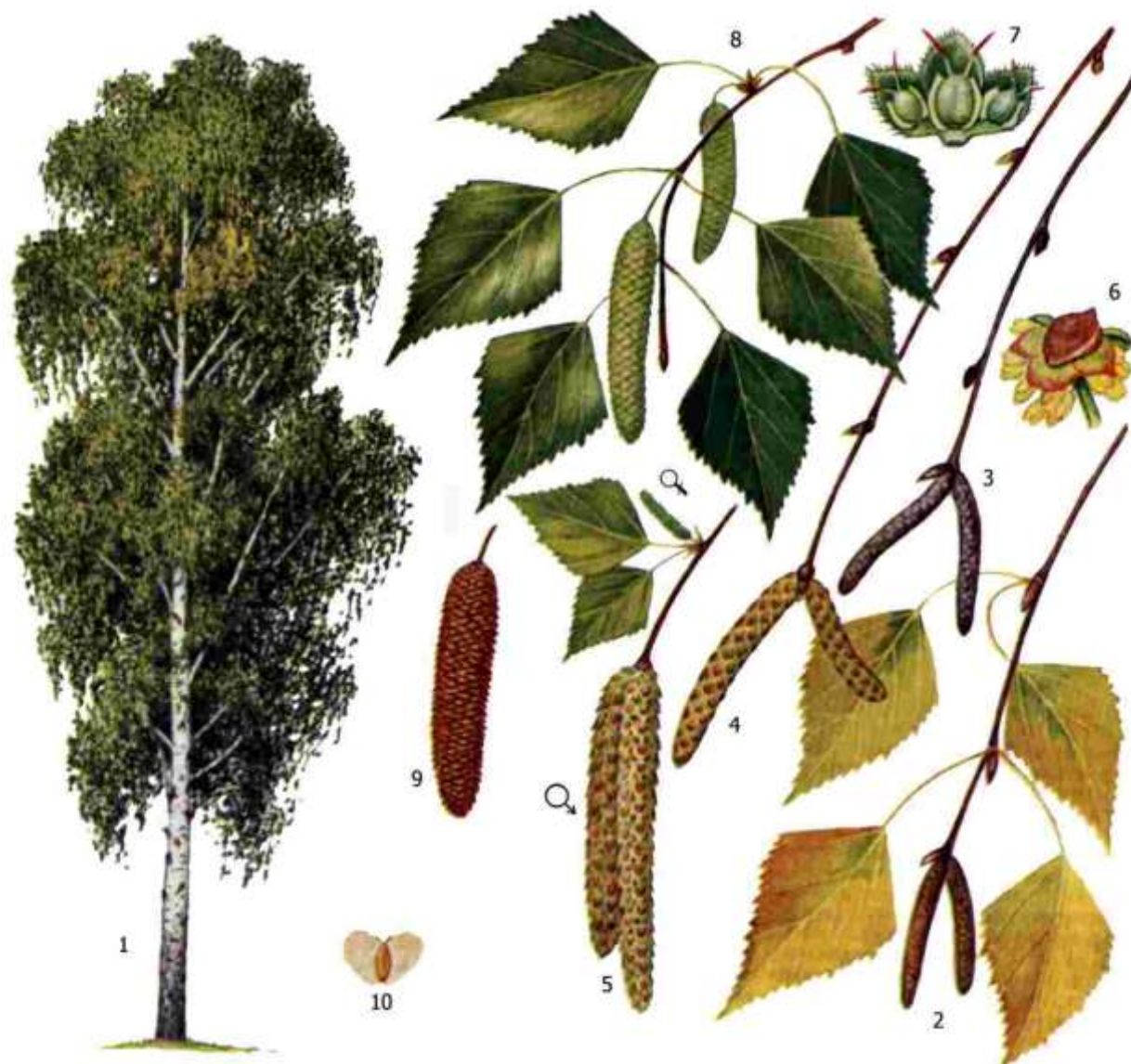


Figure VII Birch Tree (1), Autumn branch with hocked leaves&stamen buds (2), Winter branch (3), Spring branch with growing buds (4), Branch with stamen&pistil catkins during pollination (5), Male flower (6), Female flower (7), Branch with fruit catkins (8), Ripe catkin (9), Fruit – winged nut (10)

Vocabulary

Graceful *a*

граціозний

Peel <i>v</i>	чистити, дерти, обдирати
Layer <i>n</i>	шар, пласт
Hairy <i>a</i>	волохатий, ворсистий
Wart <i>n</i>	бородавка
Mould <i>n</i>	перегній
Scatter <i>v</i>	розкидати, розсіювати
Tiny <i>a</i>	крихітний
Wing <i>n</i>	крило
Room <i>n</i>	<i>перен.</i> можливість
Creep <i>v</i>	повзти, стелитися
Skilfully <i>adv</i>	уміло, вправно
Polish <i>v</i>	полірувати, шліфувати
Mahogany <i>n</i>	червоне дерево
Floor-board <i>n</i>	дошка для підлоги
Canoe <i>n</i>	каное, байдарка
Article <i>n</i>	предмет, річ
Spool <i>n</i>	катушка, коток
Toothpick <i>n</i>	зубочистка
Handle <i>n</i>	ручка, держак

I. Fill in the blanks with the appropriate words from the list given below

1. Birch leaves are golden in spring, very green during the summer and yellow in the autumn, after which they fall and make good
2. The females then produce tiny ... fruits, often called seeds.
3. Unlike most of the other woodland trees the silvery-white bark ... in thin layers round the trunk.
4. The twigs of the white birch are ... and hairy but those of the silver birch are
5. The trunk, being waterproof, can be made into ... for supporting bridges; when skilfully used it also makes an excellent
6. (waterproof, charcoal, winged, peels off, piles, smooth, leaf-mould, warty).

II. Put the questions to paragraph 2 and answer them

III. Translate and analyse the following sentences. (Grammar revision)

1. If they have room to grow, silver and white birches will rise to a height of 60 or

70 feet, but a third kind, the dwarf birch, is only a shrubby, creeping plant found on open mountainsides.

2. The trunk, being waterproof, can be made into piles for supporting bridges; when skilfully used it also makes an excellent charcoal.
3. There are many kinds of birch in the world and the wood of some can be polished until it looks like mahogany.

IV. Answer the questions.

1. What family does the Birch belong to?
2. Where does it grow in our country?
3. What is its most distinctive feature?
4. What is the form of the flowers?
5. What kind of fruits do they produce?
6. What characteristic features does its bark have?
7. What is the difference between twigs of the white birch and silver birch?
8. How is birch wood used?

ALDER

Look through the text and 1) say what each of paragraphs is about; 2) find the paragraph where its root system is described.

The alder is native to the forest-steppe zone and the Polissya where it occurs mainly in low-lying meadows with soggy ground and floodplains. This tree has a rough black bark and blunt leaves and belongs to the same family as the birch. The flower buds are formed in the autumn and open out before the leaves in the following spring; the male flowers are drooping, reddish catkins but the female ones are small and oval. The leaves are a handsome dark, glossy green throughout the summer and fall, with little colour change in autumn. Of all the trees that love the banks of rivers and streams none is more attractive than the alder. It grows to 70 feet in height and develops an irregularly ovoid or oblong crown; among its roots otters make their homes. The alder is a soil-improving species like the legumes because its roots have nodules of nitrogen-fixing microorganisms, and large quantities of nitrogen compounds are added to the soil from the roots and decaying leaves.

Legend says that there were once two fishermen who would not spare the time to worship a certain goddess, so she turned one into the weeping willow and the other into the alder. The wood turns red when it is cut and a German legend says that this is because it sheds tears of blood.

The wood does not rot quickly in water and that may be why the very first boats were made from it; it is certainly the reason for using alder piles to support bridges.

Clogs, wooden shoes and plywood are made from the wood, and furniture makers love it because it polishes so well. The bark is useful in tanning leather and making coloured dyes.

Do not confuse the alder with the elder, which is a different tree, although its name is similar.

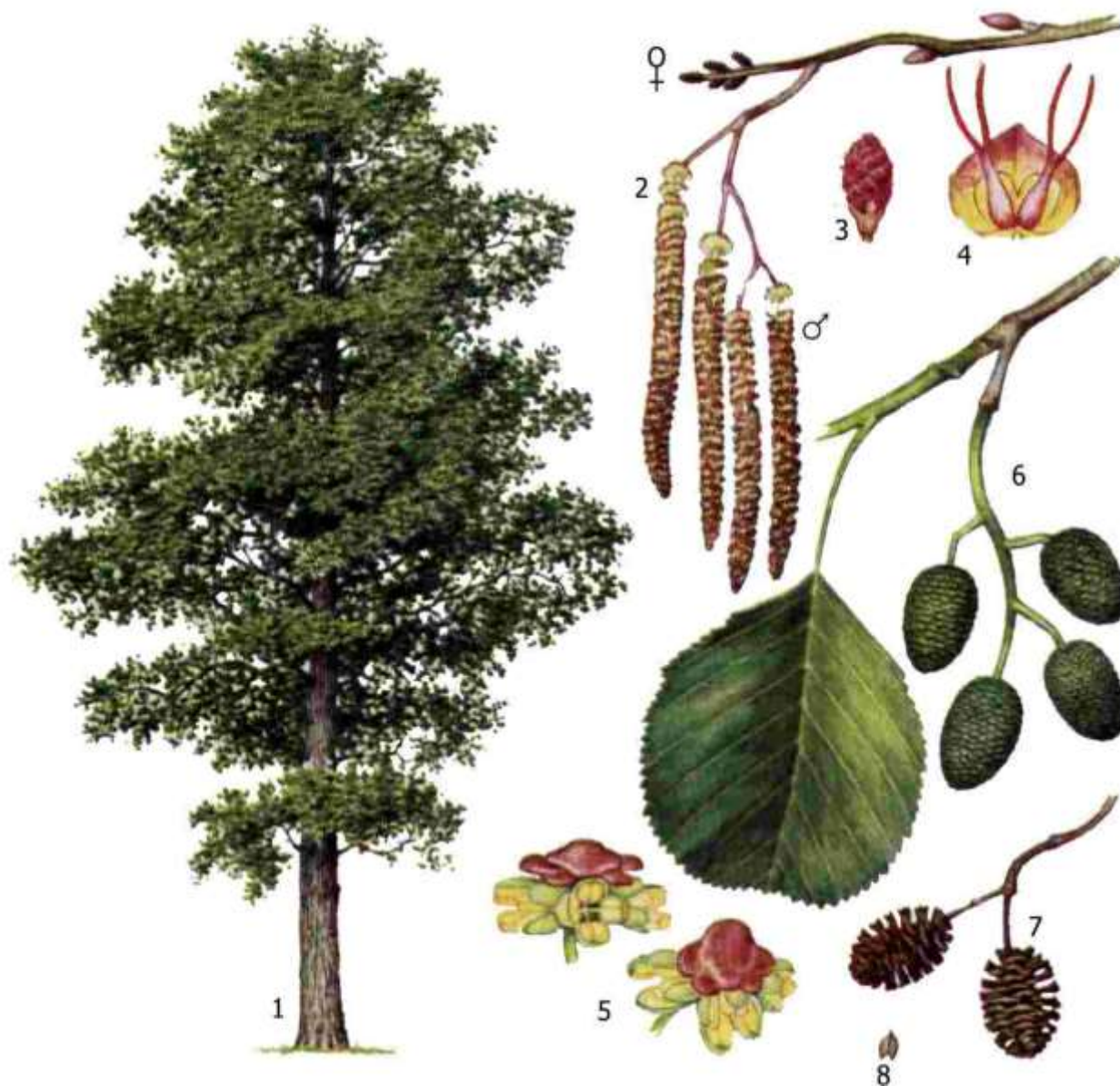


Figure VIII Alder Tree (1), Branch with male&female spikes (2), Female spike (3), Female flower (4), Male flowers (5), Branch with no opened cones (6), Opened cones (7), Seed (8)

Vocabulary

Alder <i>n</i>	вільха
Soggy <i>a</i>	вологий, мокрий
Rough <i>a</i>	грубий, шершавий
Blunt <i>n</i>	тупий, округлий

Droop <i>v</i>	в'янути
Glossy <i>a</i>	глянсуватий
Reddish <i>a</i>	червонуватий
Ovoid <i>a</i>	яйцеподібний
Oblong <i>a</i>	довгастий
Nodule <i>n</i>	вузлик, нарiст
Nitrogen <i>n</i>	азот
Otter <i>n</i>	видра
Worship <i>v</i>	поклонятися
Goddess <i>n</i>	богиня
Tear <i>n</i>	сльоза
Rot <i>v</i>	гнити
Pile <i>n</i>	паля
Clog <i>n</i>	черевик (на дерев'яній подошві)
Dye <i>n</i>	фарба
Hoary <i>n</i>	вкритий iнеєм, сивий
Tan <i>v</i>	дубити, вичинювати шкіру
Leather <i>n</i>	шкіра
Confuse <i>v</i>	переплутувати
Elder <i>n</i>	бузина

I. Fill in the blanks with the appropriate words from the text

1. The alder is native to the forest-steppe zone and the Polissia where it occurs mainly in ... meadows with ...ground and floodplains.
2. This tree has a ... black bark and ... leaves and belongs to the same family as the birch.
3. The male flowers are ... , reddish catkins but the female ones are small and oval.
4. It grows to 70 feet in height and develops an irregularly ... or ... crown.
5. Its roots have ... of nitrogen- fixing microorganisms, and large quantities of nitrogen ... are added to the soil from the roots and ...leaves.
6. (drooping, soggy, nodules, low-lying, blunt, compounds, ovoid, decaying, rough, oblong)

II. Say whether the following statements are true or false. Correct the false ones

1. It occurs mainly in high-lying meadows with dry ground and floodplains.

2. This tree has a light bark and blunt leaves and belongs to the same family as the beech.
3. It grows to 70 feet in height and develops an irregularly ovoid or oblong crown; among its roots otters make their homes.
4. The wood rots quickly in water and that's why it cannot be used in manufacture of boats.

III. Answer the questions

1. Where does the alder mainly occur? What zone is it native to?
2. What kind of bark and leaves does it have?
3. What family does it belong to?
4. Why is the alder considered to be a soil-improving species?
5. What peculiarity does its wood have? How is it used?

ASPEN

Look through the text and say 1) what information relating to this species you have got; 2) what family does it belong to.

This beautiful tree is sometimes called the trembling poplar, because its rounded leaves hang on such slender stalks that they quiver in the slightest breeze. The flowers hang in long catkins and the bark is whitish grey and smooth. The aspen grows to 40 or 50 feet in height and it is found in woods and hedgerows. It grows rapidly, tolerates a wide variety of soils, and has ornamental value at all times of the year so that one might expect it to be a useful and popular tree for landscaping.

Unfortunately, it has a number of faults that discourage its use for street and yard plantings. The aspen often reproduces rapidly by root suckers that form dense thickets if not cut repeatedly. It is short lived, with an average life span of only 50 years; is subject to attack by a number of diseases and insect pests; and its small, open crown provides meagre shade. Botanists speak of aspens as pioneer trees because their small seeds are blown great distances by the wind and germinate readily in open, sunny areas resulting from fire or human disturbance.

Aspen wood is light, soft, weak, and usually pale in colour. It is used for pulp, excelsior, boxes, crates, matches, and many other products.

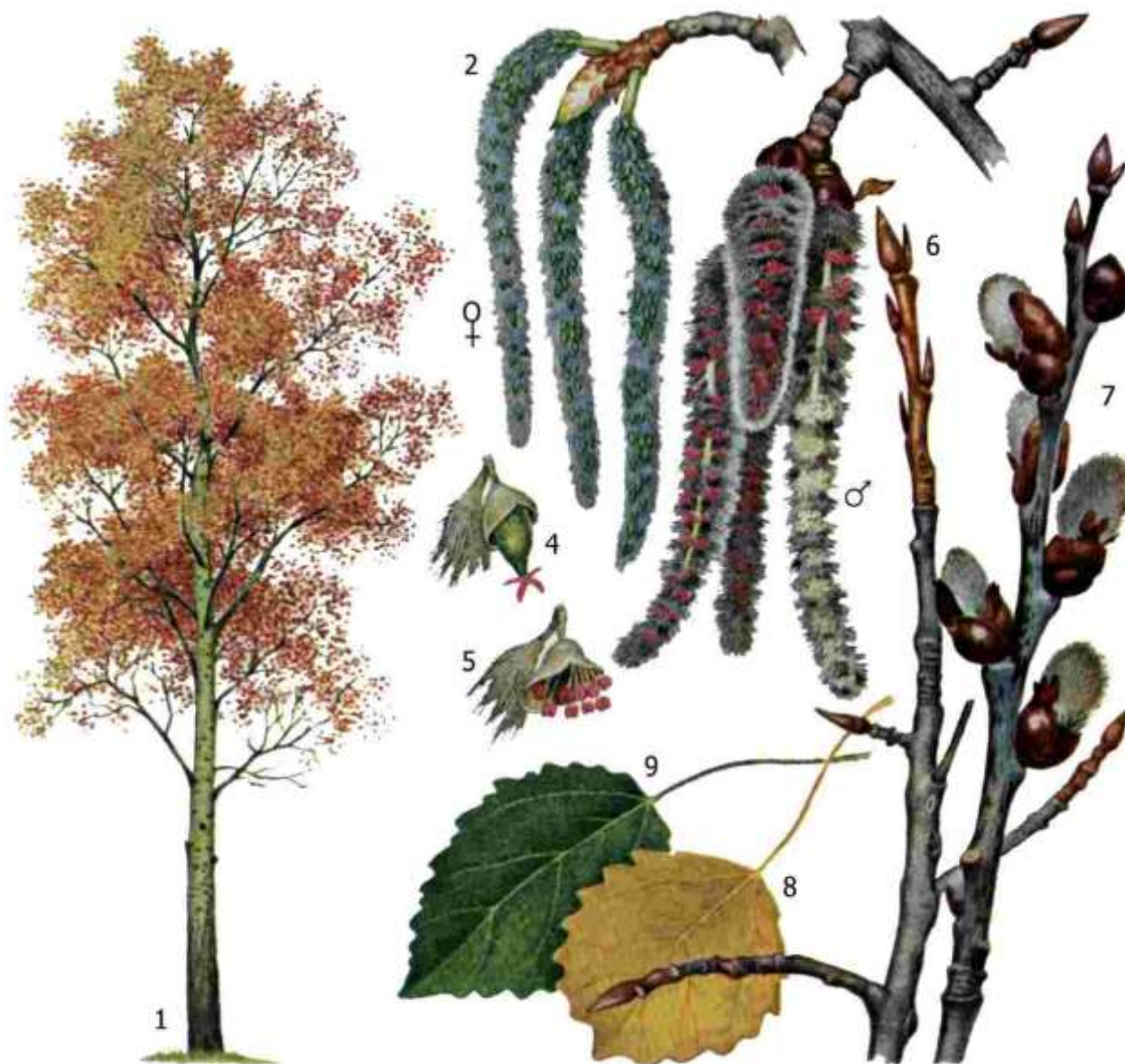


Figure IX Aspen Tree (1), Blooming sprout (female catkins) (2), Blooming sprout (male catkins) (3), Female flower (4), Male flower (5), Winter sprout (6), Spring sprout (7), Leaf of a tree (8), Leaf of shoot (sprout) (9)

Vocabulary

Trembling <i>a</i>	тремтячий, тріпотливий
Aspen <i>n</i>	осика
Hang <i>v</i>	висіти
Slender <i>a</i>	тонкий, гнучкий
Stalk <i>n</i>	стебло
Quiver <i>v</i>	тремтіти, дрижати, тріпотіти
Slight <i>a</i>	легкий, слабкий (вітер)
Breeze <i>n</i>	легкий вітерець

Whitish <i>a</i>	білуватий, білястий
Hedge <i>n</i>	огорожа, живопліт
Tolerate <i>v</i>	терпіти, переносити
Span <i>n</i>	короткий проміжок часу
Fault <i>n</i>	вада, хиба
Discourage <i>v</i>	бентежити, відбивати бажання
Sucker <i>n</i>	бот. паросток, бічний пагін
Attack <i>v</i>	уражати (хворобою), піддаватися нападу
Pioneer <i>n</i>	піонер, перший поселенець
Germinate <i>v</i>	проростати
Meagre <i>a</i>	недостатній, бідний, мізерний
Excelsior <i>n</i>	деревна стружка для упакування
Crate <i>n</i>	пакувальна клітка або кошик

I. Complete the following sentences according to the text

1. This beautiful tree is sometimes called the trembling poplar, because its rounded leaves hang ... stalks that they quiver ... breeze.
2. It grows rapidly, ... a wide variety of soils, and has ... value at all times of the year so that one might expect it to be a useful and popular tree for landscaping.
3. The aspen often reproduces rapidly by ... that form dense thickets if not cut repeatedly.
4. Its small, open crown provides
5. Botanists speak of aspens as pioneer trees because their small seeds are ... great distances by the wind and ... readily in open, sunny areas resulting from fire or human disturbance.

II. Answer the questions

1. What is the aspen's second name?
2. Why is it called trembling poplar?
3. How does the aspen often reproduce?
4. Why is it not recommended for street and yard plantings?
5. Why do botanists speak of aspens as pioneer trees?
6. How is its wood used?

WHITE POPLAR

Look through the text and 1) find the paragraph with the description of the features of this species; 2) say how does it differ from the other deciduous trees.

The White poplar has many of the qualities one looks for in a shade or ornamental tree, but unfortunately it has an equally large number of shortcomings that limit its value for landscaping. It grows rapidly, reaches a large size, and has a broad, spreading crown; but like most other poplars it is very short lived. Its leaves are simple, alternate, oval to nearly round in outline, 3 to 5 lobed or with a few irregularly sized teeth, 2 to 5 inches long; lower surface and petiole having a white, feltlike coating. Winter twigs are slender to moderate in diameter, olive-green to grey, densely covered with a white, feltlike material that can easily be rubbed off; leaf scars similar to quaking aspen. Buds ovoid, the terminal is $\frac{1}{8}$ to $\frac{1}{4}$ inch long and the laterals are often of two sizes, divergent from the twig; bud scales are brown, partially to completely covered with white hairs. Although its bark and foliage are among the most attractive of our trees, its brittle branches are often broken during storms. It adapts well to city life, but its roots often clog drains. Perhaps its most serious flaw is its tendency to spread aggressively by root suckers, especially after the aboveground portion of the tree has died. As in other poplars, the tiny, inconspicuous flowers of this species are arranged in elongate clusters called catkins.



Figure X White Poplar (1), Leaf (2), Spring sprout (3), Stem (4), Bark (5)

These appear in early spring, long before the leaves. An individual catkin is composed of either male or female flowers but never both, and the male (staminate) and female (pistillate) catkins occur on separate trees. Most white poplars found in Ukraine are female. Each of their flowers develops into a tiny, flask-shaped capsule containing numerous cottony, wind-blown seeds. The seeds often become a nuisance when they are dispersed in late spring and early summer. The relatively innocuous catkins of male trees release pollen and fall from the trees before the leaves are full-grown.

Vocabulary

Shortcoming <i>n</i>	недостача, вада, недолік
Outline <i>n</i>	обрис, контур
Petiole <i>n</i>	бот. черешок листка
Felt <i>n</i>	фетр, повсть
Rub off <i>v</i>	стиратися
Scar <i>n</i>	рубець
Ovoid <i>a</i>	яйцеподібний
Diverge <i>v</i>	розходитися
Brittle <i>a</i>	крихкий, ламкий
Clog <i>v</i>	перешкоджати
Drain <i>n</i>	водостік
Flaw <i>n</i>	недолік, вада
Staminate <i>a</i>	наділений тільки тичинками
Pistillate <i>a</i>	бот. маточковий
Capsule <i>n</i>	бот. насіннева коробочка
Nuisance <i>n</i>	перешкода, неприємність, незручність
Disperse <i>v</i>	розганяти, розповсюджувати, розсіювати

I. Fill in the blanks with the suitable word combinations given below

1. Unfortunately, it has an equally large number of ... that limit its value for landscaping.
2. Buds ovoid, the terminal is 1/8 to 1/4 inch long and the laterals are often of two sizes, ... from the twig.
3. Bud scales are brown, partially to completely ... white hairs.
4. As in other poplars, the tiny, ... flowers of this species are arranged in elongate clusters called catkins.
5. Each of their flowers develops into a tiny, flask-shaped ... containing numerous

cottony, wind-blown seeds.

6. The seeds often become ... when they are ... in late spring and early summer.
7. The relatively ... catkins of male trees release pollen and fall from the trees before the leaves are full-grown.
8. (divergent, innocuous, dispersed, shortcomings, covered with, capsule, dispersed, nuisance, inconspicuous).

II. Ask questions to which these sentences are the answers

1. Its leaves are simple, alternate, oval to nearly round in outline, 3 to 5 lobed or with a few irregularly sized teeth, 2 to 5 inches long; lower surface and petiole having a white, feltlike coating.
2. Winter twigs are slender to moderate in diameter, olive-green to grey, densely covered with a white, feltlike material that can easily be rubbed off; leaf scars similar to quaking aspen.
3. Buds ovoid, the terminal is 1/8 to 1/4 inch long and the laterals are often of two sizes, divergent from the twig; bud scales are brown, partially to completely covered with white hairs.
4. Although its bark and foliage are among the most attractive of our trees, its brittle branches are often broken during storms. It adapts well to city life, but its roots often clog drains.

III. Answer the other questions on the text

1. What are the shortcomings of the Poplar, which limit its value of landscaping.
2. How does it grow and what size does it reach.
3. What kind of leaves does it have?
4. How does the White poplar spread?
5. What is its catkin composed of?
6. What does its capsule enclose?

LOMBARDY POPLAR

The tall, spirelike Lombardy poplar is one of our most distinctive trees. Its rapid growth and narrow, compact crown have long made it popular for borders, screens, and wind breaks, although its usefulness is limited by its short life span. Trees seldom reach an age of 50 years even under ideal circumstances, and they are sometimes killed or disfigured at a much earlier age by cankers. The attractiveness of an unbroken row of Lombardy poplars is seldom maintained for very long.

Like aspens, and willows, its male and female flowers are borne on separate trees. Most of the Lombardy poplars used in landscaping are infertile males, propagated clonally

from cuttings. Female trees, which reportedly have a somewhat broader crown, are rarely seen in cultivation.

Poplars belong to the same genus, *Populus*, as our native aspens. The Lombardy and white poplars are the most commonly cultivated types in our country. Distinguishing characteristics of the Lombardy poplar: leaves are simple, alternate, triangular to broadly diamond shaped in outline, 1½ to 4 inches long, glabrous, with toothed margins and flattened petioles. Winter twigs are slender, glabrous, yellow or grey-green. Buds are ovoid, the terminal is 3/16 to 1/4 inch long and the laterals are slightly smaller; bud scales are brown, glabrous, and slightly sticky. Flowers, when present, in catkins. Fruits and seeds are absent. Bark is thin; light grey, smooth on branches. Crown is columnar, with ascending branches.

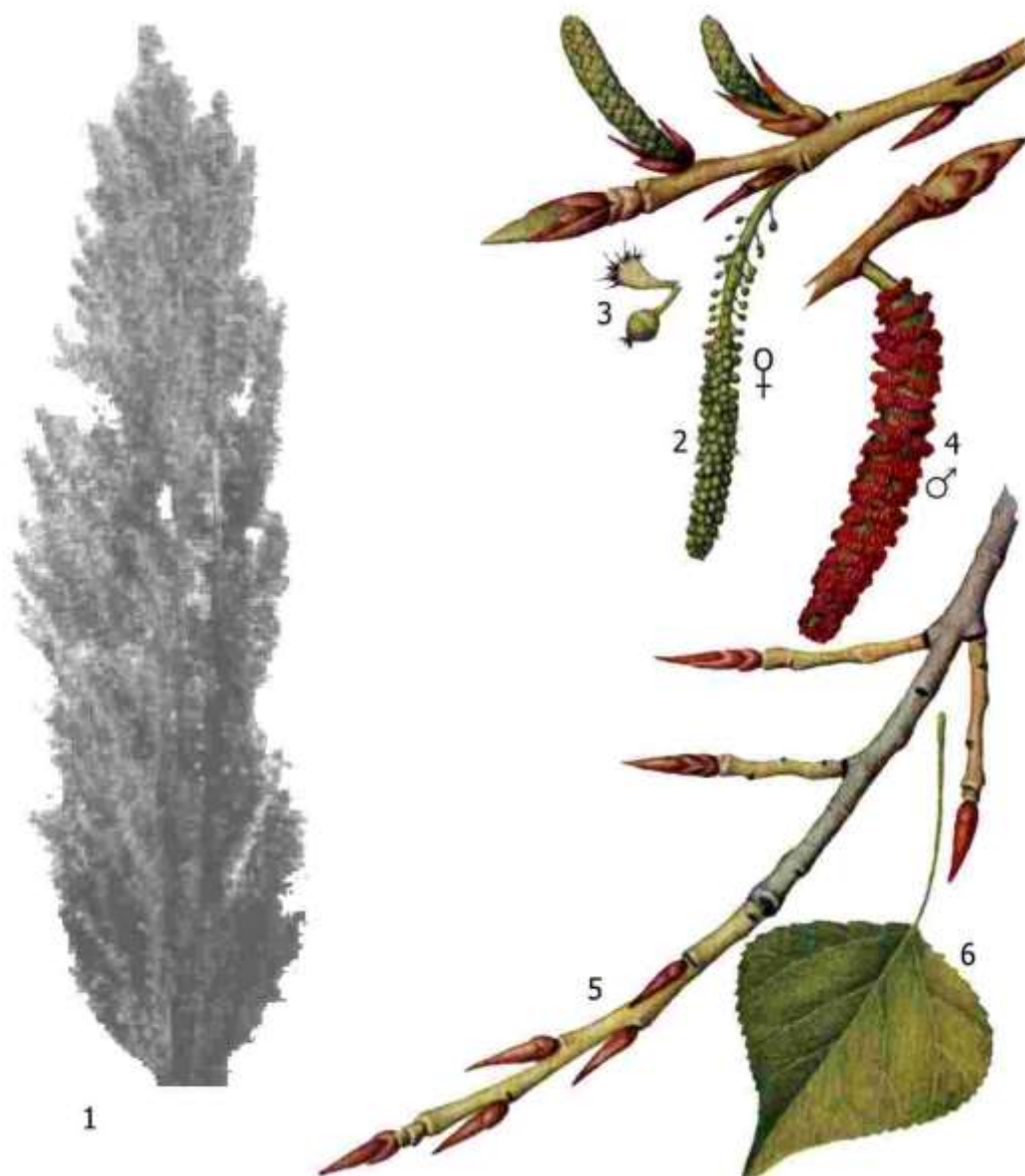


Figure XI Lombardy Poplar tree (1), Sprout with female catkin (2), Fruit (3), Sprout with male catkin (4), Shoot sprout (5), Leaf (6)

Vocabulary

Spire *n* шпиль, гостра верхівка, спіраль

Wind-break	<i>n</i>	вітрозахисна смуга
Span	<i>n</i>	короткий проміжок часу
Circumstances	<i>pl n</i>	умови, обставини
Disfigure	<i>v</i>	спотворювати, пошкоджувати, псувати
Unbroken	<i>a</i>	цілий, неперервний
Row	<i>n</i>	ряд
Infertile	<i>a</i>	не плодючий
Propagate	<i>v</i>	розмножувати(ся), розповсюджувати(ся)
Cloning	<i>n</i>	вегетативне розмноження
Diamond	<i>a</i>	ромбоподібний
Glabrous	<i>a</i>	гладенький
Sticky	<i>a</i>	липкий, клейкий
Ascend	<i>v</i>	підніматися, сходити

ASH

Look through the text and 1) say what species of this family grow in our country; 2) find the sentences, which explain the term "dioecious"; 3) say what each of the paragraphs deals with.

Two species of this family are widely distributed in our country: *Fraxinus excelsior* which mainly grows in the forest-steppe zone and forms clear stands there, and *Fraxinus viridis* growing in the steppes. This tree has a pale green bark, which becomes wrinkled with age. If there is lime in the soil, plenty of space to grow and some shelter from the wind, it may rival the oak by reaching a height of 80 feet, although its trunk is not so thick. It grows rather quickly, provides good shade, thrives in a variety of soils and environments, develops an irregular or rounded crown, and has attractive leaves that turn bright yellow in autumn. In winter the ash looks grey and the large buds are black. Small, purple clusters of flowers come before the leaves, which are broad and have a number of leaflets. Tennyson wrote of how the ash waits "to clothe herself when all the woods are green", and yet it is the first tree in the wood to lose its leaves in the autumn.

The ash is dioecious. This means that the male and female flowers occur on separate trees, so some trees never fruit. The female trees produce small, winged seeds that are rather like aircraft propellers, and they whirl long distances in the wind.

The ash has a romantic story. A Norse legend tells us that the god Odin made the first man from an ash tree, and that the gods ruled the earth from the shade of an ash whose branches reached to heaven. An eagle lived in the top branches, with a squirrel as his messenger, and serpents played among the long roots.

Ash wood is tough and light and will bend without breaking, which is why the Greeks used spears of ash. The Greek warrior Achilles is said to have killed Hector with one

in the Trojan War, while Cupid's arrows of love was supposed to be made of the same wood. The Cross on which Christ was crucified is said to have been partly made of ash. Nowadays ash is used for making cabinets, car bodies, chair bottoms and the bent parts of furniture, veneer, agricultural implements, boxes, barrels, wheel spokes, etc. Many kinds of sports equipment are made from ash—oars, baseball bats, tennis rackets, skis, polo and hockey sticks and the like. Few trees are so useful for such a variety of products.

Notes: 1. Odin - міф. Один; 2. Achilles - міф. Ахіллес; 3. Trojan War - троянська війна.

Vocabulary

Wrinkle <i>v</i>	зморщувати (ся)
Lime <i>n</i>	вапно
Shelter <i>n</i>	покрив, прикриття
Rival <i>n</i>	суперник
Thrive <i>v</i>	процвітати, буяти
Purple <i>a</i>	багряний, пурпурний
Leaflet <i>n</i>	пелюстка
Dioecious	дводомний
Aircraft <i>n</i>	літак
Whirl <i>v</i>	вертіти, кружляти
Heaven <i>n</i>	небо
Eagle <i>n</i>	орел
Messenger <i>n</i>	посланець, вісник
Tough <i>a</i>	жорсткий, міцний
Bend <i>v</i>	згинатися, гнутися
Spear <i>n</i>	спис
Warrior <i>n</i>	воїн
Cross <i>n</i>	хрест
Crucify <i>v</i>	розпинати, умертвляти
Partly <i>adv</i>	частково
Oar <i>n</i>	весло
Bat <i>n</i>	біта
Agr. implements <i>n (pl)</i>	с.-г. інвентар
Barrel <i>n</i>	діжка

I. Complete the following sentences according to the text

1. This tree has a pale green bark, which becomes
2. Small, purple clusters of flowers come before the leaves, which are broad and have
3. The term “dioecios” means that the male and female flowers occur on ... , so some trees
4. The female trees produce small, ... that are rather like ... , and they ... long distances in the wind.
5. Ash wood is ... and ... and will bend without
6. Few trees are so useful for such ... products.

II. Translate the sentences paying attention to the functions of the Infinitive and the Complex Subject

1. If there is lime in the soil, plenty of space to grow and some shelter from the wind, it may rival the oak by reaching a height of 80 feet.
2. The ash is the first tree in the wood to lose its leaves in the autumn.
3. The Greek warrior Achilles is said to have killed Hector with a spear of ash in the Trojan War, while Cupid's arrows of love was supposed to be made of the same wood.
4. The Cross on which Christ was crucified is said to have been partly made of ash.

III. Answer the following questions on the text

1. Where do two species of Ash grow in our country?
2. What colour is its bark?
3. May the Ash rival the oak by reaching the same height?
4. What shape is its crown?
5. What are its flowers?
6. What does the term “dioecious” mean?
7. What is a romantic Norse legend about?
8. How is ash wood used nowadays?

WILLOW

Look through the text and 1) say what each paragraph is about; 2) say what family do they belong to; 3) find the sentences describing their leaves, twigs, flowers, and seeds.

There are a number of species, or kinds, of willow tree, the one most frequently seen in Ukraine being the white willow (*Salix alba* L.). It grows throughout our country

along the banks of rivers, and if left untouched it reaches 70 feet or more in height. Most willows need marshy land to be at their best. They bind earth together with their roots, and are therefore useful for strengthening riverbanks. Willows are related to poplars and belong to the Salicaceae family.

The willow narrow, pointed leaves are delicate silvery green in colour, 2 to 5 inches long, finely and closely toothed (teeth usually 18 to 25 per inch of margin). The leaves of willows are quite different from those of other trees, allowing them to be easily identified as willows. The twigs themselves are typically long and slender and sometimes brightly coloured (green or greenish-brown); this is a further aid in identification when the leaves are absent in winter.

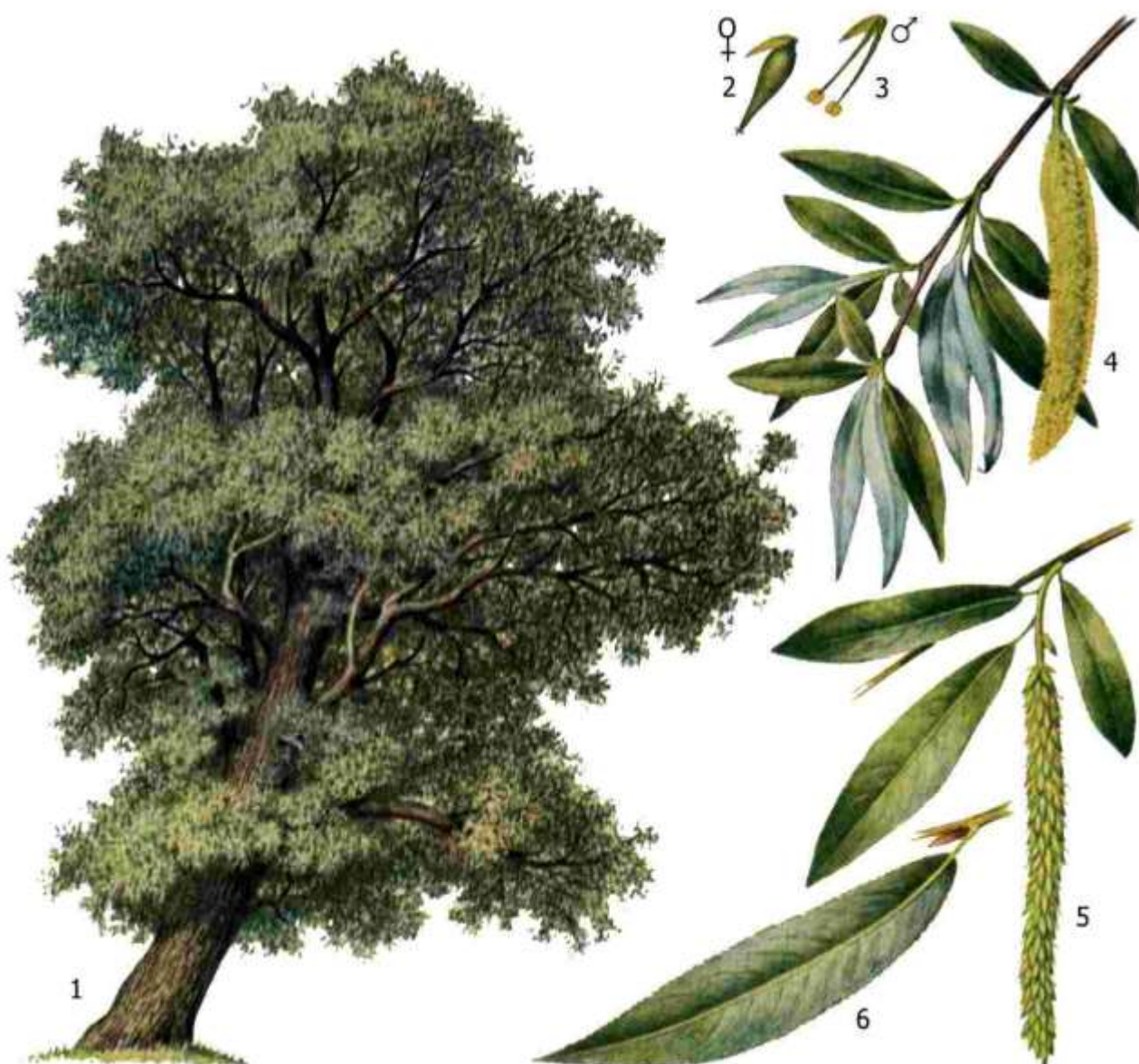


Figure XII White Willow (1), Female flower (2), Male flower (3), Male catkin (4), Female catkin (5), Leaf (6)

Male and female flowers grow on separate trees. The catkins appearing at the ends of expanding leafy shoots in spring ripen before the leaves are open. Flowers are spirally arranged, each subtended by a yellowish, deciduous bract. Insects carry the pollen from the male to the female flowers; bees collect both nectar (the sweet liquid

found in flowers) and pollen. The tiny, short-lived seeds of willows mature in late spring or early summer and require a moist, bare mineral soil for germination. Fresh deposits of silt and sand left by receding spring floodwaters provide an ideal seedbed and are rapidly colonized by seedlings of these sun-loving, fast-growing trees. However, such willow thickets are a temporary phenomenon, for the trees cannot reproduce in their own shade and eventually give way to other more shade-tolerant trees.

The weeping willow is also grown in our country. It is often found in gardens because it is so beautiful with its branches hanging down all round the stem, generally touching the ground. The Emperor Napoleon asked that a weeping willow should be planted on his grave on the island of St. Helena. In many countries the weeping willow has long been associated with mourning.

Willows have little commercial importance because most species are too small to provide merchantable timber and their wood is less valuable than that of other species. However, willows play an important role in the conservation of our soil and wildlife. Most species can be propagated quickly and inexpensively by simply cutting twigs and placing their ends in moist soil. The plants that grow from these cuttings produce networks of interlacing roots that prevent stream banks from washing away; and their foliage provides shelter, food, and nesting cover for many birds and mammals.

The bitter bark of willows contains salicin, a chemical precursor of aspirin. Its medicinal properties were discovered by an eighteenth-century British scientist who used an extract of willow bark for treating malaria. This drug is now manufactured synthetically.

At one time tannin, a substance used in preparing leather and manufacturing ink, was extracted from willow bark, but it is now obtained from oak. The willow branches are often used for wickerwork. The wood of the white willow is used to make charcoal and wood pulp.

Vocabulary

Bind <i>v</i>	зв'язувати
Pointed	загострений
Tooth <i>v</i>	нарізати зубці
Slender <i>a</i>	тонкий, гнучкий
Shoot <i>n</i>	пагін, паросток
Subtend <i>v</i>	стягувати
Bract <i>n</i>	зачаток листка на кореневищі
Bare <i>a</i>	чистий, без рослинності
Deposit <i>n</i>	осадок, відкладення
Silt <i>n</i>	намул, осадок
Recede <i>v</i>	відступати

Thicket <i>n</i>	хаща, гущавина
Eventually <i>adv</i>	в кінці кінців, з часом
Hang <i>v</i>	висіти
Mourning <i>n</i>	траур, жалоба
Merchantable <i>a</i>	ходовий (товар)
Bitter <i>a</i>	гіркий
Precursor <i>n</i>	попередник
Malaria <i>n</i>	малярія
Tannin <i>n</i>	танін
Wickerwork <i>n</i>	плетені вироби

I. Fill in the blanks with the appropriate words from the list given below

1. Most willows need ... land to be at their best.
2. The twigs themselves are typically long and ... and sometimes ... coloured (green or greenish-brown).
3. Flowers are spirally ... , each ... by a yellowish, deciduous
4. The tiny, short-lived seeds of willows mature in late spring or early summer and require a moist, ... mineral soil for
5. Willows have little commercial importance because most species are too small to provide ... timber and their wood is less ... than that of other species.
6. (bract, slender, marshy, subtended, brightly, arranged, valuable, bare, merchantable, germination).

II. Find the sentences with the Gerund and translate them

III. Answer the questions

1. What species of Willow trees grow in Ukraine?
2. What land do they need to be at their best?
3. Why are they useful for strengthening riverbanks?
4. Are willows related to poplars?
5. What colour and shape are the willow leaves?
6. Are the willow twigs long or short? Describe them, please.
7. Do male and female flowers grow on the same tree?
8. When do the seeds of willows mature? What soil do they need for germination?
9. Is the Willow a shade-tolerant tree?
10. What medicinal properties does the bark of willows have?

11.How are willows used nowadays?

HORNBEAM

Look through the text and say 1) what information relating to this species you could get from it; 2) what the second paragraph is about; 3) how botanists call this tree.

This attractive little tree has many names. Hornbeam combines "horn," meaning toughness, with "beam," an old name for tree. However, some people call it "bluebeech" because its bark is very smooth like that of the beech. Botanists call the tree by its ancient Latin name, *Carpinus*.

Most of the English names of this tree refer to its hard, heavy, peculiarly twisted wood. This gives its smooth-barked trunks a characteristic muscle-bound appearance, a useful aid in recognizing a species that is otherwise little different from several other, more common understory trees. The wood is occasionally used for homemade mallets, levers, tool handles, and other articles requiring exceptional strength and toughness; but the hornbeam is too small to be important commercially. It makes excellent firewood, although it seems a shame to cut it for such a mundane purpose when oak,

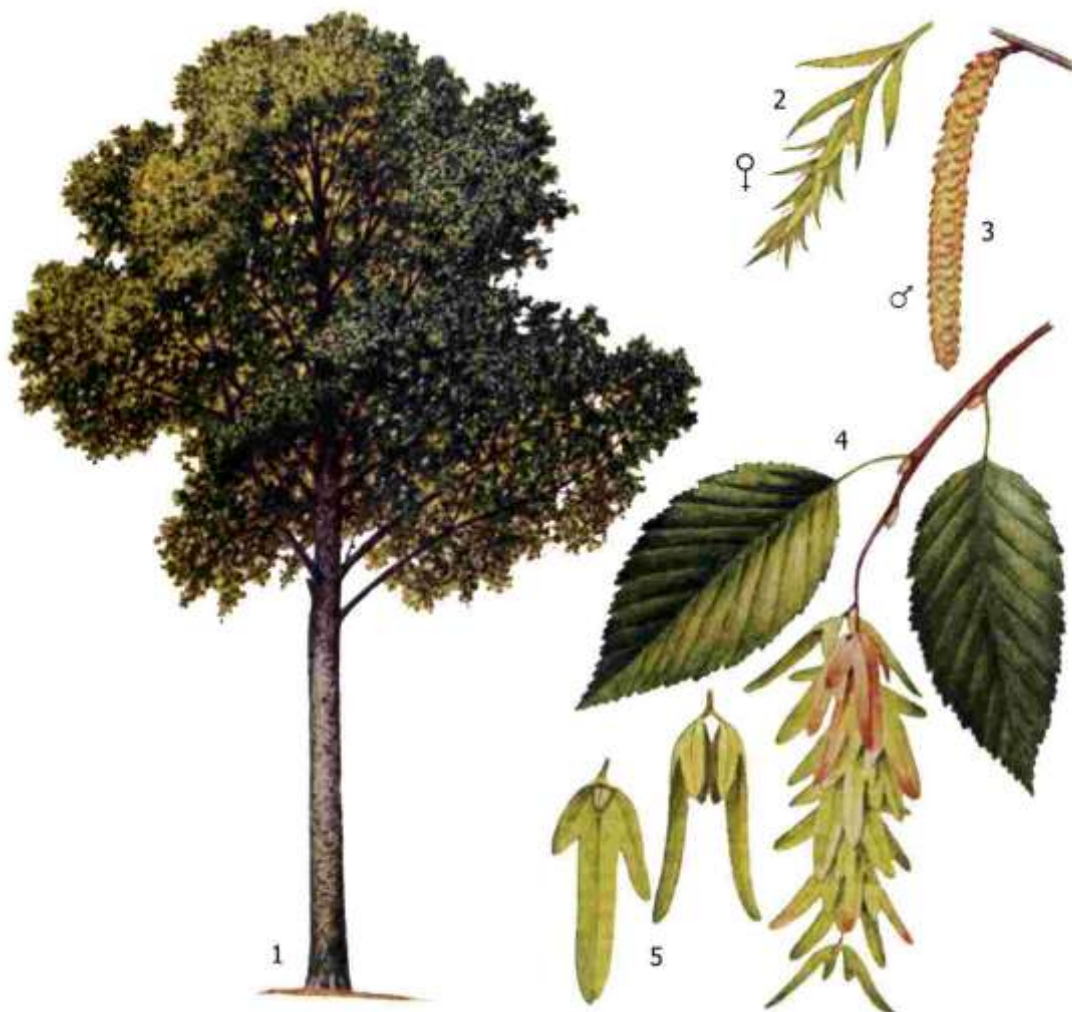


Figure XIII Hornbeam Tree (1), Female spike (2), Male spike (3), Branch (4), Wrapper with nuts (5)

ash, and other equally suitable woods are plentiful. In our country this tree occurs chiefly in the forest-steppe zone.

Hornbeam, which often grows in clumps of several stems, is seldom over 30 feet tall or 1 foot in diameter. This tree is very tolerant of shade and is usually found beneath a canopy of other trees. It prefers a moister site such as a stream terrace or the lower part of a north-facing slope.

Hornbeam has a good deal of ornamental value. It is relatively free of diseases and insect pests, though somewhat difficult to transplant. Trees do best when placed in a moist, sheltered location where the soil is fertile and slightly acid in reaction. The ornamental value of its twisted trunks is enhanced by encouraging the trees to form clumps. The leaves turn a handsome reddish-orange in autumn if the tree is growing on a favourable site.

Hornbeam <i>n</i>	граб
Horn <i>n</i>	ріг
Toughness <i>n</i>	міцність
Beam <i>n</i>	колода, деревина
Peculiarly <i>adv</i>	особливо
Twisted	витий, кручений
Otherwise <i>adv</i>	інакше, у протилежному разі
Understory <i>n</i>	другий ярус насаджень
Mallet <i>n</i>	дерев'яний молоток, киянка
Lever <i>n</i>	важіль, рукоятка, ручка
Tool handle <i>n</i>	ручка (рукоятка) інструмента
Mundane <i>a</i>	мирський, світський, земний
Plentiful <i>a</i>	багатий, рясний, численний
Clump <i>n</i>	група (дерев), кореневище
Beneath <i>prep</i>	під, нижче
A good deal	багато
Enhance <i>v</i>	збільшувати, піднімати ціну
Encourage <i>v</i>	заохочувати, підтримувати
Handsome <i>a</i>	гарний, значний

I. Complete the following sentences according to the text

1. Hornbeam combines "horn," meaning ... , with "beam," an
2. Most of the English names of this tree refer to its hard, heavy, ...
3. The wood is occasionally used for homemade mallets, levers, tool handles, and other

articles requiring exceptional

4. This tree is very tolerant of shade and is usually found
5. Trees do best when placed in a moist, sheltered location where the soil is
6. The ornamental value of its twisted trunks is enhanced by

II. Translate the sentences paying attention to the words ending in – ed

1. Most of the English names of this tree refer to its hard, heavy, peculiarly **twisted** wood.
2. The wood is occasionally **used** for homemade mallets, levers, tool handles, and other articles requiring exceptional strength and toughness
3. Trees do best **when placed** in a moist, **sheltered** location where the soil is fertile and slightly acid in reaction.
4. The ornamental value of its twisted trunks **is enhanced** by encouraging the trees to form clumps.

III. Answer the questions

1. What does the name of this tree mean?
2. What kind of wood does this tree have?
3. What trunk does the Hornbeam have?
4. How is its wood used?
5. Where does this tree grow in our country?
6. Is it tolerant of shade?
7. What land does it prefer to grow?
8. What soils should it be planted on?
9. Where does the European larch grow in Ukraine?

NORWAY MAPLE

Look through the text and 1) say what species of the Maple grow in Ukraine; 2) find the paragraph with the description of this tree in the text.

This species is native to Ukraine and grows throughout the country. Such species as *Acer tataricum* L. is widespread in the steppe zone. It would be difficult to find a town in our country that did not have at least one of these handsome trees planted next to a street or in someone's front yard. This popularity is certainly understandable, for the Norway maple transplants easily, tolerates a variety of soil types, withstands city conditions, and casts excellent shade. It normally develops a broad, rounded crown and matures at a height of 40 to 60 feet, but can grow much larger. Maple leaves are simple, opposite, palmately 5 (rarely 7)

lobed, 2 ½ to 6 inches long. Its foliage turns bright yellow in late autumn, after many other trees have lost their leaves for the year. The flowers are yellow-green, and appear just before the leaves in spring. Its fruit – a pair of samaras joined at the base; wings 1 ½ to 2 inches long, - fall from the tree in late summer.

Norway maples are usually rather trouble-free, but trees stressed by drought or injuries are sometimes killed by verticillium wilt. Frost cracks also may be a problem, especially on young, thin-barked trees exposed to winter sun. Mulching, watering during drought, and wrapping the trunks of young trees in winter will help keep them healthy.

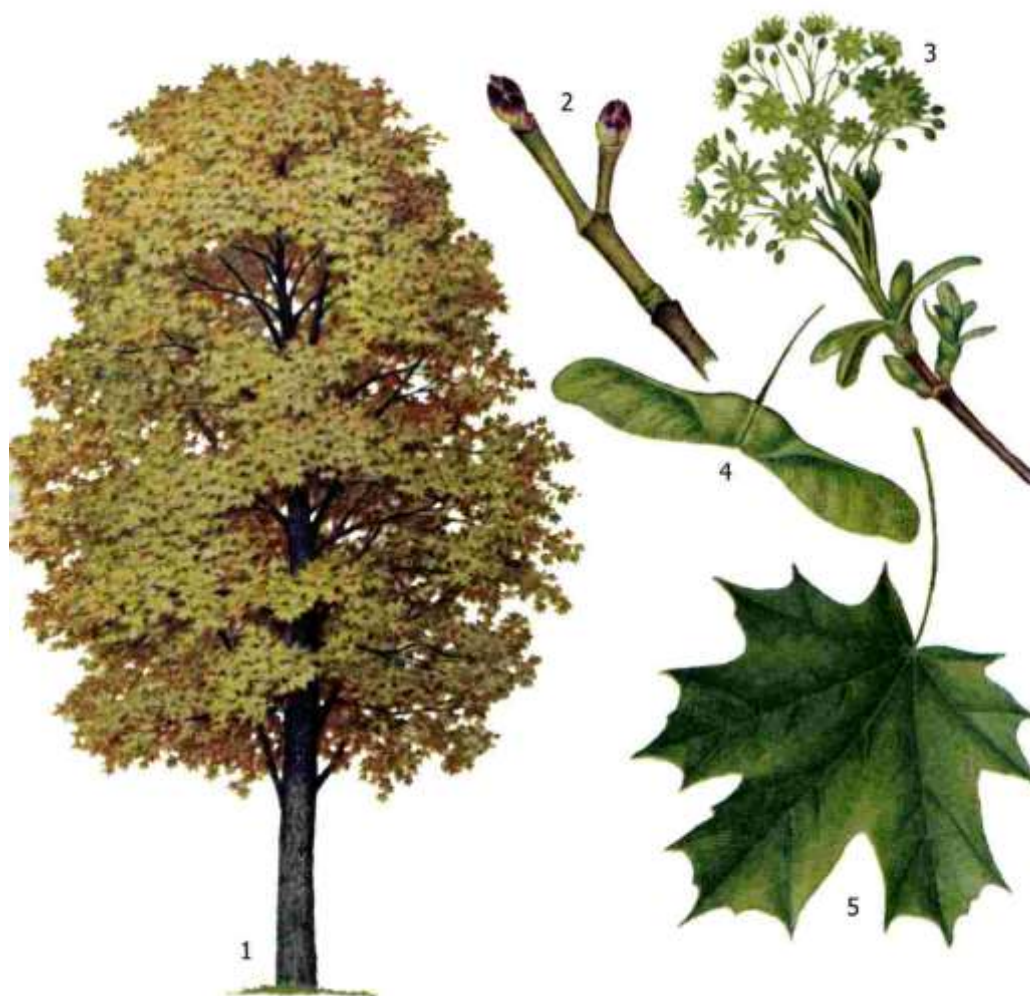


Figure XIV Norway Maple (1), Sprout (2), Blooming sprout (3), Wing nut (4), Leaf (5)

Lawn grasses sometimes grow poorly beneath the Norway maple because its dense crown and aggressive roots reduce light and moisture. Removing a tree's lower branches as it grows and creating a more open crown through pruning increase the light reaching the ground. Periodic pruning also helps to maintain the vigour and attractive shape of a tree.

Vocabulary

Norway Maple клен гостролистий

<i>Acer tataricum</i> L.	клен татарський
<i>Acer campestre</i> L.	клен польовий
Front <i>n</i>	фасад
Withstand <i>v</i>	протистояти
Cast <i>v</i>	кидати
Verticillium wilt <i>n</i>	вертицильоз (ув'ядання)
Crack <i>n</i>	тріщина
Expose <i>v</i>	залишати незахищеним, виставляти напоказ
Mulching <i>n</i>	мульчування, зелене добриво
Opposite <i>a</i>	супротивний, протилежний
Palmate <i>a</i>	дланевидний, лапчастий, пальчатий
Palmately lobed <i>a</i>	дланевидно-лопатевий, пальчасто лопатеві

I. Complete the following sentences according to the text

1. This popularity is certainly understandable, for the Norway maple transplants easily, tolerates a variety of soil types, withstands
2. Maple leaves are simple, opposite,
3. Norway maples are usually rather trouble-free, but trees stressed by Mulching, watering during drought, and ... will help keep them healthy.
4. Lawn grasses sometimes grow poorly beneath the Norway maple because its dense crown and

II. Make up questions based on the main facts and figures mentioned in the text

III. Say whether the following statements are true or false. Correct the false ones

1. Such species as *Acer tataricum* L. is widespread in the forest-steppe zone.
2. It normally develops a long, columnar crown and matures at a height of 40 to 60 feet, but can grow much larger.
3. The flowers are purple, and appear just before the leaves in spring.
4. Its fruit – a pair of legumes joined at the base, - fall from the tree in late autumn.

IV. Answer the questions

1. Is the Norway Maple native to Ukraine? Where does it grow?
2. Why is it so popular in our country? (Does it tolerate a variety of soil types; withstand city conditions and cast excellent shade?)
3. What is its crown?
4. What colour are its flowers? When do they appear?
5. What is a fruit of Maple?
6. What can cause the damage to this tree?

7. Is periodic pruning necessary for the vigour and attractive shape of a tree?

HONEY LOCUST

Look through the text and say what information concerning its qualities you can get from it.

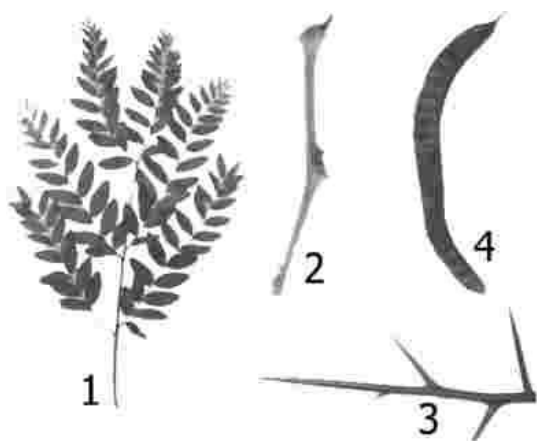


Figure XV Leaves (1), Sprout (2), Thorns (3), Pod (4)

Few sights in nature are more formidable than the honey locust. It grows mainly in the steppe zone of Ukraine. This species has leaves once- or twice-pinnately compound (both types usually present on same tree), alternate, 6 to 12 inches long; its leaflets are oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, with tiny, inconspicuous, widely spaced teeth. Winter twigs are moderate in diameter, greenish or red-brown, glabrous and often glossy; those of wild trees are commonly armed with smooth, stout, branched thorns; leaf scars are small and irregularly shaped. Flowers are small, greenish-white, regular, appearing in early summer. Its fruit is a flattened and often twisted leathery pod 6 to 18 inches long with 12 or more seeds about

$\frac{1}{3}$ inch long. Its thorns, which look as if they were specially designed for some cruel medieval weapon, are very sharp and often as long as 6 to 8 inches. They are such a conspicuous feature of wild trees that it seems the thornless locusts so widely planted in our towns and cities should be a different species altogether. However, a careful comparison of leaves, fruits, and other features reveals that wild and cultivated trees are in most respects identical.

These trees have many qualities that recommend them for street and yard planting: ease in transplanting; fast growth; longevity; ability to thrive in a variety of soils and environments. They produce a light shade, allowing grass to grow well beneath them. Some have the further advantage of not producing the large pods of wild locusts. Mature trees are usually 70 to 80 feet tall.

The honey locust was once considered remarkably free of diseases and insects, but pests are an increasing problem in many areas. Mimosa webworm, cankers, and borers have been especially troublesome.

Native honey locust was probably rather uncommon at the time of settlement, occurring as a minor associate of other trees along the largest rivers and streams. Then agriculture provided a new environment ideal for the spread of this species, and it has become a common weed of pastures and fencerows in many areas. Cattle feed on the pods, which contain a sweet, honey like pulp, and subsequently disperse the seeds throughout the pasture. The animals' digestive juices do not damage the seeds but actually facilitate germination by softening the hard outer seed coat.

The attractive reddish wood of the honey locust is hard, heavy, strong, durable, and shock resistant. It is used for fence posts, railroad ties, furniture, interior finish, and fuel.

Vocabulary

Honey locust	гледичія звичайна (трьохколючкова)
Pinnate <i>a</i>	бот. перистий
Compound (a leaf)	складний листок (із двох і більше листочків)
Oblong <i>a</i>	довгастий, видовжений
Inconspicuous <i>a</i>	непомітний
Glabrous <i>a</i>	гладенький
Glossy <i>a</i>	блискучий, полірований
Stout <i>a</i>	міцний, товстий
Thorn <i>n</i>	колючка
Scar <i>n</i>	рубець
Flatten <i>v</i>	вирівнювати, розгладжувати
Twist <i>v</i>	крутити, сплітати, витися
Leathery <i>a</i>	жорсткий, твердий, схожий на шкіру
Pod <i>n</i>	стручок, біб (сухий плід)
Design <i>v</i>	призначувати
Cruel <i>a</i>	жорстокий, безжалісний, болісний, тяжкий
Medieval <i>a</i>	середньовічний
Reveal <i>v</i>	відкривати, виявляти, показувати
Longevity <i>n</i>	довговічність
Thrive <i>v</i>	процвітати
Mimosa webworm <i>n</i>	бобова вогнівка (шкідник)
Canker <i>n</i>	червоточина
Borer <i>n</i>	червиця, шашіль
Troublesome <i>a</i>	неспокійний, турботний, клопітний, морочливий
Minor <i>a</i>	незначний, другорядний, менший
Associate <i>v</i>	з'єднувати, сполучати, об'єднувати
Weed tree <i>n</i>	дерево, яке не має експлуатаційної цінності
Fence <i>n</i>	загорожа
Subsequently <i>adv</i>	згодом, потім, пізніше
Softening <i>n</i>	зм'якшення
Interior <i>a</i>	внутрішній

I. Complete the following sentences according to the text

1. Its leaflets are oblong, 1/2 to 1 1/2 inches long, with tiny,
2. Winter twigs are moderate in diameter, greenish or red-brown,
3. These trees have many qualities that recommend them for street and yard planting: ease in transplanting;
4. The honey locust was once considered remarkably free of diseases and insects, but pests are Mimosa webworm, cankers, and borers
5. The animals' digestive juices do not damage the seeds but actually facilitate germination by
6. The attractive reddish wood of the honey locust is hard, heavy, strong

II. Make up questions based on the main facts and figures mentioned in the text

III. Answer the questions

1. Where does this species grow?
2. What leaves does it have (once- or twice-pinnately compound)?
3. Are winter twigs of the Honey Locust glabrous and glossy compared with wild trees?
4. What flowers and fruit do they have?
5. What identical and different qualities do wild and cultivated trees have?

BLACK LOCUST

Black Locust is especially common in the southern part of the country (in the steppe zone) where its showy white blossoms are a conspicuous feature of the landscape in late spring and early summer. Its leaves are once-pinnately compound, alternate, 8 to 14 inches long; leaflets are 7 to 21 in number, 1 1/2 to 2 inches long with stout stalks 1/8 to 1/4 inch long, ovate-oblong in shape, with entire margins and glabrous surfaces. Winter twigs are moderate in diameter, light reddish-brown, glabrous, with pairs of sharp spines up to 1/2 inch long. Flowers are white, perfect, and irregular, in showy racemes, appearing in late spring or early summer. Fruit is a flattened pod 2 to 4 inches long, abruptly tapered or rounded at ends, with 3 to 8 seeds about 3/16 inch long.

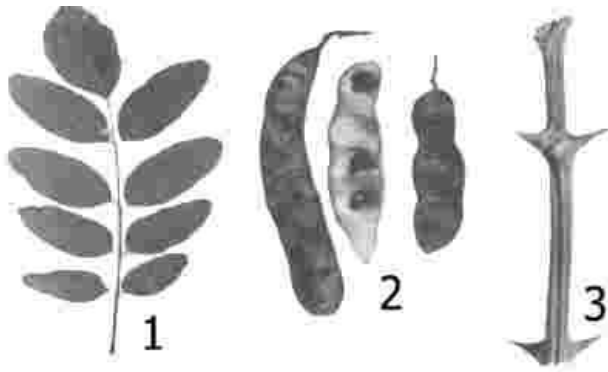


Figure XVI Leaves (1), Fruits (2), Sprout with spines (3)

Black locust has long been a popular ornamental tree, but it is seldom used for landscaping. Although relatively free of serious diseases and able to thrive in a variety of environments, it provides poor shade and is subject to attack by a number of insects. The worst of these insects are the locust leaf miners, which may skeletonize the foliage of entire trees, and the locust borers, which deform or even kill the trees by burrowing into the trunks and larger branches. Susceptibility to these

pests is apparently related to the condition of the tree; vigorously growing specimens are the most resistant.

Black locust is sometimes used in conservation plantings. It is especially desirable for reclaiming strip-mined or eroded land, as it tolerates dry, sterile, acid conditions and holds the soil from washing away with its wide-spreading root system. Black locust also improves the nutrient content of the soil through the decay of its leaf litter and the action of nitrogen-fixing bacteria in its root nodules. Its vigour is often reduced on poor sites so that it is more susceptible to insect attacks, but the trees sprout extensively from the roots when the tops are killed. The thickets thus provided are an excellent source of nesting and protective cover for wildlife. The seeds are eaten to a limited extent by quail and squirrels.

Black locust is also planted for its hard, strong, heavy wood, which is stiffer, is more resistant to decay, and possesses a higher fuel value than that of any other broadleaf tree. It also shrinks and swells less than the wood of most other trees. These properties make it particularly useful for fence posts, railroad ties, fuel and mine timbers. It is unfortunate that borers are such a serious threat to so valuable a tree.

Vocabulary

Black Locust	біла акація
Showy <i>a</i>	ефектний, яскравий, строкатий, пістрявий
Stalk <i>n</i>	стебло, живець
Ovate <i>a</i>	бот. овальний
Spine <i>n</i>	бот. колючка
Raceme <i>n</i>	бот. китиця
Flatten <i>v</i>	вирівнювати, розгладжувати
Abrupt <i>a</i>	обривистий, крутий, раптовий
Taper <i>v</i>	звужувати, загострювати; звужуватися на кінці
Leaf miner <i>n</i>	листогриз

Burrow <i>v</i>	рити нору
Susceptibility <i>n</i>	сприйнятливість, схильність, чутливість, вразливість
Apparently <i>adv</i>	явно, очевидно; мабуть, певно
Vigorously <i>adv</i>	сильно, енергійно
Specimen <i>n</i>	зразок, екземпляр
Strip <i>n</i>	стрічка, смуга; пошкодження, псування
Nutrient <i>a</i>	поживний
Leaf litter <i>n</i>	лісова підстилка, опале листя
Vigour <i>n</i>	сила, енергія
Top <i>n</i>	верхня частина
Quail <i>n</i>	перепел
Stiff <i>a</i>	тугий, негнучкий, жорсткий,
Shrink <i>v</i>	скорочуватися, зморщуватися
Swell <i>v</i>	збільшуватися, розростатися

PHYSICAL PROPERTIES OF WOOD

The uses to which a particular timber can be put depend in the first place on its physical properties. We think of using wood when we require a material that is strong in proportion to its weight and which can be cut, nailed, and screwed with ease. We may also want a material that is pleasing to the eye and warm to the touch. All these qualities, with the exception of the purely aesthetic one, are due to physical properties that can be measured.

Woods vary greatly in these physical properties. The wood from one species of tree varies considerably according not only to the rate of growth of the tree from which it was cut, but even from what part of the trunk it was taken. It must always be remembered, therefore, that any figures quoted for the physical properties of a timber are only the average values.

Density of Wood

The density of a material is the mass of a unit volume of that material. The density of wood used always to be expressed in Imperial measures as the weight in pounds of a cubic foot of timber. In metric terms it is expressed as kilogrammes per cubic metre.

The density depends to a considerable degree on the amount of moisture held in the wood. Freshly felled timber full of sap is much heavier than the same timber after it has been seasoned (dried). With experience one can roughly estimate the moisture content of a piece of familiar wood by assessing its weight in the hand. It is therefore usual when describing a timber to quote its weight when green (freshly sawn out of the log) as well as its weight when seasoned down to 12 per cent moisture content.

Different timbers vary enormously in their density, from about 5 to 70 lbs per cu ft.

Woods may roughly be grouped into five classes on the basis of their densities thus:

<i>Class</i>	<i>kg/m³</i>	<i>lb/cu ft</i>	<i>Examples</i>
Very light	80-240	5-15	Balsa
Light	400-560	25-35	Spruce
Medium	560-720	35~45	Ash
Heavy	720-960	45-60	Jarrah
Very heavy	Over 960	Over 60	Lignum Vitae

Specific gravity is the ratio of the weight of a substance to that of an equal volume of water. As the volume of a piece of wood alters with changes in moisture content it is usual to adopt a nominal specific gravity for wood which is based on the weight when oven dried and the volume at the time of test.

In some trees, particularly in ring-porous hardwoods, the density may vary greatly from tree to tree according to the rate of growth which determines the relative amounts of the porous earlywood and of the latewood which consists mainly of fibres. Ash, for instance, may vary from 33-52 lb/cu ft (528-832 kg/m³).

Density has an important influence on the strength of wood. Broadly speaking the denser a piece of wood the stronger it is. However, the strength may be assessed in a variety of ways and some strength properties are more closely related to density than others. Hardness is probably the quality most closely linked to density.

Very dense woods tend to be impermeable as there is little space into which liquids can penetrate. It is therefore not possible to treat them effectively with wood preservatives. However as most of them are very durable, treatment is seldom necessary.

Very light woods, such as balsa, find a use in the construction of model aircraft. The early air planes were built of Sitka spruce, a wood that is very tough for its low density.

Heat Conductivity

The ability of any material to conduct heat depends on its specific conductivity and its specific heat; i.e. the amount of heat required to raise unit weight (1 gm) of its substance 1°C. Though the specific heat of wood substance is similar to that of many metals, or even greater, the conductivity is very much less because all dry woods contain a considerable volume of air enclosed in the cells. The conductivity of green unseasoned timber is much higher than that of dry wood as in green wood the cells are filled with water which is a better conductor of heat than is air.

The conductivity of dry wood depends greatly on its density; the lighter the wood the better are its insulating properties. Balsa wood was used as an insulating material long before the invention of expanded plastics.

The excellent insulating properties of timber make it a particularly suitable material for walls of buildings in cold climates. The traditional cottages in Russia were built of solid logs. Panelling a room with wood not only greatly reduces the heat loss through the walls but it also enables the room to be heated more quickly. Because wood conducts heat so poorly it is the ideal material from which to make such things as saucepan handles.

The slow conduction of heat through timbers renders it suitable (rather surprisingly at first thought) for the construction of fire-resistant doors. Provided that the panels do not separate and so make openings through which flames can pass, a well-made, solid timber door can resist the penetration of fire for a long time.

Vocabulary

strong adj	твердий, міцний,
nail v	теслярувати, прибивати цвяхами
screw v	викривляти, крутити, викручувати
purely adv	чисто, тільки
rate n	швидкість, темп
therefore adv	тому, отже
quote v	розцінювати, посилатися, цитувати
average adj	середній
density n	щільність
pound n	фунт
fell v	зрубувати, валити
sap n	сік
roughly adv	приблизно
assess v	оцінювати
lbs per cu ft	фунтів на кубічний фут
Balsa	бальза, пробкове дерево
Lignum Vitae	залізне дерево
ratio n	відношення, пропорція
alter v	змінювати(ся)
nominal adj	номінальний, загальний, умовний, символічний
oven n	сушильна піч
hardness n	твердість, міцність
impermeable adj	водонепроникний
treat v	обробляти, просочувати
preservative n	консервант
durable adj	довговічний, стійкий, тривалого користування
tough adj	міцний, твердий, жорсткий
specific heat	питома теплоємність
insulating adj	ізоляційний
solid adj	суцільний, твердий, міцний, масивний
panel m	обшивати панелями
fire-resistant	вогнестійкий

I. Fill in the blanks with suitable words given below

1. The uses to which a particular timber can be put depend in the first place on its physical
2. It must always be remembered that any figures quoted for the physical properties of a timber are only the ... values.
3. The ... of wood in metric terms is expressed as kilogrammes per cubic metre.

4. The density depends to a considerable degree on the amount of ... held in the wood.
 5. Freshly felled timber full of sap is much heavier than the same timber after it has been ... (dried).
 6. Very dense woods tend to be ... as there is little space into which liquids can penetrate.
 7. The heat conductivity of all dry woods is very much less because they contain a considerable volume of ... enclosed in the cells.
- (density, properties, moisture, air, average, impermeable, seasoned)

II. Find Ukrainian equivalents of the following English words:

pound	КІЛЬКІСТЬ
density	ПИТОМА ТЕПЛОЕМНІСТЬ
amount	ТВЕРДІСТЬ, МІЦНІСТЬ
fire-resistant	ФУНТ
specific heat	ЩІЛЬНІСТЬ
insulating	ВОГНЕСТІЙКИЙ
hardness	ІЗОЛЯЦІЙНИЙ

III. Choose synonyms to the following English words:

- | | |
|--------------------|-----------------|
| 1) amount | a) solid, tough |
| 2) moderate | b) wet |
| 3) seasoned (wood) | c) quantity |
| 4) moist | d) dried |
| 5) hard | e) temperate |

IV. Answer the following questions:

1. Does the wood from one species of tree vary greatly in physical properties?
2. What is the density of a material? How is it expressed in metric terms?
3. Does the density depend on the amount of moisture held in the wood?
4. What is the “specific gravity”?
5. What is “a nominal specific gravity for wood” based on?
6. Does the density have an important influence on the strength of wood?
7. What properties does the ability of any material to conduct heat depend on?
8. Does the heat conductivity of green unseasoned timber differ from that of dry wood? Why?
9. What does the conductivity of dry wood depend on?

V. Write a summary of the text. Define each physical property of wood.

VI. Read the text once again and try to retell it.

PHYSICAL PROPERTIES OF WOOD (II)

Electrical Conductivity

Dry wood is a poor conductor of electricity but it becomes a partial conductor when it contains moisture. The degree of conductivity is closely related to the amount of moisture in the wood and this property has been used in many electric moisture meters for wood to assess the moisture content.

Calorific Value of Wood

Wood, and charcoal prepared from wood, are still the principal fuels in many parts of the world. When forests were thought to be almost inexhaustible and timber was cheap, wood was even used to fuel the railway locomotives in many parts of Africa.

The calorific value of absolutely dry wood is only about 60 per cent of that of an equivalent weight of coal, but as firewood in practice always contains some moisture its value as fuel is in fact even less than this. Wood for burning should, of course, always be as dry as possible as much of the heat produced by combustion may be wasted in boiling off the water from wet wood.

The best fuel woods are hardwoods such as beech, oak and sycamore.

Wood fuels produce far less ash than does coal and the ash they do make is rich in potash and phosphates and therefore useful as a fertiliser, especially on poor forest soils that lack these elements.

Charcoal is made by partial combustion of wood under a very restricted supply of air so that only carbon remains, and the volatile compounds that give rise to flames when burnt are all drawn off. Since charcoal burns without flame or smoke it is very suitable for cooking and is still used for barbecue grilling.

Acoustic Properties

Wood is used for many musical instruments as it is a very resonant material that vibrates when activated by sound waves to give a pleasing sound.

Uniformity of texture resulting from an even growth, and freedom from knots, are the important qualities sought for in timber to be used for musical instruments. The sounding board of a piano is generally made of finest quality spruce, and this wood, usually from Rumania, has also traditionally been the one most prized for making the belly of violins, while maple is used for the back. For wind instruments stability under varying conditions is a most important quality.

If wood is fixed firmly so that it cannot vibrate it absorbs sound waves and does not reflect them. For this reason its use as panelling in concert halls reduces echoes and improves acoustics.

Odour and Taste

Many woods have a characteristic smell which is usually most pronounced when the timber is freshly sawn. These odours are often a great help in identification but it may be necessary to expose a fresh surface in order to catch them. Most softwoods, particularly the pines, have a resinous smell, and Western red cedar can always be recognized by its aromatic odour. A few woods, such as Queensland walnut, have a really foul smell when freshly cut. It is not unusual for logs that have lain for some time in a log pond to have a very high smell, but this is due to bacterial growth in the water. These bacteria enter the wood and by their action render it more permeable to preservatives. Unusual odours may result from fungal infections.

Vocabulary

partial adj	частковий
moisture meter	вологомір
calorific adj	тепловий
charcoal n	деревне вугілля
inexhaustible adj	невичерпний
firewood n	дрова, паливо, пальне
combustion n	горіння
ash n	попіл
volatile adj	летючий, леткий, випарний
resonant adj	дзвінкий, резонансний, лункий
uniformity n	однорідність
to seek (sought p.p.)	шукати
odour n	запах
foul adj	кепський, смердючий, смердючий
lain p.p. (to lie)	лежати

I. Find Ukrainian equivalents of the following English words:

moisture	горіння
partial	якість
charcoal	волога
combustion	частковий
quality	консервант
preservative	деревне вугілля

II. Make up sentences using the text:

1. Wood for burning should, of course, always be as dry as possible as much of the heat	a) it absorbs sound waves and does not reflect them.
2. Dry wood is a poor conductor of electricity but	b) of that of an equivalent weight of coal
3. The calorific value of absolutely dry wood is only about 60 per cent	c) produced by combustion may be wasted in boiling off the water from wet wood.
4. If wood is fixed firmly so that it cannot vibrate	d) it becomes a partial conductor when it contains moisture.

III. Translate these words and word combinations into English:

тепловий, горіння, паливо, волога, вологомір, суха деревина, деревне вугілля, грибкові захворювання, акустичні властивості, твердолистяні, звукові хвилі.

IV. Answer the following questions

1. Is dry wood a good conductor of electricity?

2. What property of wood has been used in many electric moisture meters to assess the moisture content?
3. What is the calorific value of absolutely dry wood?
4. Which hardwoods are the best fuel woods?
5. How is charcoal made?

LOGGING

Logging has been called the key of forestry. The best silvicultural plan can be wrecked by poorly planned or careless logging.

Moreover, because logging costs are usually the major item in the total cost of forest products, efficient and economical logging is essential to sustained yield forest management. Such logging must be planned.

Successful planning of a logging operation requires simultaneous consideration of the forest itself, and of men and machines.

Even in northern operations the traditionally seasonal conduct of logging has been replaced by using permanent, all season roads, and by mechanization of operations. Successful mechanization requires not only machines but also good techniques for their use, capable, trained labour, and thoughtful supervision.

Hauling with Cable-Cranes

For many years cable cranes have been used for opencast mines and quarries for conveying coal, stone or other materials, usually horizontally, for considerable distances. There are now many different kinds of cranes used but they may be divided into three main systems.

The monocable system depends on a single horizontal cable kept slowly rotating and on which the loads can be hung at any point as the cable passes by.

They can also be off-loaded, at any point required, without halting the steady movement.

The second type of cable crane has one fixed main cable and also a moving smaller line which hauls the loads by gravity along the static main cable. A third type of crane, which is the most frequently used for timber extraction from mountainous forests, is also a twocable system but depends on a static winch or skidder at the top terminus to have the crane uphill and also to control the loaded crane on its descent down the cable to the base.

Vocabulary

logging n	лісозаготівлі
wreck v	руйнувати, провалити(ся), пропасти
careless adj	недбалий
sustained yield forest management	система безперервного відновлення лісу
capable adj	здібний, умілий, вправний
thoughtful adj	вдумливий, уважний
haul v	перевозити, транспортувати, тягти

cable n	трос, канат, кабель
crane n	кран
cable-crane	кабель-кран
opencast	що добувається відкритим способом
quarry n	кар'єр, каменоломня
monocable adj	однотросовий, <u>одноканатний</u> (кабельний)
to keep doing smth	весь час (безперервно) щось робити
rotate v	обертатися
load n; v	вантаж, навантажувати
hang v (hung, hung)	вішати, підвішувати
point n; at any point	пункт, в будь-якому місці
halt v	зупиняти
steady adj	постійний, сталий
line n	лінія, канат, трос
haul v	буксирувати, тягти
gravity n	тяжіння, сила ваги
extraction n	видобуток
winch n	лебідка
skidder n	скідер, механічна лебідка (для підтягування колод)
terminus n	кінцева станція, кінцевий пункт
uphill adv	вгору, що йде вгору
descent n	спуск, зниження
base n	база

I. Translate the following word combinations:

silvicultural plan, careless logging, efficient logging, sustained yield forest management, successful mechanization, thoughtful supervision, opencast mines, steady movement, static main cable, mountainous forests.

II. Find antonyms to the following English words:

careless	off-loaded
thoughtful	careful
inconsiderable	rarely
frequently	inefficient
loaded	considerable
efficient	thoughtless

III. Answer the following questions:

1. What are the benefits of logging forests?
2. What does successful mechanization require?
3. How have cable cranes been used for many years?
4. What does the monocable system depend on?
5. Which type of crane is the most frequently used for timber extraction from mountainous forests?

IV. Give a brief summary of the text.

V. Work out a plan to the text. Try to retell the text «Logging».

FELLING

The process of cutting down a tree is called felling. The men who do it are called fallers or cutters. The task of the faller or felling crew in the woods is to fell a tree so that it will not lodge against another, will not break because of uneven ground and will lie so that it can be trimmed of branches, cut into logs, and skidded to the landing with least difficulty. The lean of the tree and the side that has the heaviest part of the crown will determine to some extent which way it must fall. Driving wedges in the saw cut will sometimes change this; and a skillfully placed undercut will provide a very accurate dropping of the tree. An undercut is made by removing a wedge-shaped section of the trunk. The backcut will then be made and the tree will fall in the direction of the undercut. A narrow strip of wood left between the undercut and the backcut will prevent the tree from rotating on the stump as it falls.

The tree must be cut at the lowest point in order to reduce the height of the stump. In America the stump is sometimes cut from 12 up to 18 inches and even from 16 up to 24 inches from the ground because of* the great size of trees.

Care must be taken to avoid damage to young trees in selecting the place to drop the tree.

Fundamentals of Mechanical Logging

1. The Short-Wood Method (Full Processing at the Stump)

In this method, most processing operations such as felling, limbing, topping, and bucking and possibly barking and chipping are done in the stump area. The operation of piling or bunching the wood for later transportation is also performed here. The wood is then forwarded to a roadside landing where it may be loaded directly to transport or stored. In some instances, the wood may be mechanically barked at the roadside. In that case, there is usually a storage stage between the preparation of the rough wood and the barking.

The largest percentage of pulpwood in Eastern Canada is produced using the short-wood method. The operator using this system will process the wood at the stump into either 4 ft, - 8 ft, - 12 ft, - 16 ft or chips and then move it to the truck road or landing. The wood has been processed manually except for some mechanical barking. The processing has been greatly aided by the development of the power saw as a manual power tool.

The attempts to increase efficiency in this method have been in the handling and transporting phase. Forwarding vehicles have been developed which incorporate both loading and off-loading means and cable skidders have been adapted to forward bundles. Mechanical means of loading, - front end loaders, cranes and pallets are used extensively. Transportation beyond this point has usually employed conventional trucks and trailers common to other industries.

The limiting factor in the development of this method at present is the necessity of manual processing and handling at the stump. Attempts have been made to mechanize the processing operations of the short-wood method without complete success.

Vocabulary

felling n	рубка (лісу)
faller n	лісоруб, вальщик
crew n	бригада, команда
lodge v	вилягати
uneven adj	нерівний
trim v	підрізати
skid v	гальмувати, ковзати
lean n	схил
wedge n	клин, гребінь, трикутна призма
wedge-shaped	клиновидний, клиноподібний
undercut n	підрубка
stump n	пеньок, обрубок
limbing	обрубкування сучків (гілля)
topping	обрізування верхівок
bucking	розкрязування
barking	знімання кори
chipping	різання тріски
piling	складання в штабелі
bunching	зв'язування в пачки
forward v	відправляти
roadside	узбіччя дороги
rough	необроблений
pulpwood	балансова деревина
truck n	вантажний автомобіль
manually adv.	вручну, ручним способом
power saw	бензопила
power tool	моторний інструмент
attempt n	спроба, намагання
handling	навантажувально-розвантажувальні операції
incorporate v	об'єднувати, включати
cable skidder n	тросова механічна лебідка
forward v	переміщати
front-end loader	ковшовий навантажувач
pallet n	піддон, транспортний стелаж
conventional adj	звичайний, традиційний
trailer n	тягач з причепом, трейлер

I. Translate these words and word combinations, form some sentences with them:

faller or felling crew, uneven ground, manual processing, limiting factor, stump, wedge-shaped, conventional, pulpwood, limbing, barking, piling, bunching, to increase efficiency, short-wood method, cable skidders.

II. Fill in the blanks with suitable words given below:

1. The process of cutting down a tree is called 2. The men who do it are called fallers or 3. An ... is made by removing a wedge-shaped section of the trunk. 4. The ... will then be made and the tree will fall in the direction of the undercut. 5. Most processing operations such as felling, limbing, ..., and bucking and possibly barking and ... are done in the stump area. 6. The largest percentage of ... in Eastern Canada is produced using the short-wood method. 7. Mechanical means of loading, - front end loaders, ... and pallets are used extensively.

(felling, backcut, undercut, topping, cutters, chipping, cranes, pulpwood)

MANAGING TIMBER RESOURCES

The goal of managing timber resources is to achieve an approximate balance between the annual harvest and growth of wood. This balance, called a *sustained yield*, ensures a continuous supply of timber. It is achieved by managing forests so they have areas of trees of equal yield for each age group, from seedlings to mature trees. The science of harvesting and growing crops of trees for sustained yield is called *silviculture*. The practice of silviculture requires that foresters know how various species of trees grow in different climates and soils, and how much sunlight and water the trees need. Foresters also use the science of genetics to breed trees that have improved growth rates and greater resistance to diseases and pests.

Harvesting. There are four silvicultural methods used in the harvest of timber: (1) clearcutting, (2) seed tree cutting, (3) shelterwood cutting, and (4) selection cutting. Each method is designed to provide an environment that favors the establishment of certain kinds of trees. New trees grow from seeds produced by the remaining or surrounding trees, from sprouting stumps or roots, or from seeds or seedlings that foresters plant.

Clearcutting is the removal of all the trees in a certain area of a forest. It is generally used to reestablish a *stand* (large group of trees) that is more even in age, by removing a mature one. Clearcutting is also generally used when a forest is to be replaced by planting or by sprouting stumps. Clearcut areas must be large enough to prevent surrounding forests from affecting young trees growing within the clearcut opening.

Seed tree cutting resembles clearcutting, but foresters leave a few trees widely scattered in the harvested area to provide a natural source of seeds. These seed trees are removed after the new stand is established. Seed tree cutting can be used with various pines, including loblolly pine and longleaf pine.

Shelterwood cutting involves harvesting timber in several stages over a period of 10 to 20 years. Foresters establish a new stand as the old one is removed. Shelterwood cutting can be used with such trees as oak, ponderosa pine, and white pine, which

require shade during their first few years of growth. It also allows the growth of some trees in a stand to continue after the majority of the trees have ceased growing well.

Selection cutting is the harvesting of small patches of mature trees to make room for younger trees and new growth. The trees are removed on the basis of their size and nearness to other trees. However, foresters leave many larger trees standing to produce seeds. Selection cutting leaves only small openings in a forest, and so it works best with trees that grow well in shade. Such trees include American beech, hemlock, and sugar maple. Forests may be harvested by selection cutting every 15 to 30 years.

The largest percentage of pulpwood in Eastern Canada is produced using the short-wood method. The operator using this system will process the wood at the stump into either 4 ft, - 8 ft, - 12 ft, - 16 ft or chips and then move it to the truck road or landing. The wood has been processed manually except for some mechanical barking. The processing has been greatly aided by the development of the power saw as a manual power tool.

The attempts to increase efficiency in this method have been in the handling and transporting phase. Forwarding vehicles have been developed which incorporate both loading and off-loading means and cable skidders have been adapted to forward bundles. Mechanical means of loading, - front end loaders, cranes and pallets are used extensively. Transportation beyond this point has usually employed conventional trucks and trailers common to other industries.

The limiting factor in the development of this method at present is the necessity of manual processing and handling at the stump. Attempts have been made to mechanize the processing operations of the short-wood method without complete success.

Vocabulary

felling n	рубка (лісу)
faller n	лісоруб, вальщик
crew n	бригада, команда
lodge v	вилягати
uneven adj	нерівний
trim v	підрізати
skid v	гальмувати, ковзати
lean n	схил
wedge n	клин, гребінь, трикутна призма
wedge-shaped	клиновидний, клиноподібний
undercut n	підрубка
stump n	пеньок, обрубок
limbing	обрубання сучків (гілля)
topping	обрізування верхівок

bucking	розкрязування
barking	знімання кори
chipping	різання тріски
piling	складання в штабелі
bunching	зв'язування в пачки
forward v	відправляти
roadside	узбіччя дороги
rough	необроблений
pulpwood	балансова деревина
truck n	вантажний автомобіль
manually adv.	вручну, ручним способом
power saw	бензопила
power tool	моторний інструмент
attempt n	спроба, намагання
handling	навантажувально-розвантажувальні операції
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Eastern Canada is produced using the short-wood method. 7. Mechanical means of loading, - front end loaders, ... and pallets are used extensively.

(felling, backcut, undercut, topping, cutters, chipping, cranes, pulpwood)

AGRICULTURE IN GREAT BRITAIN

British agriculture has long had a reputation for its pioneering of new techniques and high efficiency, and remains among the most progressive in the world. In a small country, with a considerable proportion of mountain, moorland, and other land unfit for cultivation, the area available for agriculture is now about 46.45 million acres (18.98 million hectares), representing 49% of the total area of the United Kingdom. Of this agricultural land more than 15 million acres (6 million hectares) consist of grazing land and only 30 million acres (12 million hectares) are under crops and grass.

Due to geographic location of Great Britain (on the British Isles) the climate is oceanic in type. The winters are mild and the summers are cool, but long enough to produce crops. The warmth comes from the Gulf Stream. In January the average temperature is +3°, +7°C, in July +16°, +17°C. The winds from the ocean to the south-west bring rainfall throughout the year. The rainfall is heaviest on the west coasts. The winds coming from the east are drier. So the west side of England, with more rain and snow, has a different sort of farming from the east side, which has far less rain and even sometimes has drought.

Soil, also, varies from one part of England to another. In the county of Norfolk, on the drier eastern side of England, some of the soil is so sandy and stony that the most suitable crop is trees, yet within a few miles there is deep rich soil which, together with the dry climate, produces wonderful grain crops.

The rivers of Great Britain are short but abundant, and they never freeze. The main rivers are the Thames, the Tyne, the Humber, the Severn, the Mersey. A considerable area of land is covered with meadows and heaths.

Thus, two outstanding features of agriculture in the United Kingdom are the wide variations in soils and the significant differences in climate. The wetter and milder west of England, Wales and Northern Ireland have always had a predominance of permanent pasture and hence the raising of cattle and dairying, while the drier and colder east of England and Scotland has been specialized in arable production.

In some areas, especially near large urban centers, the agricultural scene is extremely varied, and it is possible to see grain crops, dairy cattle, sheep, orchards and soft fruits, potatoes and vegetables, poultry, market gardens, all within a circuit of 10 miles (16 km) or less.

Agriculture in Great Britain is intensive and highly mechanized. In the western part of the country, most farms are dairy. Income from livestock and dairy products is about three times that from crops. Farmers raise cattle, sheep, pigs and poultry. British livestock breeders have developed many of the cattle, sheep and pig breeds with worldwide reputation. There are over 60 principal breeds of sheep in Britain.

Crop production is concentrated on the eastern side. On the arable land, wheat and barley are supreme, accounting between them for well over half the acreage. Such other crops as potatoes, sugar beets, oats, maize (corn), and rape for oilseed are also

significant. About 5,400 acres (2,200 hectares) are under glass or plastic for growing early tomatoes and other market-garden produce.

Bulbs and flower growing are established in former marshland areas in Kent, with over 13,000 acres (5,300 hectares) devoted to these specialties.

Crop production is the main enterprise, but there are still many mixed farms on which farmers both grow crops and raise livestock. The mixed farm produces many different types of food: milk, butter and cheese, beef, pork, bacon, wheat, barley, sugar beet, mutton and, of course, all sorts of poultry, since hens, ducks and turkeys can always be fitted in somewhere. The farmer of a mixed farm therefore has a great variety of produce to sell.

Fish farming is a small but highly productive sector of Scotland's rural industry. Marine fishes harvested include Atlantic mackerel, Atlantic herring, cod, and various flatfishes, including flounder, Atlantic salmon and Norway lobster. The principal freshwater fish is rainbow trout. Domestic fish production provides about three-quarters of Great Britain's needs.

Of the approximately 2.2 million hectares (about 5.4 million acres) of woodlands in Great Britain, about 40 percent are in England, 49 percent in Scotland, and 11 percent in Wales. However, they provide only 15 percent of home consumption of wood products. Private owners hold more than 60 percent of the total forestlands. About 70 percent of productive forest is coniferous. The most common broadleaved trees are oak, beech, ash, and elm. Pine and birch predominate in Scotland.

Vocabulary

1. acreage	площа в акрах
2. ash	ясень
3. beech	бук
4. circuit	довжина округи
5. cod	тріска
6. coniferous	хвойні дерева
7. consumption	споживання
8. efficiency	дієвість, ефективність
9. elm	в'яз
10. expansion	розширення
11. feature	характерна особливість, риса
12. fit	придатний, відповідати, годитися
13. flatfishes	пласкі, плескаті риби (камбала, палтус)
14. flounder	камбала
15. graze	випасати (худобу)
16. heath	степ, який заріс вересом
17. hence	отже, атож
18. herring	оселедець
19. income	прибуток
20. lobster	омар
21. mackerel	макрель, скумбрія

22.marsh	болото
23.moor	бот. верес
24.mutton	баранина
25.oak	дуб
26.permanent	постійний
27.pioneer	піонер, ініціатор, прокладати шлях, вести
28.pork	свинина
29.predominance	переважання, перевага
30.predominate	переважати, мати перевагу
31.rainbow trout	райдужна форель
32.remain	залишатися
33.rural	сільський
34.salmon	лосось, сьомга
35.tend	мати тенденцію, намір
36.therefore	тому, отже
37.thus	таким чином

I. Fill in the blanks with suitable words given below:

1. Of this agricultural land more than 15 million acres consist of ... and only 30 million acres are under ... and grass.
2. ... geographic location of Great Britain (on the British Isles) the climate is ... in type. The winters are ... and the summers are cool, but ... to produce crops.
3. Thus, two ... of agriculture in the United Kingdom are the wide ... in soils and the ... in climate.
4. In some areas, ... near large ... centres, the agricultural scene is ... varied, and it is possible to see grain crops, dairy cattle, sheep, ... and soft fruits, potatoes and vegetables, poultry, ... , all within a circuit of 10 miles (16km) or less.
5. Crop production is concentrated on the ... side. On the ... land wheat and barley are ... , accounting between them for well over half the
(crops, market gardens, acreage, due to, mild, long enough, variations, extremely, occur, grazing land, significant differences, especially, urban, oceanic, orchards, eastern, arable, supreme, outstanding features).

II. Match up two parts of the sentences:

- | | |
|--|---|
| 1. British agriculture has long had a reputation for its pioneering of new techniques and high efficiency, | a) while the drier and colder east of England and Scotland has been the home of districts of specialized arable production. |
| 2. The winters are mild and the summers are cool, | b) with a balance of both livestock and arable interests. |
| 3. The wetter and milder west of England, Wales and Northern Ireland have always had a predominance of permanent pasture | c) Atlantic mackerel, Atlantic herring, cod, various flatfishes, including flounder, Atlantic salmon and Norway lobster. |

and hence the raising of cattle and dairying,

4. Crop production is the main enterprise, but there are still many mixed farms

5. Marine fishes harvested include

d) and remains among the most progressive in the world.

e) but long enough to produce crops.

III. Read the text and find the sentences with the Present Perfect and Present Perfect Continuous in Active Voice. Translate them and explain their usage.

IV. Choose the synonyms to the italicized words:

(important, deciduous, suitable, different, unsuitable, meets ... the requirements, large, available, predominate/to be predominant)

1. In a small country, with a considerable proportion of mountain, moorland, and other land *unfit* for cultivation, the area *available* for agriculture is now about 46.45 million acres.
2. A *considerable* area of land is covered with meadows and heaths.
3. On the arable land, wheat and barley *are supreme*, accounting between them for well over half the acreage.
4. Such other crops as potatoes, sugar beets, oats, maize (corn), rape for oilseed are also *significant*.
5. All sorts of poultry: hens, ducks and turkeys can always *be fitted* for rearing anywhere.
6. Marine fishes harvested include Atlantic mackerel, Atlantic herring, cod, *various* flatfishes.
7. Domestic fish production *provides* about three-quarters of Great Britain's *needs*.
8. The most common *broadleaved* trees are oak, beech, ash, and elm.

V. Answer the questions:

1. Why does British agriculture remain one of the most progressive in the world?
2. What is its area available for agriculture?
3. Is the climate of Great Britain favourable to the development of agriculture?
4. What are two outstanding features of agriculture in the United Kingdom?
5. Why is the agricultural scene extremely varied near large urban centres?
6. What types of farms are distinguished in Great Britain?
7. Where is arable production concentrated in the country?
8. What are the main grain crops in Great Britain?
9. What are the main livestock products?
10. What does the mixed farm produce?
11. What part of Great Britain is highly productive in fish farming?
12. Do forests of Great Britain completely provide home consumption of wood products?
13. What are the most common broadleaved and coniferous trees of Great Britain?

VI. Work out a plan to the text. Try to retell the text “Agriculture in Great Britain”.

AGRICULTURE IN THE USA

Agriculture is one of the largest and most important branches of national economy in the United States. 47% of the land area of the USA is farmland, of which 152 million hectares are harvested cropland and 560 million hectares are permanent pastureland. The USA leads the world in many aspects of agricultural production. The country exports more farm products per year than any other nation in the world.

Leading agricultural crops are corn, soybeans, wheat, vegetables, fruits and nuts, greenhouse and nursery products, cotton and tobacco. The USA has been occupying the leading position in the production of corn and wheat for many years. Corn is a major crop in many parts of the United States, but most is produced in the Midwest, where it is the main feed for the cattle and hogs raised there. Iowa, Illinois, Nebraska, Minnesota, and Indiana together produce about two-thirds of the annual U.S. corn crop.

Soybeans are grown primarily in the Midwest, especially in Iowa and Illinois, as well as in the Lower Mississippi Valley and other parts of the South. The Midwest is the most important agricultural region in the United States (though California is the number one state in terms of the value of its agricultural products) and alone produces almost twice as much as the American people can consume.

Wheat is another important U.S. crop. Kansas usually leads all states in early wheat production. North and South Dakota, Montana, Oklahoma, Colorado, Texas, Minnesota, and Nebraska also are major wheat producers.

Cotton growing is now concentrated in the lower Mississippi Valley, the plains of Texas, and the valleys of California and Arizona. Tobacco remains an important cash crop. The leading tobacco-producing states are North Carolina, Virginia, Maryland, and Kentucky.

Other leading crops include peanuts, sugarcane, rice, sorghum; such vegetables as tomatoes, potatoes, broccoli, cabbage, beans, carrots, celery, cucumbers, lettuce, onions, green peppers, cantaloupes, and watermelon. California grows nearly one-half of the nation's fresh vegetables; about two-thirds of the potatoes are grown in Idaho and Washington.

Valuable fruit crops grown in the USA are apples, pears, cherries, plums and prunes, grapes, oranges, peaches, pineapples and strawberries. More than three-quarters of the oranges are produced in Florida; about five-sixths of the grapes are raised in California; and about half of the commercial apples come from orchards in Washington. Pineapples are mainly grown in Hawaii.

Major nut crops include almonds, pecans, peanuts, and walnuts.

Livestock-farming is also carried out on a large scale.

Beef cattle are the most valuable product of the nation's farms. Many of the cattle are raised on large ranches in southwestern states. Texas produces more beef cattle than

any other state, and states such as Nebraska, Kansas, Oklahoma, Colorado, and Iowa also raise many cattle.

Dairy products are the second most valuable item coming from American farms. California, Pennsylvania, and Minnesota are leading dairy states. Hogs and broiler chickens are other major livestock raised on U.S. farms. In terms of market value, 68 percent of the hogs are produced in Iowa, North Carolina, Illinois, Minnesota, Nebraska, and Indiana. Poultry farming is widespread in the country-side near all big cities.

Other major livestock and livestock products include chicken eggs, turkeys, sheep and lambs. Sheep farming is highly developed in the western regions of the country and in the prairies.

Vocabulary

1. almond	мигдаль
2. beef	яловичина
3. cantaloupe	канталупа (сорт дині)
4. carry out	виконувати
5. cash crop	прибуткова культура
6. cattle-farming	розведення рогатої худоби
7. celery	селера
8. consume	споживати
9. corn	кукурудза; зерно
10. cotton	бавовна
11. grain	зерно; зернові
12. hog	свиня
13. in terms of	виходячи з, на підставі
14. including	включно
15. lamb	ягня
16. leading	провідний
17. lettuce	салат (рослина)
18. nursery	розсадник
19. peanuts	арахіс
20. pecan	пекан (горіх)
21. pepper	перець
22. permanent	постійний
23. pig production	вирощування свиней
24. pineapple	ананас
25. production	виробництво
26. prune	чорнослив
27. remain	залишатися
28. sheep farming	вівчарство
29. sorghum	сорго
30. soybeans	соя
31. sugarcane	цукрова тростина

32. tobacco	ТЮТЮН
33. value	цінність, вартість, значення
34. walnut	грецький горіх
35. widespread	широкорозповсюджений

I. Translate the sentences into Ukrainian paying attention to the forms of Perfect Passive:

1. The seedbed for winter wheat had been ploughed before rainfall was heavy. 2. The vegetables will have been harvested by the first frosts. 3. Ploughing has just been done. 4. Spring ploughing has always been practiced on soils of light types. 5. Soils low in organic matter have been ploughed in the spring to make them more easily cultivated. 6. If the soil has been tilled well we may expect good results. 7. The effect of soil erosion had always been considered in planning all tillage operations. 8. The USA has been occupying the leading position in the production of corn and wheat for many years.

2. Transform the tense-forms from Active into Passive:

1. Farmers have already done all tillage operations in their fields.
All tillage operations _____ by farmers in their fields.

2. They had harrowed their fields thoroughly before they sowed spring wheat.
Their fields _____ before they sowed spring wheat.

3. Farmers have never ploughed clay soils when they are wet.
Clay soils _____ when they are wet.

4. Students have just planted many exotic trees and shrubs in the park.
Many exotic trees and shrubs _____ by students in the park.

3. Do you agree with these statements?

1. The preparation of good seedbed is one of the most important factors in getting high yields.

2. The most common tillage preparations are ploughing, harrowing, and cultivating.

3. Harrowing is the first and the most important step in the preparation of the seedbed.

4. Crop rotation is of great importance in providing favourable conditions for plant growth.

5. Farmers use only fertilizers to produce good crops.

6. The milk gives farmers a steady income throughout the year.

7. Crop species growing as well as types of animal husbandry depend on soil and climatic conditions.

4. Complete the sentences and translate them into Ukrainian:

1. 47% of the land area of the USA is ... , of which 152 million hectares are harvested ... and 560 million hectares are ... pasture land.

2. The USA ... the world in many ... of agricultural

3. Corn is a ... crop in many parts of the United States, but most is produced in the ...

4. Soybeans are grown ... in the Midwest, especially in ... and ..., as well as in the lower ... Valley.
5. The Midwest is the ... important agricultural region in the United States (though California is the number ... state in terms of the value of its agricultural products) and alone ... almost ... as much as the American people can
6. ... usually leads all states in ... wheat production.
7. Livestock-farming is also ... on a large scale.
8. Poultry farming is ... in the country-... near all big cities.

5. Answer the questions:

1. Agriculture is one of the largest and most important branches of the national economy, isn't it?
2. Does the USA lead the world in many aspects of agricultural production? What agricultural products does it export?
3. What are the leading crops of the U.S.?
4. Where is corn grown in the USA?
5. What is the most important agricultural region in the USA?
6. Where are soybeans mainly grown?
7. What state is "the number one" in terms of the value of its agricultural products?
8. What states are major wheat producers?
9. Where is cotton grown?
10. What vegetables (fruits) are grown in the U.S.?
11. What nut crops are grown in the country?
12. What is the most valuable livestock product of the nation's farms?
13. Where are hogs raised?
14. Where is poultry farming widespread in the country?

6. Make up a plan to the text "Agriculture in the United States of America" and write the summary.

7. Try to retell the text "Agriculture in the USA", using the plan and summary to the text.

Do you know that...?

1. World's Largest Single-Stem Tree: "General Sherman" Giant Sequoia (*Sequoiadendron giganteum*)

Not the tallest nor the broadest tree in the world, but the biggest living single tree in volume, the General Sherman tree is a giant sequoia 275 feet tall (almost the length of a football field). It weighs about 1,800 tons (3,600,000 pounds), and is wide enough that a school bus could be driven through its trunk. But it is much smaller than the

largest tree ever recorded, a Coast Redwood (*Sequoia sempervirens*) that fell over in 1905 and weighed 3,300 tons. Wow! These trees, of course, have no natural predators.

2. World's Largest Tree By Area and Volume: Pando, the Quaking Aspen *Populus tremuloides*

The Pando tree, an aspen in southern Utah with over 40,000 genetically identical trunks and a shared root system, covers an area of 106 acres, weighs almost 6000 tons, and is thought to be 80,000 years old, having survived multiple ice ages and fires.

ADDITIONAL READING

Read these additional texts with a dictionary and try to retell them

AGRICULTURE

Agriculture in Ukraine secures approximately 10-11% of national GDP and employs a quarter of working population. Ukraine has 42.8 m ha of agricultural land comprising 71% of the country's total area, of which 32.5 m ha is arable (excl. pastures, grasslands, permanent plantings etc.). Ukraine has favorable climate for large-scale agriculture, rich agricultural soils and access to abundant land and water resources.

Ukraine is richly endowed with chernozem (also known as "black soil"), one of the most fertile soils worldwide. Chernozem, a black-colored soil that contains a very high percentage of humus (3% to 15%) along with phosphoric acids, phosphorus and ammonia, occupies 41% of Ukraine's total area and even more of its agricultural land (54%), and plow land (58%).

Thirty percent of the world's black soil is in Ukraine, and 42 million of the country's 60 million hectares (231,660 square miles) is agricultural land where wheat, barley, rapeseed and sunflowers grow in abundance. The crops constitute about 55% of the total agricultural output. Among the leading crops are wheat, maize, sunflowers, sugar beets, tobacco, legumes, fruits and vegetables. Livestock farming includes cattle, pigs, sheep, horses etc.

By virtue of its unspoiled soil, Ukraine is also emerging as a major producer of organic food. Already, hundreds of thousands of acres are devoted to organic farming and agricultural officials and outside experts believe that Ukraine can become a major exporter and help satisfy the increasing demand in Western Europe for such products.

Annual production of wheat in Ukraine is 15 to 22 million t. The entire cereal production reaches 90-100 mn t. Local needs, even if dramatically increased, take 35 to 40 mn t., making around 50-60 mn t. available for exports in the sphere of agriculture. Ukraine thus occupies sixth place on the world grain export market.

Most of the exported grain is destined for the countries of Middle East and North Africa. The local Ministry of Economic Development and Trade subjects export contracts for certain groups of agricultural products to registration. The key items exported from Ukraine are subjected to licensing and/or quotas where applicable and must be registered prior the export.

In 2015 Ukraine secured following leading positions worldwide:

1st exporter of sunflower oil (4 million tons);

3rd exporter of barley (4.5 million tons);

4th exporter of maize (15.5 million tons);

6th exporter of wheat (15.5 million tons);

7th exporter of soybean (2.1 million tons);

The production of cereal and industrial crops tends to be the focal point for agricultural enterprises. Major cereal crops of grain markets in Ukraine incorporate winter wheat, spring barley and fodder maize. Winter wheat is the core crop for both private farms and agricultural enterprises.

Grain crops

In 2014/15, cereal production reached another record of 63,8 million tons (excluding the Crimea), which was possible by an increase in the average yield from 40,6 t/ha to 43,7 t/ha despite the reduction in acreage planted by almost 5% compared to 2013/14.

In 2015/16 MY, the drop of grain export is expected to be about 28%, which is primarily caused by the reduction of gross production. Maize is expected to be the most exported crop with the share in total exports of almost 60%.

Wheat

Wheat is grown all across the country, but central and south-central regions are the key growing areas of Ukraine. Wheat is planted in the fall and harvested throughout July or August of the following year. About 95% of it is winter wheat.

Once known as the breadbasket of Europe, Ukraine is about to regain that place as harvests soar. Ukraine produces mostly the hard-red winter wheat of bread wheat. Normally, some 80% of domestic wheat crops are considered to be of milling quality according to national standards. In 2013 the production of wheat in Ukraine was 23,01 mn t. which is 59.18% more than in 2012.

Wheat is widely used for production of pastry and bread. Ukraine's bakery production has a substantial strategic role in the domestic economy and accounts for 15% of national food industry. In addition, wheat tops the grain prices in Ukraine, being the most expensive grain.

Increase in acreage planted approximately by 11% in the agricultural enterprises, mainly due to winter wheat, caused by high level of profitability in 2014 (about 15,6% in USD equivalent) as compared to other crops. An additional incentive for the increase of sown areas under wheat is a limited activity of the Russian Federation on international wheat markets and, thus, a possibility to substitute the share of Russia.

The increase in wheat production in 2013-2014 allowed increasing exports. Particularly, in 2014, the export of this crop increased by 41% compared to the previous

year. The main export destinations for wheat were Africa and Asia, but it is worth to mention a significant expansion of exports to the European Union, which have increased by more than 10 times in 2013-2014, thus making EU the second largest foreign trade partner with the share of 10%. 65% out of 1 million tons of wheat, exported to the EU were delivered to Spain.

The wheat exports tend to have a positive dynamic. According to the Ministry of Agrarian Policy and Food the wheat exports will amount to 16.6 million tons in 2015/2016 MY while in 2014/2015 MY Ukraine exported only 11,1 million tons.

Barley

Barley has been the main forage grain in Ukraine for most of the past 10 years in terms of consumption. Spring barley accounts for over 90% of the barley crop. It is typically planted in April and harvested in August in the main barley growing region – eastern Ukraine. It is the frequently used crop for the spring reseeding of damaged or destroyed winter harvests. The area is inversely related, to some degree, to the area of winter wheat. Winter barley is the least cold-tolerant of the winter cereals and its production is restricted to the extreme south. In the season 2013/2014 its production was 7 mn t. (- 7,41% to 2012/2013).

High yield in 2014 and limitation of external markets might be an incentive for overall reduction in 2015. Acreage of winter barley is by 5,4% less than in 2014.

Growth of productivity allowed to significantly increasing the volume of foreign trade in barley (+44% in 2014 compared with the previous year). However, the export geography of barley has not changed considerably. Saudi Arabia remains the main market (about 64% of total exports). Also, China appeared in the ranking of top 10 importers of Ukrainian barley (179,1 thousand tons in 2014). Considering the development of relations with China, we can expect intensification of trade. Besides, the volume of sales to the EU has increased by 9 times compared to 2013.

After the huge spike of exports in 2014, in 2015 the amount of foreign trade on the barley market remains nearly at the same level (a slight decrease in 3% is expected in 2015/2016 compared to the previous one).

Maize

Maize is the third most important feed cereal in Ukraine. The planting zone has increased despite a number of constraints, such as obsolete and insufficient harvesting equipment, the high cost of production, especially post-harvest drying costs, and pilferage. The main growing region is eastern and southern Ukraine, although rainfall in some oblasts (regions) in the extreme south is too low to support growth of this crop. Maize is usually planted in late April or early May. Harvest starts in mid-September and is nearing complete by early November. Only 25-50% of general maize area is harvested for grain, the remainder being cut for silage, normally throughout August. In 2013 its production went up to 30,9mn t. (+47.69% to 2012).

As in the case of barley, decrease in acreage is expected. Mostly, the transition to production of soybeans is going to take place.

The European Union and Egypt remain the main markets for Ukrainian maize with shares of 46% and 12% from the total volume of supply in 2014, respectively. Tighter cooperation with China made it possible to increase the volume of exports up to 1.6 mln. tons in 2014, which is 15 times more than in 2013, and brought this country to the third position in the rating of top 10 importers of Ukrainian maize. The cooperation with China continued in 2015 when Ukraine became a top maize supplier to China in the first half of the year leaving the USA behind.

Industrial crops are sugar beet, sunflower and rapeseed. Numerous farms specialize in production of the first two crops.

Sugar beet

Sugar beet is primarily grown in central and western regions. The beet is planted at the end April - beginning of May and harvested from mid-September until the end of October.

The Ukrainian sugar industry contributes about 1.2 percent to national Gross Domestic Product (GDP) with 2010 revenues estimated at about USD 1.67 billion. While the area under sugar beets – the main source of raw material for sugar production in Ukraine – declined from 1.6 million hectares in the 1990s to about 600 000 hectares in 2010, sugar beet yields have been increasing since 1999 thanks to improved access to capital, the introduction of hybrid seeds, improved application of fertilizer and crop protection chemicals.

Ukrainian farmers obtain higher sugar beet yields today than during the Soviet era. Sugar beet production has also been consolidating and the average size of sugar beet-growing farms has increased. The share of rural households 4 in total sugar beet production has declined dramatically – from 15 percent in 2006 to 8 percent in 2010. After a sharp drop in the early 1990s, average sugar production in Ukraine stabilized at about 1.8 million tons per year in recent years and equaled estimated domestic demand. The primary reasons for focusing on vegetable growing are the many possibilities for selling produce, either fresh or for processing, and the availability of manual labor instead of necessary equipment.

Sugar beet production requires a substantial amount of manual labour and remains vital option for small household farms with limited access to the farming machinery.

In recent years, the traditional zonal pattern for growing major agricultural crops has altered. Thus, for instance, sugar beet, a crop grown principally in the forest-steppe zone, has progressed further south and is now grown by Kherson farmers. However, the areas sown to these crops are not significant and the yields are much lower than in the traditional growing areas. In 2010, sugar beet planting area continued to shrink, with the exception of Rivne, Vinnytsia and Khmelnytskyi Oblasts, where a slight escalation was registered. In southern regions, no sugar beet production was reported.

On April 14, 2015, The Cabinet of Ministers of Ukraine has increased the minimum price of beet sugar for the 2015/16 agricultural year (September – August)

by 36.7% compared to the previous year, to UAH 6,454.73 per tonne (value added tax not included).

Sunflower

Over recent years, the market of sunflower has experienced a simultaneous intensification and extensification of production. UCAB experts do not expect a significant increase in acreage under sunflower in 2015 and marginal growth is estimated at 3-5%. Further growth will be possible due to increase of the productivity, but these trends are doubtful in 2015 due to general negative situation in the economy.

Even despite 4% increase of acreage, the output of 2014 decreased by 7,7% to 10,1 million tons because of the very dry summer in southern Ukraine. In general, processing companies reported insufficient supply of seeds, because agricultural producers refrained from selling sunflower seeds to the instability of the purchase prices in hryvnia. Because Ukrainian processing capacities reach 13-14 million tons of seeds per year, processors to switch to processing of soybeans and rapeseeds.

At the end of February, the Verkhovna Rada has registered the bill on amendments to the Law of Ukraine “On rates of export duties on certain types of oil crops seeds (to ensure the competitiveness of oilseed producers) No.1837, which provides an abolition of 16% export duty on sunflower seeds. Processing companies, naturally, opposed this, arguing that these changes will support seed exports, greater undercapacity and will lead to a reduction in added value, which stays in the country due to processing.

China is the biggest importer of Ukrainian sunflower oil so far. In 2015 the part of Ukrainian oil in Chinese import was 85%.

Soybeans

In 2014, the acreage under soybeans increased by 32%. Agricultural producers gave more preference to soybean instead of maize in 2014/15, which was caused by low profitability of maize in 2013/14. Favourable weather conditions also allowed obtaining a good harvest. The trend continued in 2015, while the maize exports decreased by 21.16%, the soybeans exports grew by 15.74%.

Ukraine is gradually increasing the production of soybean oil. It is influenced by the increase of demand for soybean meal, and also by the excess of capacity to produce oil due to lack of sunflower seeds. UCAB forecasts an increase in the production of soybean oil to 165 thousand tons in 2014/2015, twice more than in the 2012/2013.

However, in 2014, the Verkhovna Rada registered a draft law No. 4693, which was supposed to increase the processing volumes of soybeans by introducing an export tax of 15%. In fact, the plan was to introduce the mechanism similar to the market of sunflower seeds, but the draft was rejected. In the last few years, 83-85% of the soybean oil production was export oriented. Along with the growth in output the share of exports increases too.

Increase of soybean production led to increase in the volume of exports by 57% in 2014 as compared to 2013. Despite the reduction in supplies to the EU, this group of states remains the main foreign contractor of Ukrainian soybeans. Also, a significant

expansion of the role of Asian countries in foreign trade is worth noting. While in 2013 this region accounted for about 21% of the country's exports of soybeans, in 2014 this figure constituted 46%. There were no deliveries to China in 2014. In the long run, expansion of trade with China is also expected.

In June 2015, Ukraine became a part of Danube Soya association. This organization operates in Europe and provides support for soya producers who grow non-GM soybeans.

Rapeseeds

The area under rape declined by 12% in 2014, but the yields, as in the case of soybeans, increased, which allowed to harvest only 6% less than in 2013. Export is the main distribution channel of Ukrainian rapeseeds.

According to the forecast, in 2014/2015, the processing share in the structure of distribution will increase up to 185 thousand tons (+92.7% compared to 2013/2014) or up to 8% of the total supply. As in the case of soybeans, in 2014, the initiative to introduce the export duties on rapeseeds to increase domestic processing was considered, but it was also rejected.

From a technological point of view, a very small share of enterprises in Ukraine can produce a rape oil because it contains aggressive erucic acid in its structure and, therefore, the equipment has to be resistant to the substance. Also, biofuel programs that are able to stimulate the processing of rapeseeds into biodiesel are not developed in Ukraine.

The geography of foreign trade in rape is quite concentrated. Top 5 countries in rating of the leading external contractors for exports of rape occupied a 98% share in the total exports from Ukraine in 2014 (97% in 2013). As in the case of soybeans, the importance of Asia is growing, but at a slower rate. In 2013, 541,5 thousand tons (23%) of export deliveries accounted for the region, while in 2014 this figure amounted to 686,2 thousand tons (34%). It should be noted that in 2014 the first delivery of rape to China was made. Its volume constituted only 0,4 thousand tons.

Despite the fact that China is a very promising market for Ukrainian rape oil producers, in 2015/2016 the exports are expected to be rather minor as China has accumulated about 6 million tons of oil produced during a support program for local farmers in 2009-2016.

Milk

Dairy farming is one of the major livestock industries in Ukraine and, before crisis, this segment demonstrated a trend towards its active development, but the situation in the dairy sector became more complicated in 2014. The biggest problem for the dairy sector was the loss of the Russian market, which accounted for about 80% of exports of dairy products. Consequently, the number of cows began to decline rapidly. In 2014, the number of cows decreased by 3.2% — to 2.36 million heads. In 2014, milk production in Ukraine amounted to 11,23 million tons, which is by 0.4% more than in 2013. There was also an increase of milk production by agricultural

enterprises and a decrease of its production by households. The share of industrial milk production increased by 24% and its supplies to processing — up to 52%.

Growth of productivity of cows became a significant achievement of the dairy sector. During the past five years' yields, have risen by 32% in 2014; average annual yield per cow constituted 5228 kg. However, in 2015, slight decrease in productivity of cows is possible due to the rapid growth of input prices.

According to the forecasts, milk production is going to decrease by 7% - to 10.4 million tons - in 2015. Exports of dairy products are going to decline to 0.35 million tons in milk equivalent and imports — to 0.15 million tons.

As a result of sanctions, the exports of dairy products dropped to 0.5 million tons in milk equivalent. In value terms, exports of dairy products from Ukraine amounted to USD 324 million, while this figure was USD 515 million in 2013. There was a reduction in cheese exports — to 19.5 thousand tons (threefold). However, there was an increase in sales of milk powder and butter to foreign markets in 2014.

Export of milk powder from Ukraine is quite diversified although Russian market occupied a big share in the structure in previous years. In 2014, after the Russian ban, Kazakhstan (20%), Bangladesh (12%), Armenia (8%) and Georgia (7%) became the main markets for Ukrainian milk powder.

Today, the main challenge for the dairy industry is finding new export markets and developing the existing markets. To do this, it is important to develop a systemic state export policy that requires work with each particular country of destination. One of the perspectives for Ukraine is also an export-oriented organic milk production, as more and more people pay attention to health and are willing to pay for quality products. The demand for dairy products for baby food is also increasing around the world, especially in China.

On January 10th, 2016, the European Commission granted Ukrainian milk processing companies access to the EU market. The first country to receive Ukrainian dairy products was Bulgaria.

After the crisis, demand for dairy products in Ukraine is going to recover, so it is very important to keep potential of production and processing of milk in the domestic market.

Meat

Meat production in Ukraine has demonstrated a consistent upward trend in the last years. Despite the difficult situation in 2014, meat production at all types of farms increased by 4.7% compared to 2013 and amounted to 2.37 million tons in slaughter weight. Pork production increased by almost 6% to 753.6 thousand tons and poultry production increased by 6.6% to 1.17 million tons. In 2014, it was produced 404.8 thousand tons of beef and veal, which is 1.8% less than in 2013.

The increase in exports of meat was the positive dynamics in 2014. For the first time since many years, Ukraine has had a visible positive trade balance. In 2010, Ukraine exported only 46.5 thousand tons of meat and imported 267 thousand tons. In

2014, the volume of exports amounted to 205.6 thousand tons and the volume of imports decreased to 93.5 thousand tons.

While in 2013 the share of imported meat in the structure of the consumption in Ukraine was about 10%, in 2014 it decreased to 4.2%. General meat consumption in Ukraine decreased by 2.2% to 2.42 million tons in 2014.

A very important achievement of the poultry sector was its access to the European market. In 2013, Ukraine got the permission to export poultry products to the EU followed by the autonomous trade preferences in April 2014 that have made poultry exports under EU import quotas economically attractive. According to the results of 2014, about 17 thousand tons of poultry meat were exported to the European Union, which amounts to USD 51.8 million. It is worth noting that parts of best quality were supplied to the EU market at a higher price. As for beef and pork, the permission to supply these products to the European market is still missing. Nevertheless, Ukraine is improving this direction, because it has quotas for duty-free exports to the EU in the amount of 12 thousand tons of beef and 20 thousand tons of pork. In addition, European quality assurance of Ukrainian products facilitates its access to other markets.

In 2014, the main export market for Ukrainian beef was Russia, with the share of 64%. However, Russia has been banning exports from Ukraine regularly and this led to a decline in exports of beef. Beef was also exported to Belarus, Azerbaijan, Moldova and other countries.

On January 1st, 2016 Russia completely banned food products import from Ukraine. It is expected that meat producers will be affected due to the lack of other promising export markets.

MINERAL FERTILIZERS

Ukraine is one of the world leaders in fertilizers production, specializing in nitrogen fertilizers. Ukraine's share on the global mineral fertilizer market is 8%. There are 8 big mineral fertilizer producers; 6 of them specialize in production of nitrogen fertilizers and form a foundation of Ukrainian chemical export: plants from Horlivka and Odesa possess around 24% of production; Cherkasy, Dniprodzerzinsk - about 22% and Severodonetsk - up to 10%. Annually they produce only 3,6 million tons of urea. Some part of this urea is sold internally, i.e. on Ukrainian domestic market. Currently, Ukraine exports about 280.000 tons of urea and 130.000 tons of ammonia nitrate per month. It is estimated then the projected volume of domestic mineral fertilizers market will double by 2017.

The largest share of the Ukrainian market of mineral fertilizers belongs to ammonium nitrate. In total consumption of fertilizers its share amounted from 45 to 50%. In 2014, the Ukrainian market of ammonium nitrate decreased to 1 535 000 tons. The main reason was the reduction of nitrate production in Ukraine by 34% due to the outage of Severodonetsk Azot and Styrol plants, as well as decrease of the load of Rivne Azot plant in June and July.

Due to the anti-dumping restrictions against nitrate of Russian origin, it almost was not supplied to Ukraine in April-October. However, the annual imports declined only by 10%. At the end of the year the EuroChem company found a way to bypass these restrictions: instead of the standard ammonium nitrate it began to import a granular ammonium nitrate.

In 2015, the market volume of ammonium nitrate increased by 1,7-1,75 million tons. This became possible through increased volumes of Ukrainian production and reduced prices for ammonium nitrate. Despite the economic crisis, the need for classical nitrate remains stable. Small and medium-sized farms, for which nitrate and carbamide-ammonia mixture (CAM) are too expensive, are going to be the main consumers of ammonium nitrate.

A cheaper alternative to ammonium nitrate is ammonium sulfate. The excess of acidity is compensated by the lowest price among the other solid nitrogenous fertilizers and the availability of easily digestible form of sulfur. In 2014, there was a jump in the consumption of ammonium sulfate (+77%). The market volume reached 188 000 tons; one of the factors for such success was the deficit of nitrate. As in 2015 the production of nitrate increased, the demand for ammonium sulfate reduced slightly but remained at the level of 160-180 thousand tons. The biggest share of ammonium sulfate is supplied to Ukraine by independent importers.

The second largest consumable fertilizer in Ukraine is NPK (a complex fertilizer of different formulas, of which the most popular are the ammonium nitrate phosphate fertilizer (NPK 16:16:16), and diamphoska (NPK 10:26:26). Considering that the Sumykhimprom plant has successfully introduced these brands, the growth of domestic consumption of NPK in Ukraine by 63% is natural. In 2015, the Ukrainian market of complexed fertilizers experienced a slight decrease (-5%).

According to the forecasts, the market volume of CAM increased to 500 thousand tons in 2015. A more substantial growth is not impossible, the key to which is the diversification of CAM supply sources. Besides two traditional suppliers, OSTCHEM and Eurochem, CAM importers of Belarussian origin and Ukrainian non-industrial producers of CAMp (products based on carbamide-ammonium mixture) are going to play a prominent role in the market.

Ammonia is a vulnerable position in the nomenclature offered by agricultural chemists in 2015. On the one hand, the application volume of ammonia annually grows. In 2014 it increased by 20% to 125 thousand tons. On the other hand, the cost of ammonia, complicated application procedure and the short period of its application restrained the market growth in 2015. Nevertheless, the features of ammonia make it irreplaceable in the autumn field works.

Total dependence of the Ukrainian agrochemical industry on the imported raw materials and the high proportion of imported fertilizers on the market dictate the dependence of Ukrainian prices on the world market prices. Since the inflation and devaluation rate is unpredictable, many export-oriented agricultural enterprises forecast the prices for mineral fertilizers on the basis of the US dollar equivalent.

On the world markets of fertilizers, a reduction in prices was a dominant trend in 2015. High harvests in previous years, a decrease in the cultivation of “fuel” crops due to the oil prices decrease, reduction of production costs of fertilizers and surplus of the market will contribute to the low-price level of fertilizers during the year.

INVESTMENT IN UKRAINIAN AGRICULTURE

Investment in agriculture is crucial for the economic development and food security of Ukraine. Today agriculture is one of the most promising sectors of the country’s economy: it is a notable player on the global agricultural market, a source of foreign currency inflow to the country, 8% of the GDP and formal employer for 15% of the population of Ukraine. Global food crisis is also favorable for investment in agricultural production in Ukraine.

Investment activity is regulated in Ukraine with numerous laws and amendments, nevertheless the legal regulations are imperfect. Ukrainian legislation de facto establishes a national treatment regime for foreign investors, i.e. neither foreign nor domestic investments are prioritized, however, the greatest shortcoming of the investment regulation in Ukraine is an absence of state protection guarantees for foreign investments. Unilateral changes of the legislation, instability of legislative base, unclear legal definitions and declarative character of laws and state programs of the agricultural sector development, as well as imperfections of national statistical data also create obstacles for the investment activity in Ukraine.

Autonomous EU trade preferences for Ukraine: first results for agricultural sector. Few positive changes in investment regulation in Ukraine took place over the recent times. Signing of the Association Agreement with the European Union opened an access to European markets for Ukrainian agri-food products.

Association Agreement between the EU and Ukraine was simultaneously ratified by the European Parliament and Parliament of Ukraine on the 16th of September, 2014. However, bilateral implementation of the trade component was postponed for political reasons until January 2016¹⁶. Instead, EU introduced preferential trade regime within a wider package of economic and financial assistance to Ukraine. Relevant regulation (EC N 374/2014) came into an effect as of April 23, 2014. Trade preferences are based on the agreement on liberalised access to the EU market under the Association Agreement, which should have been implemented in the first year of free trade regime between the EU and Ukraine.

Harmonization of the Ukrainian legislation with the European one is expected to intensify international trade in Ukraine. However, harmonization requires stricter regulation of trade with agricultural products by private households, which might negatively affect private households in a short-term perspective.

Implementation of the Deep and Comprehensive Free Trade Area (DCFTA), i.e., bilateral reduction or removal of import duties on the majority of commodities, starting from January, 2016, will increase competition at the domestic market of Ukraine. The above-mentioned study of the APD demonstrates that reduction of Ukraine’s import

duties could increase imports up to 7% largely due to increased supplies of beverages, vegetable oils and fats, meat, mineral or chemical fertilizers, animal oils and fats, and sugar. Hence, it seems that gains obtained by Ukraine are likely to be higher than for the EU at least in the medium- and long-term.

In conclusion, introduction of the autonomous trade preferences brought first promising results in terms of increased exports of to the EU and also contributed to the improvement of food quality and safety standards and, thus, opened international export possibilities for Ukraine. Delayed implementation of the DCFTA provides more time for the government to implement all required legislative changes. The Ukrainian agribusiness should adapt their production processes and standards to the EU requirements to strengthen their competitiveness at the EU market, as well as to maintain and expand their positions on the domestic market.

WOOD

One of the most important things produced by plants is wood. Trees and shrubs form wood, and not only does it occur in the trunk and branches but in the roots as well. It is hard and long-lasting and able to resist decay; it also gives strength to the plant. It is used by man for making almost every kind of object from matches to ships. It is also a source of fuel.

Prehistoric men used wood to make their bows and arrows and some of their tools, besides burning it to cook their food and keep themselves warm. Later, when they learned to cultivate the soil, their ploughs and digging tools were made of wood, so were some of their houses. Wooden furniture was made later and rafts and boats were built from logs and shaped pieces of wood.

Even today, when steel, concrete and plastics are taking the place of wood in many countries, wood is still used in all kinds of ways. This can be seen by looking round the inside of an ordinary house. To begin with, there are the obvious things, such as planks in the floor, the doors, the dining-room table and other pieces of furniture. There are also the bags in which food is brought home, the daily newspapers and the pages of books, for paper is made from wood after it has been crushed into pulp.

On farms wood is used to build barns, shelters and fences and to make implements. By the sea and on great rivers there are piers, wharves (platforms where ships are moored) and breakwaters, most of which are made, at least in part, of wood. Pit-props in the mines, telegraph poles along the roads, and sleepers (placed between the rails) on the railway lines are all made of wood. A lot of people still use wood for fuel, although coal, gas, oil and electricity have taken its place in large cities.

The wood of trees can be divided into two classes, the hardwoods and the softwoods. The hardwoods come from trees such as oak, beech, elm, sweet chestnut, willow, walnut and a number of tropical trees such as mahogany and teak.

Each of the hardwoods is different and each has its own special uses. Oak is particularly well known for its strength and long-lasting quality and it has a handsome grain. People in past centuries built their roofs, panelled their rooms and made their

furniture of oak, and in old houses this oak work can still be seen. The first ships to sail round the world were made of oak. Today ladders, barrels, gate-posts, mill-wheels and other objects that need to be hard-wearing are made of oak.

BARK, WOOD, BRANCHES AND CAMBIUM

The fibrous nature of wood strongly influences how it is used. Wood is primarily composed of hollow, elongate, spindle-shaped cells that are arranged parallel to each other along the trunk of a tree. When lumber and other products are cut from the tree, the characteristics of these fibrous cells and their arrangement affect such properties as strength and shrinkage as well as the grain pattern of the wood. This chapter briefly describes some elements of wood structure.

A cross section of a tree shows the following welldefined features (from outside to center): bark, which may be divided into an outer corky dead part, whose thickness varies greatly with species and age of trees, and an inner thin living part, which carries food from the leaves to growing parts of the tree; wood, which in merchantable trees of most species is clearly differentiated into sapwood and heartwood; and pith, a small core of tissue located at the center of tree stems, branches, and twigs about which initial wood growth takes place. Sapwood contains both living and dead tissue and carries sap from the roots to the leaves. Heartwood is formed by a gradual change in the sapwood and is inactive. The wood rays, horizontally oriented tissue through the radial plane of the tree, vary in size from one cell wide and a few cells high to more than 15 cells wide and several centimeters high. The rays connect various layers from pith to bark for storage and transfer of food. The cambium layer, which is inside the inner bark and forms wood and bark cells, can be seen only with a microscope. As the tree grows in height, branching is initiated by lateral bud development. The lateral branches are intergrown with the wood of the trunk as long as they are alive. After a branch dies, the trunk continues to increase in diameter and surrounds that portion of the branch projecting from the trunk when the branch died. If the dead branches drop from the tree, the dead stubs become overgrown and clear wood is formed.

Most growth in thickness of bark and wood is caused by cell division in the cambium. No growth in diameter takes place in wood outside the cambial zone; new growth is purely the addition and growth of new cells, not the further development of old ones. New wood cells are formed on the inside of the cambium and new bark cells on the outside. Thus, new wood is laid down to the outside of old wood and the diameter of the woody trunk increases. In most species, the existing bark is pushed outward by the formation of new bark, and the outer bark layers become stretched, cracked, and ridged and are finally sloughed off.

SAPWOOD AND HEARTWOOD

Sapwood is located between the cambium and heartwood. Sapwood contains both living and dead cells and functions primarily in the storage of food; in the outer layers near the cambium, sapwood handles the transport of water or sap. The sapwood may vary in thickness and number of growth rings. Sapwood commonly ranges from

4 to 6 cm (1-1/2 to 2 in.) in radial thickness. In certain species, such as catalpa and black locust, the sapwood contains few growth rings and usually does not exceed 1 cm (1/2 in.) in thickness. The maples, hickories, ashes, some southern pines, and ponderosa pine of North America may have sapwood 8 to 15 cm (3 to 6 in.) or more in thickness, especially in second-growth trees. As a rule, the more vigorously

growing trees have wider sapwood. Many second-growth trees of merchantable size consist mostly of sapwood. In general, heartwood consists of inactive cells that do not function in either water conduction or food storage. The transition from sapwood to heartwood is accompanied by an increase in extractive content. Frequently, these extractives darken the heartwood and give species such as black walnut and cherry their characteristic color. Lighter colored heartwood occurs in North American species such as the spruces (except Sitka spruce), hemlocks, true firs, basswood, cottonwood, and buckeye. In some species, such as black locust, western redcedar, and redwood, heartwood extractives make the wood resistant to fungi or insect attack. All darkcoloured heartwood is not resistant to decay, and some nearly colourless heartwood is decay resistant, as in northern whitecedar. However, none of the sapwood of any species is resistant to decay. Heartwood extractives may also affect wood by (a) reducing permeability, making the heartwood slower to dry and more difficult to impregnate with chemical preservatives, (b) increasing stability in changing moisture conditions, and (c) increasing weight (slightly). However, as sapwood changes to heartwood, no cells are added or taken away, nor do any cells change shape.

The basic strength of the wood is essentially not affected by the transition from sapwood cells to heartwood cells. In some species, such as the ashes, hickories, and certain oaks, the pores (vessels) become plugged to a greater or lesser extent with ingrowths known as tyloses. Heartwood in which the pores are tightly plugged by tyloses, as in white oak, is suitable for tight cooperage, because the tyloses prevent the passage of liquid through the pores.

Tyloses also make impregnation of the wood with liquid preservatives difficult.

GROWTH RINGS

In most species in temperate climates, the difference between wood that is formed early in a growing season and that formed later is sufficient to produce well-marked annual growth rings. The age of a tree at the stump or the age at any cross section of the trunk may be determined by counting these rings. However, if the growth in diameter is interrupted, by drought or defoliation by insects for example, more than one ring may be formed in the same season. In such an event, the inner rings usually do not have sharply defined boundaries and are termed false rings. Trees that have only very small crowns or that have accidentally lost most of their foliage may form an incomplete growth layer, sometimes called a discontinuous ring. The inner part of the growth ring formed first in the growing season is called earlywood and the outer part formed later in the growing season, latewood. Actual time of

formation of these two parts of a ring may vary with environmental and weather conditions. Earlywood is characterized by cells with relatively large cavities and thin walls. Latewood cells have smaller cavities and thicker walls.

The transition from earlywood to latewood may be gradual or abrupt, depending on the kind of wood and the growing conditions at the time it was formed. Growth rings are most readily seen in species with sharp contrast between latewood formed in one year and earlywood formed in the following year, such as in the native ringporous hardwoods ash and oak, and in softwoods like southern pines. In some other species, such as water tupelo, aspen, and sweetgum, differentiation of earlywood and latewood is slight and the annual growth rings are difficult to recognize.

In many tropical regions, growth may be practically continuous throughout the year, and no well-defined growth rings are formed. When growth rings are prominent, as in most softwoods and ring-porous hardwoods, earlywood differs markedly from latewood in physical properties.

Earlywood is lighter in weight, softer, and weaker than latewood. Because of the greater density of latewood, the proportion of latewood is sometimes used to judge the strength of the wood. This method is useful with such species as the southern pines, Douglas-fir, and the ring-porous hardwoods (ash, hickory, and oak).

WOOD CELLS

Wood cells—the structural elements of wood tissue—are of various sizes and shapes and are quite firmly cemented together. Dry wood cells may be empty or partly filled with deposits, such as gums and resins, or with tyloses. The majority of wood cells are considerably elongated and pointed at the ends; these cells are customarily called fibers or tracheids. The length of wood fibers is highly variable within a tree and among species. Hardwood fibers average about 1 mm (1/25 in.) in length; softwood fibers range from 3 to 8 mm (1/8 to 1/3 in.) in length. In addition to fibers, hardwoods have cells of relatively large diameter known as vessels or pores.

These cells form the main conduits in the movement of sap. Softwoods do not contain vessels for conducting sap longitudinally in the tree; this function is performed by the tracheids. Both hardwoods and softwoods have cells (usually grouped into structures or tissues) that are oriented horizontally in the direction from pith toward bark. These groups of cells conduct sap radially across the grain and are called rays or wood rays.

The rays are most easily seen on quartersawn surfaces, and they vary greatly in size in different species. In oaks and sycamores, the rays are conspicuous and add to the decorative features of the wood. Rays also represent planes of weakness along which seasoning checks readily develop. Another type of wood cells, known as longitudinal or axial parenchyma cells, function mainly in the storage of food.

CHEMICAL COMPOSITION

Dry wood is primarily composed of cellulose, lignin, hemicelluloses, and minor amounts (5% to 10%) of extraneous materials. Cellulose, the major component, constitutes approximately 50% of wood substance by weight. It is a high-molecular-weight linear polymer consisting of chains of 1 to more than 4 β -linked glucose monomers. During growth of the tree, the cellulose molecules are arranged into ordered strands called fibrils, which in turn are organized into the larger structural elements that make up the cell wall of wood fibers. Most of the cell wall cellulose is crystalline. Delignified wood fibers, which consist mostly of cellulose, have great commercial value when formed into paper. Delignified fibers may also be chemically altered to form textiles, films, lacquers, and explosives. Lignin constitutes 23% to 33% of the wood substance in softwoods and 16% to 25% in hardwoods. Although lignin occurs in wood throughout the cell wall, it is concentrated toward the outside of the cells and between cells. Lignin is often called the cementing agent that binds individual cells together. Lignin is a three-dimensional phenylpropanol polymer, and its structure and distribution in wood are still not fully understood. On a commercial scale, it is necessary to remove lignin from wood to make high-grade paper or other paper products. Theoretically, lignin might be converted to a variety of chemical products, but in commercial practice a large percentage of the lignin removed from wood during pulping operations is a troublesome byproduct, which is often burned for heat and recovery of pulping chemicals. One sizable commercial use for lignin is in the formulation of oil-well drilling muds. Lignin is also used in rubber compounding and concrete mixes. Lesser amounts are processed to yield vanillin for flavoring purposes and to produce solvents. Current research is examining the potential of using lignin in the manufacture of wood adhesives. The hemicelluloses are associated with cellulose and are branched, low-molecular-weight polymers composed of several different kinds of pentose and hexose sugar monomers. The relative amounts of these sugars vary markedly with species. Hemicelluloses play an important role in fiberto-fiber bonding in the papermaking process. The component sugars of hemicellulose are of potential interest for conversion into chemical products. Unlike the major constituents of wood, extraneous materials are not structural components. Both organic and inorganic extraneous materials are found in wood. The organic component takes the form of extractives, which contribute to such wood properties as color, odor, taste, decay resistance, density, hygroscopicity, and flammability. Extractives include tannins and other polyphenolics, coloring matter, essential oils, fats, resins, waxes, gum starch, and simple metabolic intermediates. This component is termed extractives because it can be removed from wood by extraction with solvents, such as water, alcohol, acetone, benzene, or ether. Extractives may constitute roughly 5% to 30% of the wood substance, depending on such factors as species, growth conditions, and time of year when the tree is cut. The inorganic component of extraneous material generally constitutes 0.2% to 1.0% of the wood substance, although greater values are occasionally reported. Calcium, potassium, and magnesium are the more abundant elemental constituents. Trace amounts (<100 parts per million) of phosphorus, sodium, iron, silicon, manganese, copper, zinc, and perhaps a few other elements are usually present. Valuable nonfibrous products produced from wood include naval stores, pulp byproducts,

vanillin, ethyl alcohol, charcoal, extractives, and products made from bark.

SPECIES IDENTIFICATION

Many species of wood have unique physical, mechanical, or chemical properties. Efficient utilization dictates that species should be matched to end-use requirements through an understanding of their properties. This requires identification of the species in wood form, independent of bark, foliage, and other characteristics of the tree. General wood identification can often be made quickly on the basis of readily visible characteristics such as colour, odor, density, presence of pitch, or grain pattern. Where more positive identification is required, a laboratory investigation must be made of the microscopic anatomy of the wood.

WOOD PRODUCTS

Wood has many characteristics that make it an important construction material. Carpenters and woodworkers can easily shape it with tools and fasten it with nails, screws, staples, and adhesives. It is light but strong. Wood provides insulation against electric current, heat, cold, and sound. It can hold paint and other finishes, and it does not rust. Unlike metal, cement-based, or plastic construction materials, wood is a renewable resource - that is, a new supply grows after the timber has been harvested. Some of the chief wood structural materials are round timbers, lumber, and veneer products.

Round timbers include pilings, poles, and posts. Pilings driven into the ground provide foundations for buildings, wharves, and other heavy structures. Poles link overhead telephone wires and power lines. People use posts chiefly to build fences. Round timbers are simply trees that have been stripped of their branches and bark, and cut into logs. The logs are dried and treated for protection against decay and insect attack.

Lumber includes boards and larger pieces of wood that have been sawed from logs. In the United States, the construction industry uses about 50 percent of the lumber production. The rest goes to make crates, furniture, railroad ties, sporting goods, toys, and thousands of other products.

Wood scientists classify lumber as softwood or hardwood, depending on the kind of tree. This classification does not always indicate the hardness of the wood. Various softwoods produce harder lumber than do some hardwoods. Softwood lumber comes from needleleaf trees that are also called evergreens or conifers. Builders use this type of lumber for most structural work because of its straightness and length. Softwoods include pine, larch, fir, hemlock, redwood, cypress, cedar, and Douglas-fir.

Hardwood lumber comes from trees that lose their leaves every autumn. Many hardwoods have beautiful grain patterns. For this reason, builders and furniture makers use hardwoods for cabinets, flooring, furniture, and paneling. Popular hardwoods include birch, mahogany, maple, oak, sweet gum, and walnut.

Veneer products are made of thin sheets of wood called veneers. These veneers may be cut into long strips or other shapes. Veneer products include baskets, matches, tongue depressors, and toothpicks.

Wood-based composite products

Manufacturers produce many products using wood together with at least one other material. By combining materials, they can take advantage of the best properties of each. Wood-based composite products include plywood and particleboard, which are made by combining wood with adhesive resins.

Plywood consists of a number of veneers that are glued together. The veneers are arranged so that the grain direction in each layer is at a right angle to the grain direction of the next layer. This arrangement gives plywood several advantages over lumber. For example, plywood shrinks and swells less than lumber, and it can be easily nailed near the edges without splitting. The construction and furniture industries use large amounts of plywood.

Particleboard is made from wood shavings, flakes, wafers, splinters, or sawdust. Some of these materials come from scrap left over in sawmills and paper mills. Particleboard makers mix the wood with an adhesive and press it at a high temperature and pressure to form large sheets or panels. Particleboard shrinks and swells little in length and width. It may be used as a base for flooring and furniture. One type of particleboard, called oriented strand board (OSB), has the strength of plywood and many of the same uses. To make OSB, manufacturers use waxes and resins to bond layers of wood flakes positioned with their grains running in alternating directions.

Other wood-based composite products are made by combining wood with such materials as fiberglass, metals, polyvinyl chloride, polypropylene, and portland cement. Wood-based composites commonly substitute for lumber. For example, laminated veneer lumber is made of parallel laminated sheets of veneer manufactured to standard lumber dimensions.

Fiber products

Wood is made up of many tiny fibers. Manufacturers produce paper and paperboard, hardboard, and insulation board from wood fibers. Wood fiber is also used as attic insulation, as a protective soil covering called mulch, and even as a dietary fiber in breakfast cereals.

Paper and paperboard are made from wood chips that have been reduced to a fiber pulp by chemicals, heat, or mechanical treatment. The pulp is then formed into a mat, filtered, drained, and pressed. Paper products include bags, books, cartons, packaging materials, and tissue.

Medium density fiberboard (MDF) is made from wood that has been reduced to individual fibers or fiber bundles and then been bonded with adhesive. MDF is used primarily to make tops with molded edges for tables or other furniture.

Hardboard is made by pressing wood fibers into flat sheets at a high temperature and pressure. The fibers are held together primarily by lignin, a substance that naturally

occurs in and between wood fibers. Hardboard is used chiefly in furniture, siding, and paneling.

Insulation board is manufactured from wood fibers that are formed into a mat, pressed lightly, and dried. It weighs less than hardboard. Insulation board is used for acoustical tile and under siding in construction.

Chemical products Many wood products are made from wood or bark that has been broken down into such basic chemical parts as cellulose and lignin. Cellulose is the main ingredient of wood fibers.

Cellulose products. Cellulose may be chemically treated to change its properties and to produce such compounds as cellulose acetate and cellulose nitrate. Both of these compounds are used in adhesives, lacquers, and plastics. Plastic items molded from cellulose compounds include piano keys, tool handles, and table tennis balls. Cellulose nitrate is also an ingredient in explosives. Other cellulose compounds have specialized uses in such products as paint, foods, and textiles.

Textile manufacturers process cellulose to produce rayon and acetate fibers, which are used for clothing, draperies, and upholstery. Rayon cords strengthen tires. Other materials made from cellulose include cellophane and photographic film.

Lignin products. Lignin has far fewer uses than cellulose. It is used in making printing inks, dyes, and concrete. Manufacturers use it to bind (hold together) animal food pellets and textiles. Artificial vanilla, a flavoring in many foods, is also made from lignin.

Naval stores include turpentine and rosin - materials once essential to the operation of wooden sailing ships. Almost all naval stores come from the processing of pine pulp.

Fuel products

In many developing countries, wood has long served as the primary fuel for cooking and heating. In industrialized countries, wood has been burned mainly in fireplaces and charcoal grills. After petroleum prices rose in the 1970's, wood became a popular fuel in communities near forested areas. Fuel products made from wood include split, dried logs; compressed wood pellets; charcoal; and sawmill by-products. In addition, the forest products industry burns the thick liquid that results from pulping wood.

Other forest products

Although most forest products are made from wood, some come from the bark, fruit and seeds, gum, leaves, and sap of trees. By-products from sawmills include wood chips, shavings, and sawdust. These by-products may be used in making particleboard and other products, in bedding for animals, and in floor-sweeping compounds.

The bark from the cork oak tree provides cork for such products as bottle stoppers, bulletin boards, and insulation. The bark of the hemlock and other trees furnishes tannic acid used in processing animal hides. Bark is sometimes used as fuel, ground cover, or mulch.

Fruit and seeds harvested from forest trees include many kinds of nuts. The seedpods of the kapok, or silk-cotton, tree provide kapok fibers. Kapok is widely used as filler in jackets and sleeping bags. Latex is a milky substance produced by plants and trees of the sapodilla family. Latex is the source of natural rubber, which is used to make balloons, hoses, tires, and other items.

The leaves of some forest trees furnish ornamental greenery for Christmas wreaths and similar products. Certain evergreen and eucalyptus leaves are distilled to produce oil used in perfumes, household cleaners, soaps, and certain drugs. Sap from certain kinds of maple trees is made into maple syrup and maple sugar.

The forest products industry

The manufacture of forest products is a major industry in many industrialized countries. The United States, China, and India are the world's leading producers of forest products.

In the United States, the forest products industry employs more than 1 1/2 million people and produces more than \$300 billion worth of goods annually. The industry has more than 50,000 manufacturing plants. United States forest products companies own about 70 million acres (28 million hectares) of commercially valuable forestland. They harvest timber in state and national forests under government contracts. They also buy logs from the owners of small wooded areas.

In China, economic reforms that began in 1980 have led to a greater demand for private housing. This demand has, in turn, brought a huge increase in the production of forest products for use as construction materials. In India, millions of people depend on gathering and selling forest products for cash.

Canada's forest products industry is a leading source of export income. More than 350,000 Canadians work for companies that make forest products. Each year, these firms produce goods worth more than \$50 billion in U.S. dollars. Canada is the world's leading producer of newsprint, the paper on which newspapers are printed. It produces more than a fourth of the world's total supply each year.

WILDLIFE

Forests contain natural habitats for a wide range of wildlife, from the elks, wolves, lynxes, and bears of northern coniferous forests to the antelopes, giraffes, elephants, lions, and tigers of tropical savannas and jungles. Certain birds, such as pheasants, wood grouse, and quail, have high sporting value, while others are cherished for attractive song, appearance, or rarity. Many endangered species depend on forest habitats that are carefully protected by national and international laws.

Forest managers must attend to the interrelated, and sometimes directly opposed, wildlife interests of hunters, conservationists, and farmers. Obviously the same animal can present a different aspect to each group. A Bengal tiger, for example, provides a biologist with a classic example of a carnivorous beast living in harmony with a jungle environment and restraining its main prey, deer, from undue increase in numbers. But to a village peasant it is a menace to his cows and goats and a threat to the safety of

himself and his family, while a game hunter regards it as a magnificent quarry demanding all his skill. The needs of the forest itself require the numbers of grazing and browsing animals to be kept to a tolerable level. Otherwise renewal of tree crops becomes impossible.

Virtually every change that occurs in a forest benefits some wildlife species and harms others. Some species require a diversity of conditions; one type for feeding, another for nesting, and yet another for cover. Some have very specific requirements essential to their existence, whereas others have a broad range of tolerance. In any case, the life history characteristics of the species must be known in order for the resource manager to plan and implement practices necessary for the well-being of the species. Sometimes the best management involves increasing the forest edge habitat, frequented by many kinds of wildlife. Forest edge improvement may be integrated with timber harvesting and the construction of fire lanes and logging roads. Because food and cover for wildlife are often more plentiful in the early stages of forest development, retardation of succession by prescribed burning may be beneficial to wildlife. Food crops may be planted in certain areas to improve the wildlife-carrying capacity.

DRYING AND SEASONING WOOD

Freshly cut wood always contains water. There may be twice as much water as wood in a tree; a redwood tree, the largest of living things, contains enough water to fill a small swimming pool. Before wood can be used for making things it has to be seasoned, or dried. If timber is not seasoned properly it shrinks, warps (loses its shape), splits and is likely to decay. It is also difficult to work properly, as planes may tear it and saws stick. Seasoning makes wood harder and stiffer and it keeps its shape better.

Wood is best seasoned by being naturally dried in the sun and wind. The fresh trunks from the forests are sawn into planks at the sawmills and are then carefully stacked in the timber yard so that they lie flat. Each plank is separated from the one underneath by thin strips of wood.

This way of seasoning may take a year or more, and so artificial seasoning is much used. Kiln drying is the most successful method of artificial seasoning, for the temperature, moisture and movement of the air in the kiln, which is really a large oven, can be altered. This means that planks of timber can be dried in the correct way in a very short time.

Nevertheless, even seasoned wood swells and shrinks with the changes of moisture in the atmosphere. It is a common thing for doors and windows to jam in wet weather and for boats to leak after being out of the water for some time. The greatest shrinkage takes place across the grain, as the curved annual rings tend to straighten out. Warping therefore always occurs away from the heart of the tree.

It is now possible to control warping by soaking wood with solutions of resins and hardening it by heat. Plywood and laminated board, which are made from thin sheets of wood stuck together with glue, are now widely used. This kind of boarding

has great advantages. It can be made in any size and any length and it does not shrink or split.

Damp or wet wood is rapidly infested by fungi and bacteria if it is exposed to the air. Wood can be preserved for long periods in the mud at the bottom of a lake - indeed, Viking and even Roman ships have been found preserved in this way. Fungi and bacteria destroy wood by breaking down the walls of the cells, causing the wood to lose its strength and sometimes to become powdery. Dry rot fungus is very destructive to buildings, being particularly likely to attack wood that is damp and poorly ventilated.

Insects also attack wood. The grub of the deathwatch beetle bores into the old oak beams of roofs, eating out the centre of a beam until only a shell of wood is left. Furniture beetles, which are more common, bore holes in wooden furniture.

Both fungi and insects can be kept away from wood by means of preservatives. Some of these are chemical substances such as creosote, which is sprayed or painted on to wood and remains there for a long time when it has soaked in thoroughly. Creosote is used for fence posts telegraph poles and the timbers of jetties, all of which are likely to be damp for long periods. Paints and varnishes also preserve wood, besides giving a smooth surface which is easily cleaned.

THE IMPORTANCE OF FORESTS

Forests have always had great importance to people. Prehistoric people got their food mainly by hunting and by gathering wild plants. Many of these people lived in the forest and were a natural part of it. With the development of civilization, people settled in cities. But they still went to the forest to get timber and to hunt.

Today, people depend on forests more than ever, especially for their (1) economic value, (2) environmental value, and (3) enjoyment value. The science of forestry is concerned with increasing and preserving these values by careful management of forestland.

Economic value. Forests supply many products. Wood from forest trees provides lumber, plywood, railroad ties, and shingles. It is also used in making furniture, tool handles, and thousands of other products. In many parts of the world, wood serves as the chief fuel for cooking and heating.

Various manufacturing processes change wood into a great number of different products. Paper is one of the most valuable products made from wood. Other processed wood products include cellophane, plastics, and such fibers as rayon and acetate.

Forests provide many important products besides wood. Latex, which is used in making rubber, and turpentine come from forest trees. Various fats, gums, oils, and waxes used in manufacturing also come from trees. In some primitive societies, forest plants and animals make up a large part of the people's diet.

Unlike most other natural resources, such as coal, oil, and mineral deposits, forest resources are renewable. As long as there are forests, people can count on a steady supply of forest products.

Environmental value. Forests help conserve and enrich the environment in several ways. For example, forest soil soaks up large amounts of rainfall. It thus prevents the rapid runoff of water that can cause erosion and flooding. In addition, rain is filtered as it passes through the soil and becomes *ground water*. This ground water flows through the ground and provides a clean, fresh source of water for streams, lakes, and wells.

Forest plants, like all green plants, help renew the atmosphere. As the trees and other green plants make food, they give off oxygen. They also remove carbon dioxide from the air. People and nearly all other living things require oxygen. If green plants did not continuously renew the oxygen supply, almost all life would soon stop. If carbon dioxide increases in the atmosphere, it could severely alter the earth's climate.

Forests also provide a home for many plants and animals that can live nowhere else. Without the forest, many kinds of wildlife could not exist.

Enjoyment value. The natural beauty and peace of the forest offer a special source of enjoyment. In the United States, Canada, and many other countries, huge forestlands have been set aside for people's enjoyment. Many people use these forests for such activities as camping, hiking, and hunting. Others visit them simply to enjoy the scenery and relax in the quiet beauty.

The structure of forests

Every forest has various *strata* (layers) of plants. The five basic forest strata, from highest to lowest, are (1) the canopy, (2) the understory, (3) the shrub layer, (4) the herb layer, and (5) the forest floor.

The canopy consists mainly of the *crowns* (branches and leaves) of the tallest trees. The most common trees in the canopy are called the *dominant* trees of the forest. Certain plants, especially climbing vines and epiphytes, may grow in the canopy. *Epiphytes* are plants that grow on other plants for support but absorb from the air the water and other materials they need to make food.

The canopy receives full sunlight. As a result, it produces more food than does any other layer. In some forests, the canopy is so dense it almost forms a roof over the forest. Fruit-eating birds, and insects and mammals that eat leaves or fruit, live in the canopy.

The understory is made up of trees shorter than those of the canopy. Some of these trees are smaller species that grow well in the shade of the canopy. Others are young trees that may in time join the canopy layer. Because the understory grows in shade, it is not as productive as the canopy. However, the understory provides food and shelter for many forest animals.

The shrub layer consists mainly of shrubs. Shrubs, like trees, have woody stems. But unlike trees, they have more than one stem, and none of the stems grows as tall as a tree. Forests with a dense canopy and understory may have only a spotty shrub layer. The trees in such forests filter out so much light that few shrubs can grow beneath them. Most forests with a more open canopy and understory have heavy shrub growth. Many birds and insects live in the shrub layer.

The herb layer consists of ferns, grasses, wildflowers, and other soft-stemmed plants. Tree seedlings also make up part of this layer. Like the shrub layer, the herb layer grows thickest in forests with a more open canopy and understory. Yet even in forests with dense tree layers, enough sunlight reaches the ground to support some herb growth. The herb layer is the home of forest animals that live on the ground. They include such small animals as insects, mice, snakes, turtles, and ground-nesting birds and such large animals as bears and deer.

The forest floor is covered with mats of moss and with various objects that have fallen from the upper layers. Leaves, twigs, and animal droppings - as well as dead animals and plants - build up on the forest floor. Among these objects, an incredible number of small organisms can be found. They include earthworms, fungi, insects, and spiders, plus countless bacteria and other microscopic life. All these organisms break down the waste materials into the basic chemical elements necessary for new plant growth.

KINDS OF FORESTS

Many systems are used to classify the world's forests. Some systems classify a forest according to the characteristics of its dominant trees. A *needleleaf forest*, for example, consists of a forest in which the dominant trees have long, narrow, needlelike leaves. Such forests are also called *coniferous* (cone-bearing) because the trees bear cones. The seeds grow in these cones. A *broadleaf forest* is made up mainly of trees with broad, flat leaves. Forests in which the dominant trees shed all their leaves during certain seasons of the year, and then grow new ones, are classed as *deciduous forests*. In an *evergreen forest*, the dominant trees grow new leaves before shedding the old ones. Thus, they remain green throughout the year.

In some other systems, forests are classified according to the usable qualities of the trees. A forest of broadleaf trees may be classed as a *hardwood forest* because most broadleaf trees have hard wood, which makes fine furniture. A forest of needleleaf trees may be classed as a *softwood forest* because most needleleaf trees have softer wood than broadleaf trees have.

Many scientists classify forests according to various *ecological systems*. Under such systems, forests with similar climate, soil, and amounts of moisture are grouped into *formations*. Climate, soil, and moisture determine the kinds of trees found in a forest formation. One common ecological system groups the world's forests into six major formations. They are (1) tropical rain forests, (2) tropical seasonal forests, (3) temperate deciduous forests, (4) temperate evergreen forests, (5) boreal forests, and (6) savannas.

Tropical rain forests grow near the equator, where the climate is warm and wet the year around. The largest of these forests grow in the Amazon River Basin of South America, the Congo River Basin of Africa, and throughout much of Southeast Asia.

Of the six forest formations, tropical rain forests have the greatest variety of trees. As many as 100 species - none of which is dominant - may grow in 1 square mile (2.6

square kilometers) of land. Nearly all the trees of tropical rain forests are broadleaf evergreens, though some palm trees and tree ferns can also be found. In most of the forests, the trees form three canopies. The upper canopy may reach more than 165 feet (50 meters) high. A few exceptionally tall trees, called *emergents*, tower above the upper canopy. The understory trees form the two lower canopies.

The shrub and herb layers are sparse because little sunlight penetrates the dense canopies. However, many climbing plants and epiphytes crowd the branches of the canopies, where the sunlight is fullest.

Most of the animals of the tropical rain forests also live in the canopies, where they can find plentiful food. These animals include such flying or climbing creatures as bats, birds, insects, lizards, mice, monkeys, opossums, sloths, and snakes.

Tropical seasonal forests grow in certain regions of the tropics and subtropics. These regions have a definite wet and dry season each year or a somewhat cooler climate than that of the tropical rain forest. Such conditions occur in Central America, central South America, southern Africa, India, eastern China, and northern Australia and on many islands in the Pacific Ocean.

Tropical seasonal forests have a great variety of tree species, though not nearly as many as the rain forests. They also have fewer climbing plants and epiphytes. Unlike the trees of the rain forest, many tropical seasonal species are deciduous. The deciduous trees are found especially in regions with distinct wet and dry seasons. The trees shed their leaves in the dry season.

Tropical seasonal forests have a canopy about 100 feet (30 meters) high. One understory grows beneath the canopy. Bamboos and palms may form a dense shrub layer, and a thick herb layer blankets the ground. The animal life resembles that of the rain forest.

Temperate deciduous forests grow in eastern North America, western Europe, and eastern Asia. These regions have a *temperate* climate, with warm summers and cold winters.

The canopy of temperate deciduous forests is about 100 feet (30 meters) high. Two or more kinds of trees dominate the canopy, and another 15 to 25 kinds may be present. Most of the trees in these forests are broadleaf and deciduous. They shed their leaves in fall. The understory, shrub, and herb layers may be dense. The herb layer has two growing periods each year. Plants of the first growth appear in early spring, before the trees have developed new leaves. These plants die by summer and are replaced by plants that grow in the shade of the leafy canopy.

Large animals of the temperate deciduous forests include bears, deer, and, rarely, wolves. These forests are also the home of hundreds of smaller mammals and birds. Many of the birds migrate south in fall, and some of the mammals hibernate during the winter.

Some temperate areas support mixed deciduous and evergreen forests. In the Great Lakes region of North America, for example, the cold winters promote the growth of heavily mixed forests of deciduous and evergreen trees. Forests of evergreen

pine and deciduous oak and hickory grow on the dry coastal plains of the Southeastern United States.

Temperate evergreen forests. In some temperate regions, the environment favors the growth of evergreen forests. Such forests grow along coastal areas that have mild winters with heavy rainfall. These areas include the northwest coast of North America, the south coast of Chile, the west coast of New Zealand, and the southeast coast of Australia. Temperate evergreen forests also cover the lower mountain slopes in Asia, Europe, and western North America. In these regions, the cool climate favors the growth of evergreen trees.

The strata and the plant and animal life vary greatly from one temperate evergreen forest to another. For example, the mountainous evergreen forests of Asia, Europe, and North America are made up of conifers. The coastal forests of Australia and New Zealand, on the other hand, consist of broadleaf evergreen trees.

Boreal forests are found in regions that have an extremely cold winter and a short growing season. The word *boreal* means *northern*. Vast boreal forests stretch across northern Europe, Asia, and North America. Similar forests also cover the higher mountain slopes on these continents.

Boreal forests, which are also called *taiga*, have the simplest structure of all forest formations. They have only one uneven layer of trees, which reaches up to about 75 feet (23 meters) high. In most of the boreal forests, the dominant trees are needleleaf evergreens - either spruce and fir or spruce and pine. The shrub layer is spotty. However, mosses and lichens form a thick layer on the forest floor and also grow on the tree trunks and branches. There are few herbs.

Many small mammals, such as beavers, mice, porcupines, and snowshoe hares, live in the boreal forests. Larger mammals include bears, caribou, foxes, moose, and wolves. Birds of the boreal forests include ducks, loons, owls, warblers, and woodpeckers.

Savannas are areas of widely spaced trees. In some savannas, the trees grow in clumps. In others, individual trees grow throughout the area, forming an uneven, widely open canopy. In either case, most of the ground is covered by shrubs and herbs, especially grasses. As a result, some biologists classify savannas as grasslands. Savannas are found in regions where low rainfall, poor soil, frequent fires, or other environmental features limit tree growth.

The largest savannas are tropical savannas. They grow throughout much of Central America, Brazil, Africa, India, Southeast Asia, and Australia. Animals of the tropical savannas include giraffes, lions, tigers, and zebras.

Temperate savannas, also called *woodlands*, grow in the United States, Canada, Mexico, and Cuba. They have such animals as bears, deer, elk, and pumas.

Forests of the United States and Canada

The United States and Canada are rich in forests. Before the first white settlers arrived in the 1600's, forests covered most of the land from the Atlantic Ocean to the Mississippi River. Altogether, nearly 40 per cent of the land north of Mexico was

forested at that time. More than half this forestland was in Canada and Alaska, where only a small portion has been cleared. Even in the lower United States, forests still grow on much of the original forestland. Today, the United States, excluding Hawaii, has about 753 million acres (305 million hectares) of forests. Canada has about 796 million acres (322 million hectares). In both countries, forests cover about a third of the land area.

The forests of the United States and Canada include all the major formations discussed in the previous section, except for tropical rain forests. The U.S.-Canadian forests can be divided into many smaller formations. One common system recognizes nine U.S.-Canadian formations. They are (1) subtropical forests, (2) southern deciduous-evergreen forests, (3) deciduous forests, (4) northern deciduous-evergreen forests, (5) temperate savannas, (6) mountain evergreen forests, (7) Pacific coastal forests, (8) boreal forests, and (9) subarctic woodlands.

Subtropical forests thrive along the coasts of the Atlantic Ocean and the Gulf of Mexico in the Southeastern United States. In these regions, the climate stays hot and humid throughout the year.

In southern Florida, raised areas of the swampy Everglades support forests of live oak, mahogany, and sabal palm. These forests have a dense undergrowth of ferns, shrubs, and small trees. Epiphytes and vines crowd the branches of the taller trees. Broadleaf-evergreen forests grow farther north, along the edges of the Atlantic and Gulf coasts. The dominant trees in these forests are bay, holly, live oak, and magnolia. Thick growths of Spanish moss, an epiphyte that looks like long gray hair, hang from the branches.

Southern deciduous-evergreen forests grow on the flat, sandy coastal plains of the Southeastern United States. The forests extend along the Atlantic Coastal Plain from New Jersey to Florida and along the Gulf Coastal Plain from Florida to Texas. These regions have long, hot summers and short winters.

Most of the forests consist of evergreen pine and deciduous oak. Pitch pine is the most common evergreen in the northern part of these forests. Going southward, pitch pine is replaced, in order, by loblolly, longleaf, and slash pine.

Deciduous forests occupy a region bounded by the coastal plains on the south and east, the Great Lakes on the north, and the Great Plains on the west. This region has dependable rainfall and distinct seasons. Severe frosts and heavy snows occur during winter in the northern parts of this formation.

The northern part of the deciduous forest region was once covered by glaciers. But the glaciers did not reach the southern portion, which has the oldest and richest deciduous forest in North America. This forest lies in the central Appalachian Mountains region. The dominant trees of the forest include ash, basswood, beech, buckeye, cucumber magnolia, hickory, sugar maple, yellow-poplar, and several kinds of oaks.

In most deciduous forests outside the central Appalachians, fewer species of trees dominate. For example, various kinds of oaks dominate the forests from southern New

England to northwestern Georgia. Hickory and yellow-poplars—and in drier areas several species of pine—grow among the oak trees. Beech and sugar maple trees dominate the northeastern and north-central deciduous forests. However, these forests also have many other kinds of trees, such as black cherry, red maple, red oak, and white elm. The northwestern deciduous forests are dominated by basswood and maple. Some oak trees also grow in these forests.

Northern deciduous-evergreen forests stretch from the Great Lakes across southeastern Canada and northern New York and New England. In this region of cold winters and warm summers, deciduous trees of the south are mixed with conifers of the north.

The dominant evergreens throughout much of this region include white-cedar, hemlock, and jack, red, and white pine. The chief broadleaf species include basswood, beech, sugar maple, white ash, and yellow birch. In moist areas, hemlock and white-cedar grow in mixed stands with black ash and white elm. Drier areas have forests of red and white pine, which is mixed with some ironwood and red oak. Areas that are neither especially dry nor moist support maple or beech forests. The region's swamps are covered with black spruce and larch.

Temperate savannas are found in areas of Canada and the United States that have lower annual rainfall and a long season of dryness. Temperate savannas dominated by aspen grow in North Dakota, Manitoba, Saskatchewan, and Alberta. Outside this region, oak, pine, or both oak and pine dominate the temperate savannas of North America. Savannas of bur oak, mixed in some areas with other oaks or hickory, extend in a belt from Manitoba through Texas. Coniferous savannas of juniper and pinon pine cover the dry foothills of the mountainous regions of the Southwestern United States from Texas to Arizona, and the southern half of Mexico. In California, the foothills of the Sierra Nevada have similar savannas of blue oak and digger pine. Along the coast of southern California, the climate supports a broadleaf savanna of various species of oaks.

Mountain evergreen forests grow above the foothill savannas of the mountains of the western United States and Canada. In general, the climate in the mountains becomes colder, wetter, and windier with increasing altitude. The forests of the lower and middle slopes are called *montane forests*. Those of the upper slopes are known as *subalpine forests*.

In the Rockies, the lower montane forests consist of unmixed stands of ponderosa pine. At higher elevations, Douglas-fir becomes dominant. Douglas-fir is mixed with grand fir in the northern Rockies and with blue spruce and white fir in the southern Rockies. Above this zone lie the cold, snowy subalpine forests, which are dominated by Engelmann spruce and subalpine fir. Lodgepole pine is also common in both the montane and subalpine zones, especially in areas that have been affected by fire. The highest elevation at which trees can grow is called the *timber line*. Beyond this point, the climate is too severe for tree growth. At the timber line, the trees grow in a scattered, savannalike way. The timber-line regions are dominated by bristlecone pine in the

southern Rockies, by limber pine in the central Rockies, and by Lyall's larch and whitebark pine in the northern Rockies.

In the Sierra Nevada, incense-cedar grows in moist areas of the lower montane forests. Douglas-fir, Jeffrey pine, ponderosa pine, and sugar pine thrive on drier slopes. In central California, magnificent giant sequoia trees grow on the western slopes of the Sierra Nevada. Sequoias are the bulkiest, though not the tallest, of all trees. The largest sequoias measure about 100 feet (30 meters) around at the base. White fir dominates the upper montane forests of the Sierra Nevada. At subalpine elevations, mountains support forests of red fir mixed with lodgepole pine and mountain hemlock. These subalpine forests thin out into savannas of bristlecone and whitebark pine at elevations near the timber line.

Pacific coastal forests extend along the Pacific Ocean from west-central California to Alaska. The warm currents of the Pacific help give this region a mild climate the year around. Warm, moisture-filled winds from the ocean bring heavy annual precipitation.

Huge conifers dominate the Pacific coastal forests. Forests of redwood, the tallest living trees, grow along a narrow coastal strip from central California to southern Oregon. Many of these giants tower more than 300 feet (91 meters). Inland from the redwoods and to the north grow magnificent forests of Douglas-fir, Sitka spruce, western hemlock, and western redcedar. Along the coast of northern Washington and southern British Columbia, high annual precipitation supports thick temperate rain forests. These forests, with their moss-covered Douglas-fir, western hemlock, Sitka spruce, and western redcedar, make up a damp, green wilderness found nowhere else in North America.

Boreal forests sweep across northern North America from northwestern Alaska to the island of Newfoundland. In this region of severe cold and heavy snowfall, winter lasts seven to eight months. However, the short growing season has dependable rainfall and many hours of daylight. Boreal forests are dominated by coniferous evergreens, chiefly balsam fir, black spruce, jack pine, and white spruce. Some areas support larch, a deciduous conifer. Such deciduous broadleaf trees as balsam poplar, quaking aspen, and white birch grow in areas that have been burned over by forest fires. Boreal forests have many *bogs* (areas of wet, spongy ground). Some bogs are treeless. Other bogs, called *muskegs*, are covered by a deep mat of moss on which dwarfed conifers grow.

Subarctic woodlands lie along the northern edge of the boreal forests. The climate in this region is bitterly cold, with low precipitation and an extremely brief growing season. These conditions force the trees to grow in a widely spaced, savannalike fashion. Black spruce dominates most of the region. Other boreal trees, such as aspen, larch, white birch, and white spruce, grow in some places. North of the woodlands lies the Arctic tundra, where trees cannot survive.

DEFORESTATION

Human activities have had tremendous impact on modern forests. Since agriculture began about 11,000 years ago, large forest areas have been cleared for farms and cities. Beginning in the 1800's, great expanses of forest have also been eliminated because of logging and industrial pollution. The destruction and degrading of forests is called *deforestation*.

Severe deforestation now occurs around the world, even in the most remote rain forests and boreal forests. Until the late 1940's, rain forests covered about 8.7 million square miles (22.5 million square kilometers) of the earth's land. Today, they cover less than half that area. Millions of acres or hectares of rain forests are destroyed each year. Since 1800, huge areas of temperate forests have also been cleared. Many parts of eastern North America, for example, have less than 2 percent of even degraded forests remaining.

Industrial pollution is a chief cause of deforestation. Factories often release poisonous gases into the air and dangerous wastes into lakes and rivers. Air pollutants may combine with rain or other precipitation and fall to earth as *acid rain*. Acid rain and polluted bodies of water can restrict plant growth or even kill most plants in a forest.

Massive deforestation has made many remaining forest tracts small, isolated islands. As forests become smaller, their ability to sustain the full variety of plant species decreases. Many forests are so seriously degraded by logging activities that they fail to regenerate replacement forests.

Loss of forests has helped create many ecological problems. For example, rain water normally trapped by the forests is causing more floods around the world. In addition, as forest areas decrease or degrade, the production of oxygen from photosynthesis also decreases. Oxygen renewal is vital to the survival of oxygen-breathing organisms. At the same time, as less carbon dioxide is taken up by photosynthesis, the amounts of carbon dioxide released into the air increases. Thus more heat from the sun is trapped near the earth's surface instead of being reflected back into space. Many scientists believe that this *greenhouse effect* is causing a steady warming that could lead to threatening climatic conditions.

The destruction of forest ecosystems also destroys the habitats of many living creatures. Countless species of animals and plants have been wiped out by deforestation, and more are killed each year at an increasing rate.

To combat these problems, people and governments have been seeking out and protecting old growth forests that remain undisturbed by humans. Such protection enables scientists to conduct long-term research on how old growth forests sustain the variety of plants and animals that live there.

SUSTAINED YIELD FOREST MANAGEMENT

The goal of managing timber resources is to achieve an approximate balance between the annual harvest and growth of wood. This balance, called a *sustained yield*, ensures a continuous supply of timber. It is achieved by managing forests so they have

areas of trees of equal yield for each age group, from seedlings to mature trees. The science of harvesting and growing crops of trees for sustained yield is called *silviculture*. The practice of silviculture requires that foresters know how various species of trees grow in different climates and soils, and how much sunlight and water the trees need. Foresters also use the science of genetics to breed trees that have improved growth rates and greater resistance to diseases and pests.

Harvesting. There are four silvicultural methods used in the harvest of timber: (1) clearcutting, (2) seed tree cutting, (3) shelterwood cutting, and (4) selection cutting. Each method is designed to provide an environment that favors the establishment of certain kinds of trees. New trees grow from seeds produced by the remaining or surrounding trees, from sprouting stumps or roots, or from seeds or seedlings that foresters plant.

Clearcutting is the removal of all the trees in a certain area of a forest. It is generally used to reestablish a *stand* (large group of trees) that is more even in age, by removing a mature one. Clearcutting is also generally used when a forest is to be replaced by planting or by sprouting stumps. Clearcut areas must be large enough to prevent surrounding forests from affecting young trees growing within the clearcut opening.

Seed tree cutting resembles clearcutting, but foresters leave a few trees widely scattered in the harvested area to provide a natural source of seeds. These seed trees are removed after the new stand is established. Seed tree cutting can be used with various pines, including loblolly pine and longleaf pine.

Shelterwood cutting involves harvesting timber in several stages over a period of 10 to 20 years. Foresters establish a new stand as the old one is removed. Shelterwood cutting can be used with such trees as oak, ponderosa pine, and white pine, which require shade during their first few years of growth. It also allows the growth of some trees in a stand to continue after the majority of the trees have ceased growing well.

Selection cutting is the harvesting of small patches of mature trees to make room for younger trees and new growth. The trees are removed on the basis of their size and nearness to other trees. However, foresters leave many larger trees standing to produce seeds. Selection cutting leaves only small openings in a forest, and so it works best with trees that grow well in shade. Such trees include American beech, hemlock, and sugar maple. Forests may be harvested by selection cutting every 15 to 30 years.

Planting. Foresters plant new timber crops by a process called *artificial reforestation*. They either plant seeds directly in the harvested land, or they raise seedlings in a nursery and transplant these young trees in the forest. The process is called *afforestation* when these methods are used to plant trees on land that was never covered by a forest.

Direct seeding works best on cultivated land or on land where a timber crop has been destroyed by fire. The seeds are treated with a chemical repellent, which discourages animals from eating them, and they are sown sometime between late autumn and early spring. Airplanes or helicopters are generally used to scatter the

seeds, but seeds may also be placed in the ground with hand tools. About 30,000 seeds per acre (75,000 per hectare) are usually sown to assure an adequate crop.

Forests are planted with seedlings in late winter or early spring, before the buds of the seedlings have opened for the growing season. Seedlings grow in a nursery for one to four years before being transplanted in the forest. Foresters generally plant about 800 trees per acre (2,000 per hectare), using hand tools or various planting machines. A person can plant about 1 acre (0.4 hectare) a day by hand - about as much land as can be planted by machine in an hour.

Tree improvement involves breeding trees for superior growth rates and increased resistance to diseases and pests. Foresters begin this process by searching forests for the straightest and fastest-growing trees of the species. Such trees, sometimes called *supertrees*, must also have high-quality wood and be healthy and free of harmful insects and other pests. Tree improvement programs have been used for such species as black walnut, Douglas-fir, and loblolly pine.

After foresters find a superior tree, they take cuttings, called *cions*, from its branches. The cions are brought to a nursery and *grafted* (joined) to the roots of 2-year-old trees. The cions receive nutrients through the roots of the young trees but keep the characteristics of the tree from which they were cut. Foresters may use the grafted cions in reforestation. Or they may take pollen from the male flowers to pollinate female flowers of cions from other superior trees. The foresters keep careful records of the cions used for each pollination.

After pollination, the female flowers yield seeds that are planted in the nursery to produce seedlings. Foresters transplant the seedlings into special plantations and closely measure the growth of the trees. If the trees from a particular set of parents appear to be developing into supertrees, the seeds from those parents may be produced commercially for reforestation.

Community forestry, also called *social forestry*, is a system of forest management that treats woodlands as a communal resource. In some regions, including parts of North America and northwestern Europe, forests have been set aside for community use for hundreds of years. The idea is newer to developing countries. But rural communities in many such countries have learned to practice community forestry to provide themselves with fuel wood and timber and to increase their food supply.

Community forestry takes many forms. In *village woodlots*, trees are grown for firewood on any spare patches of land. *Agroforestry* involves techniques that produce trees in combination with crops, animals, or other products. In *intercropping*, cereals, vegetables, and fruit are grown between rows of newly planted trees until the trees grow too tall and overshadow them. *Silvipasture* involves managing tree growth through controlled forest grazing by animals. *Multiple-product forestry* utilizes techniques designed to increase the yield of fruit, game, honey, and other forest commodities in addition to timber.

Managing other forest resources

Water. All forests grow within *watersheds*—that is, regions that supply water for rivers and streams. The soil of forests collects water by soaking up rain and melted snow. Watershed management largely involves keeping forest soil porous so it can absorb a maximum amount of water. The soil of a forest is covered by a spongy layer of leaves and twigs, called *litter*. The action of earthworms, insects, rodents, and decaying roots creates open spaces within the soil. When rain or snow falls, the water fills these spaces and is absorbed by the litter. Much of the water is used by plants, and some flows underground and then into rivers, streams, and wells. Proper forest harvesting reduces the water lost to evaporation and so increases the underground supply and stream flow of water.

If forest soil becomes too hard and nonporous, water flows over the surface of the ground, carrying mud and other materials into nearby streams. This runoff damages other soil, pollutes the water of the streams, and may even cause flooding.

Foresters help keep soil porous in several ways. They reforest harvested areas quickly to assure a continuous supply of litter. They regulate livestock grazing to maintain a good cover of grass and to prevent the animals from packing down the earth. Foresters also make sure that truck roads built for logging operations are carefully designed to prevent damage to the soil.

FIRE AND FORESTS

Most scientists consider forest fires an essential natural process. Although fire can cause great destruction, it produces great ecological benefits. Perhaps the leading benefit of fire is that it recycles nutrients, substances that plants need for growth. Fire also clears areas of forest to allow new tree growth. To take advantage of such benefits, foresters permit certain types of fires to burn. Such blazes, called prescribed fires, may be started by lightning or set by fire crews. Prescribed fires must meet certain conditions. For example, they must pose no danger to human lives or buildings.

Other fires, especially those that endanger lives or property, are referred to as wildfires. Wildfires are generally fought quickly and aggressively. Most are caused by human beings. They may be started accidentally or deliberately. Lightning strikes also cause some wildfires. During dry seasons, when fires can easily start, foresters may close a forest to the public to reduce the danger of fire. Foresters may watch for fires from lookout towers, or they may patrol forests by airplane.

To extinguish a wildfire, firefighters must remove the blanket of fuel made up of fallen leaves, twigs, and other decaying material from the forest floor. Firefighting crews spray water or chemicals on the burning area to cool the fire and slow its progress. They then can get close enough to the flames to dig a fireline, also called a firebreak. Firefighters start a fireline by clearing all logs, brush, and trees from a wide strip around the fire. Then they scrape away the litter and some of the soil with axes, shovels, or bulldozers. Firefighters called smoke jumpers may parachute from airplanes or helicopters to dig a fireline in an area that is difficult to reach by land.

After creating a fireline, the firefighters may set backfires to burn the area between the line and the forest fire itself. Backfires remove additional fuel and widen the fireline to help stop the spread of the flames. After a fire dies, the firefighters clear any flammable material from the edge of the burned area. This action prevents the material from smoldering and starting new fires.

PROTECTING FOREST RESOURCES

The full benefits of forest resources can be obtained only if timber is protected from diseases and insect pests. Many countries have passed legislation designed to protect forest resources in other ways.

Diseases and pests. Most tree diseases are caused by fungus infections. Diseases attack trees chiefly by clogging the flow of sap, killing the leaves, or rotting the roots or wood. Destructive tree diseases include beech bark disease, chestnut blight, Dutch elm disease, oak wilt, and stem blister rusts that affect pines. Such diseases are often accidentally transported from region to region along with nursery products that are traded between countries. Insects that damage trees include bark beetles, sucking insects, and *defoliators*. Bark beetles feed on a tree's inner bark. Sucking insects, such as aphids, suck the fluid from trees. Defoliators eat leaves and also attack evergreens. They include spruce budworms, tussock moths, and gypsy moths.

Foresters control diseases and pests by three chief methods: (1) biological controls, (2) silvicultural controls, and (3) direct controls. Biological controls fight diseases and pests with natural enemies. For example, foresters might spray a forest with a disease organism that affects a particular species of insect. Silvicultural controls use methods of timber management to make a forest undesirable for diseases and pests. For example, foresters may remove old, weak trees that are easy prey for fungi and insects. Direct controls include the use of chemical pesticides to kill fungi and insects. But the chemicals can kill nontarget plants and animals, and so pesticides are generally used only if other controls fail.

Wood materials and their uses

Throughout history, the unique characteristics and comparative abundance of wood have made it a natural material for homes and other structures, furniture, tools, vehicles, and decorative objects. Today, for the same reasons, wood is prized for a multitude of uses. All wood is composed of cellulose, lignin, hemicelluloses, and minor amounts (5% to 10%) of extraneous materials contained in a cellular structure. Variations in the characteristics and volume of these components and differences in cellular structure make woods heavy or light, stiff or flexible, and hard or soft. The properties of a single species are relatively constant within limits; therefore, selection of wood by species alone may sometimes be adequate. However, to use wood to its best advantage and most effectively in engineering applications, specific characteristics or physical properties must be considered. Historically, some species filled many purposes, while other less available or less desirable species served only one or two needs. For example, because white oak is tough, strong, and durable, it was highly prized for shipbuilding, bridges, cooperage, barn timbers, farm implements, railroad

crossies, fence posts, and flooring. Woods such as black walnut and cherry were used primarily for furniture and cabinets. Hickory was manufactured into tough, hard, and resilient striking-toolhandles, and black locust was prized for barn timbers. What the early builder or craftsman learned by trial and error became the basis for deciding which species were appropriate for a given use in terms of their characteristics. It was commonly accepted that wood from trees grown in certain locations under certain conditions was stronger, more durable, more easily worked with tools, or finer grained than wood from trees in other locations. Modern research on wood has substantiated that location and growth conditions do significantly affect wood properties. The gradual reductions in use of old-growth forests in the United States has reduced the supply of large clear logs for lumber and veneer. However, the importance of high-quality logs has diminished as new concepts of wood use have been introduced. Second-growth wood, the remaining old-growth forests, and imports continue to fill the needs for wood in the quality required. Wood is as valuable an engineering material as ever, and in many cases, technological advances have made it even more useful.

The inherent factors that keep wood in the forefront of raw materials are many and varied, but a chief attribute is its availability in many species, sizes, shapes, and conditions to suit almost every demand. Wood has a high ratio of strength to weight and a remarkable record for durability and performance as a structural material. Dry wood has good insulating properties against heat, sound, and electricity. It tends to absorb and dissipate vibrations under some conditions of use, and yet it is an incomparable material for such musical instruments as the violin. The grain patterns and colors of wood make it an esthetically pleasing material, and its appearance may be easily enhanced by stains, varnishes, lacquers, and other finishes. It is easily shaped with tools and fastened with adhesives, nails, screws, bolts, and dowels. Damaged wood is easily repaired, and wood structures are easily remodeled or altered. In addition, wood resists oxidation, acid, saltwater, and other corrosive agents, has high salvage value, has good shock resistance, can be treated with preservatives and fire retardants, and can be combined with almost any other material for both functional and esthetic uses.

Timber Resources and Uses

In the United States, more than 100 wood species are available to the prospective user, but all are unlikely to be available in any one locality. About 60 native woods are of major commercial importance. Another 30 species are commonly imported in the form of logs, cants, lumber, and veneer for industrial uses, the building trade, and crafts. A continuing program of timber inventory is in effect in the United States through the cooperation of Federal and State agencies, and new information on wood resources is published in State and Federal reports. Two of the most valuable sourcebooks are *An Analysis of the Timber Situation in the United States 1989–2040* (USDA 1990) and *The 1993 RPA Timber Assessment Update* (Haynes and others 1995). Current information on wood consumption, production, imports, and supply and demand is published periodically by the Forest Products Laboratory (Howard 1997) and is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC.

Hardwoods and Softwoods

Trees are divided into two broad classes, usually referred to as hardwoods and softwoods. These names can be confusing since some softwoods are actually harder than some hardwoods, and conversely some hardwoods are softer than some softwoods. For example, softwoods such as longleaf pine and Douglas-fir are typically harder than the hardwoods basswood and aspen. Botanically, hardwoods are Angiosperms; the seeds are enclosed in the ovary of the flower. Anatomically, hardwoods are porous; that is, they contain vessel elements. A vessel element is a wood cell with open ends; when vessel elements are set one above another, they form a continuous tube (vessel), which serves as a conduit for transporting water or sap in the tree. Typically, hardwoods are plants with broad leaves that, with few exceptions in the temperate region, lose their leaves in autumn or winter. Most imported tropical woods are hardwoods. Botanically, softwoods are Gymnosperms or conifers; the seeds are naked (not enclosed in the ovary of the flower). Anatomically, softwoods are nonporous and do not contain vessels. Softwoods are usually cone-bearing plants with needle- or scale-like evergreen leaves. Some softwoods, such as larches and baldcypress, lose their needles during autumn or winter.

Commercial Sources of Wood Products

Softwoods are available directly from the sawmill, wholesale and retail yards, or lumber brokers. Softwood lumber and plywood are used in construction for forms, scaffolding, framing, sheathing, flooring, moulding, paneling, cabinets, poles and piles, and many other building components. Softwoods may also appear in the form of shingles, sashes, doors, and other millwork, in addition to some rough products such as timber and round posts. Hardwoods are used in construction for flooring, architectural woodwork, interior woodwork, and paneling. These items are usually available from lumberyards and building supply dealers. Most hardwood lumber and dimension stock are remanufactured into furniture, flooring, pallets, containers, dunnage, and blocking. Hardwood lumber and dimension stock are available directly from the manufacturer, through wholesalers and brokers, and from some retail yards. Both softwood and hardwood products are distributed throughout the United States. Local preferences and the availability of certain species may influence choice, but a wide selection of woods is generally available for building construction, industrial uses, remanufacturing, and home use.

Use Classes and Trends

The production and consumption levels of some of the many use-classifications for wood are increasing with the overall national economy, and others are holding about the same. The most vigorously growing wood-based industries are those that convert wood to thin slices (veneer), particles (chips, flakes), or fiber pulps and reassemble the elements to produce various types of engineered panels such as plywood, particleboard, strandboard, veneer lumber, paper, paperboard, and fiberboard products. Another growing wood industry is the production of laminated wood. For a number of years, the lumber industry has produced almost the same volume of wood per year. Modest

increases have occurred in the production of railroad crossties, cooperage, shingles, and shakes.

U.S. Wood Species

Hardwoods

Alder, Red

Red alder (*Alnus rubra*) grows along the Pacific coast between Alaska and California. It is the principal hardwood for commercial manufacture of wood products in Oregon and Washington and the most abundant commercial hardwood species in these two states. The wood of red alder varies from almost white to pale pinkish brown, and there is no visible boundary between heartwood and sapwood. Red alder is moderately light in weight and intermediate in most strength properties but low in shock resistance. It has relatively low shrinkage. The principal use of red alder is for furniture, but it is also used for sash and door panel stock and other millwork.

Ash (White Ash Group)

Important species of the white ash group are American white ash (*Fraxinus americana*), green ash (*F. pennsylvanica*), blue ash (*F. quadrangulata*), and Oregon ash (*F. latifolia*). The first three species grow in the eastern half of the United States. Oregon ash grows along the Pacific Coast. The heartwood of the white ash group is brown, and the sapwood is light-colored or nearly white. Second-growth trees are particularly sought after because of the inherent qualities of the wood from these trees: it is heavy, strong, hard, and stiff, and it has high resistance to shock. Oregon ash has somewhat lower strength properties than American white ash, but it is used for similar purposes on the West Coast. American white ash is used principally for nonstriking tool handles, oars, baseball bats, and other sporting and athletic goods. For handles of the best grade, some handle specifications call for not less than 2 nor more than 7 growth rings per centimeter (not less than 5 nor more than 17 growth rings per inch). The additional weight requirement of 690 kg/m³ (43 lb/ft³) or more at 12% moisture content ensures high quality material. Principal uses for the white ash group are decorative veneer, cabinets, furniture, flooring, millwork, and crates.

Ash (Black Ash Group)

The black ash group includes black ash (*F. nigra*) and pumpkin ash (*F. profunda*). Black ash grows in the Northeast and Midwest, and pumpkin ash in the South. The heartwood of black ash is a darker brown than that of American white ash; the sapwood is light-colored or nearly white. The wood of the black ash group is lighter in weight (basic specific gravity of 0.45 to 0.48) than that of the white ash group (>0.50). Pumpkin ash, American white ash, and green ash that grow in southern river bottoms, especially in areas frequently flooded for long periods, produce buttresses that contain relatively lightweight and brash wood. Principal uses for the black ash group are decorative veneer, cabinets, millwork, furniture, cooperage, and crates.

Aspen

Aspen is a generally recognized name that is applied to bigtooth (*Populus grandidentata*) and quaking (*P. tremuloides*) aspen. Aspen does not include balsam poplar (*P. balsamifera*) and the other species of *Populus* that are included in the cottonwoods. In lumber statistics of the U.S. Bureau of the Census, however, the term cottonwood includes all the preceding species. Also, the lumber of aspen and cottonwood may be mixed in trade and sold as either popple or cottonwood. The name popple should not be confused with yellow-poplar (*Liriodendron tulipifera*), also known in the trade as poplar. Aspen lumber is produced principally in the Northeastern and Lake States, with some production in the Rocky Mountain States. The heartwood of aspen is grayish white to light grayish brown. The sapwood is lighter colored and generally merges gradually into the heartwood without being clearly marked. Aspen wood is usually straight grained with a fine, uniform texture. It is easily worked. Well-dried aspen lumber does not impart odor or flavor to foodstuffs. The wood of aspen is lightweight and soft. It is low in strength, moderately stiff, and moderately low in resistance to shock and has moderately high shrinkage. Aspen is cut for lumber, pallets, boxes and crating, pulpwood, particleboard, strand panels, excelsior, matches, veneer, and miscellaneous turned articles. Today, aspen is one of the preferred species for use in oriented strandboard, a panel product that is increasingly being used as sheathing.

Basswood

American basswood (*Tilia americana*) is the most important of the native basswood species; next in importance is white basswood (*T. heterophylla*), and no attempt is made to distinguish between these species in lumber form. In commercial usage, “white basswood” is used to specify the white wood or sapwood of either species. Basswood grows in the eastern half of the United States from the Canadian provinces southward. Most basswood lumber comes from the Lake, Middle Atlantic, and Central States. The heartwood of basswood is pale yellowish brown with occasional darker streaks. Basswood has wide, creamy white or pale brown sapwood that merges gradually into heartwood. When dry, the wood is without odor or taste. It is soft and light in weight, has fine, even texture, and is straight grained and easy to work with tools. Shrinkage in width and thickness during drying is rated as high; however, basswood seldom warps in use. Basswood lumber is used mainly in venetian blinds, sashes and door frames, moulding, apiary supplies, wooden ware, and boxes. Some basswood is cut for veneer, cooperage, excelsior, and pulpwood, and it is a favorite of wood carvers.

Beech, American

Only one species of beech, American beech (*Fagus grandifolia*), is native to the United States. It grows in the eastern one-third of the United States and adjacent Canadian provinces. The greatest production of beech lumber is in the Central and Middle Atlantic States. In some beech trees, color varies from nearly white sapwood to reddish-brown heartwood. Sometimes there is no clear line of demarcation between heartwood and sapwood. Sapwood may be roughly 7 to 13 cm (3 to 5 in.) wide. The wood has little figure and is of close, uniform texture. It has no characteristic taste or odor. The wood of beech is classed as heavy, hard, strong, high in resistance to shock, and highly suitable for steam bending. Beech shrinks substantially and therefore requires careful drying. It machines smoothly, is an excellent wood for turning, wears

well, and is rather easily treated with preservatives. Most beech is used for flooring, furniture, brush blocks, handles, veneer, woodenware, containers, and cooperage. When treated with preservative, beech is suitable for railway ties.

Birch

The three most important species are yellow birch (*Betula alleghaniensis*), sweet birch (*B. lenta*), and paper birch (*B. papyrifera*). These three species are the source of most birch lumber and veneer. Other birch species of some commercial importance are river birch (*B. nigra*), gray birch (*B. populifolia*), and western paper birch (*B. papyrifera* var. *commutata*). Yellow, sweet, and paper birch grow principally in the Northeast and the Lake States; yellow and sweet birch also grow along the Appalachian Mountains to northern Georgia. Yellow birch has white sapwood and light reddish-brown heartwood. Sweet birch has light-colored sapwood and dark brown heartwood tinged with red. For both yellow and sweet birch, the wood is heavy, hard, and strong, and it has good shock-resisting ability. The wood is fine and uniform in texture. Paper birch is lower in weight, softer, and lower in strength than yellow and sweet birch. Birch shrinks considerably during drying. Yellow and sweet birch lumber is used primarily for the manufacture of furniture, boxes, baskets, crates, wooden ware, cooperage, interior woodwork, and doors; veneer plywood is used for flush doors, furniture, paneling, cabinets, aircraft, and other specialty uses. Paper birch is used for toothpicks, tongue depressors, ice cream sticks, and turned products, including spools, bobbins, small handles, and toys.

Buckeye

Buckeye consists of two species, yellow buckeye (*Aesculus octandra*) and Ohio buckeye (*A. glabra*). These species range from the Appalachians of Pennsylvania, Virginia, and North Carolina westward to Kansas, Oklahoma, and Texas. Buckeye is not customarily separated from other species when manufactured into lumber and can be used for the same purposes as aspen (*Populus*), basswood (*Tilia*), and sapwood of yellow-poplar (*Liriodendron tulipifera*). The white sapwood of buckeye merges gradually into the creamy or yellowish white heartwood. The wood is uniform in texture, generally straight grained, light in weight, weak when used as a beam, soft, and low in shock resistance. It is rated low on machinability such as shaping, mortising, boring, and turning. Buckeye is suitable for pulping for paper; in lumber form, it has been used principally for furniture, boxes and crates, food containers, wooden ware, novelties, and planing mill products.

Cottonwood

Cottonwood includes several species of the genus *Populus*. Most important are eastern cottonwood (*P. deltoides* and varieties), also known as Carolina poplar and whitewood; swamp cottonwood (*P. heterophylla*), also known as cottonwood, river cottonwood, and swamp poplar; black cottonwood (*P. trichocarpa*); and balsam poplar (*P. balsamifera*). Eastern and swamp cottonwood grow throughout the eastern half of the United States. Greatest production of lumber is in the Southern and Central States. Black cottonwood grows on the West Coast and in western Montana, northern Idaho, and western Nevada. Balsam poplar grows from Alaska across Canada and in the

northern Great Lakes States. The heartwood of cottonwood is grayish white to light brown. The sapwood is whitish and merges gradually with the heartwood. The wood is comparatively uniform in texture and generally straight grained. It is odorless when well dried. Eastern cottonwood is moderately low in bending and compressive strength, moderately stiff, moderately soft, and moderately low in ability to resist shock. Most strength properties of black cottonwood are slightly lower than those of eastern cottonwood. Both eastern and black cottonwood have moderately high shrinkage. Some cottonwood is difficult to work with tools because of its fuzzy surface, which is mainly the result of tension wood. Cottonwood is used principally for lumber, veneer, pulpwood, excelsior, and fuel. Lumber and veneer are used primarily for boxes, crates, baskets, and pallets.

Elm

Six species of elm grow in the eastern United States: American (*Ulmus americana*), slippery (*U. rubra*), rock (*U. thomasii*), winged (*U. alata*), cedar (*U. crassifolia*), and September (*U. serotina*) elm. American elm is also known as white, water, and gray elm; slippery elm as red elm; rock elm as cork and hickory elm; winged elm as wahoo; cedar elm as red and basket elm; and September elm as red elm. American elm is threatened by two diseases, Dutch Elm disease and phloem necrosis, which have killed hundreds of thousands of trees. Sapwood of elm is nearly white and heartwood light brown, often tinged with red. Elm may be divided into two general classes, soft and hard, based on the weight and strength of the wood. Soft elm includes American and slippery elm. It is moderately heavy, has high shock resistance, and is moderately hard and stiff. Hard elm includes rock, winged, cedar, and September elm. These species are somewhat heavier than soft elm. Elm has excellent bending qualities. Historically, elm lumber was used for boxes, baskets, crates, and slack cooperage; furniture; agricultural supplies and implements; caskets and burial boxes; and wood components in vehicles. Today, elm lumber and veneer are used mostly for furniture and decorative panels. Hard elm is preferred for uses that require strength.

Oak (Red Oak Group)

Most red oak comes from the Eastern States. The principal species are northern red (*Quercus rubra*), scarlet (*Q. coccinea*), Shumard (*Q. shumardii*), pin (*Q. palustris*), Nuttall (*Q. nuttallii*), black (*Q. velutina*), southern red (*Q. falcata*), cherrybark (*Q. falcata* var. *pagodaefolia*), water (*Q. nigra*), laurel (*Q. laurifolia*), and willow (*Q. phellos*) oak. The sapwood is nearly white and roughly 2 to 5 cm (1 to 2 in.) wide. The heartwood is brown with a tinge of red. Sawn lumber of the red oak group cannot be separated by species on the basis of wood characteristics alone. Red oak lumber can be separated from white oak by the size and arrangement of pores in latewood and because it generally lacks tyloses in the pores. The open pores of red oak make this species group unsuitable for tight cooperage, unless the barrels are lined with sealer or plastic. Quartersawn lumber of the oaks is distinguished by the broad and conspicuous rays. Wood of the red oaks is heavy. Rapidly grown second-growth wood is generally harder and tougher than finer textured old-growth wood. The red oaks have fairly high shrinkage in drying. The red oaks are primarily cut into lumber, railroad crossties, mine timbers, fence posts, veneer, pulpwood, and fuelwood. Ties, mine timbers, and fence

posts require preservative treatment for satisfactory service. Red oak lumber is remanufactured into flooring, furniture, general millwork, boxes, pallets and crates, agricultural implements, caskets, wooden ware, and handles. It is also used in railroad cars and boats.

Oak (White Oak Group)

White oak lumber comes chiefly from the South, South Atlantic, and Central States, including the southern Appalachian area. Principal species are white (*Quercus alba*), chestnut (*Q. prinus*), post (*Q. stellata*), overcup (*Q. lyrata*), swamp chestnut (*Q. michauxii*), bur (*Q. macrocarpa*), chinkapin (*Q. muehlenbergii*), swamp white (*Q. bicolor*), and live (*Q. virginiana*) oak. The sapwood of the white oaks is nearly white and roughly 2 to 5 cm or more (1 to 2 in. or more) wide. The heartwood is generally grayish brown. Heartwood pores are usually plugged with tyloses, which tend to make the wood impenetrable by liquids. Consequently, most white oaks are suitable for tight cooperage. Many heartwood pores of chestnut oak lack tyloses. The wood of white oak is heavy, averaging somewhat greater in weight than red oak wood. The heartwood has good decay resistance. White oaks are usually cut into lumber, railroad crossties, cooperage, mine timbers, fence posts, veneer, fuelwood, and many other products. High-quality white oak is especially sought for tight cooperage. Live oak is considerably heavier and stronger than the other oaks, and it was formerly used extensively for ship timbers. An important use of white oak is for planking and bent parts of ships and boats; heartwood is often specified because of its decay resistance. White oak is also used for furniture, flooring, pallets, agricultural implements, railroad cars, truck floors, furniture, doors, and millwork.

Softwoods

Baldcypress

Baldcypress or cypress (*Taxodium distichum*) is also known as southern-cypress, red-cypress, yellow-cypress, and whitecypress. Commercially, the terms tidewater red-cypress, gulfcypress, red-cypress (coast type), and yellow-cypress (inland type) are frequently used. About half of the cypress lumber comes from the Southern States and about a fourth from the South Atlantic States (Fig. 1-1). Old-growth baldcypress is no longer readily available, but second-growth wood is available. Sapwood of baldcypress is narrow and nearly white. The color of heartwood varies widely, ranging from light yellowish brown to dark brownish red, brown, or chocolate. The wood is moderately heavy, moderately strong, and moderately hard. The heartwood of old-growth baldcypress is one of the most decay resistant of U.S. species, but second-growth wood is only moderately resistant to decay. Shrinkage is moderately low but somewhat higher than that of the cedars and lower than that of Southern Pine. The wood of certain baldcypress trees frequently contains pockets or localized areas that have been attacked by a fungus. Such wood is known as pecky cypress. The decay caused by this fungus is stopped when the wood is cut into lumber and dried. Pecky cypress is therefore durable and useful where water tightness is unnecessary, appearance is not important, or a novel effect is desired. When old-growth wood was available, baldcypress was

used principally for building construction, especially where resistance to decay was required. It was also used for caskets, sashes, doors, blinds, tanks, vats, ship and boat building, and cooling towers. Second-growth wood is used for siding and millwork, including interior woodwork and paneling. Pecky cypress is used for paneling in restaurants, stores, and other buildings.

Douglas-Fir

Douglas-fir (*Pseudotsuga menziesii*) is also known locally as red-fir, Douglas-spruce, and yellow-fir. Its range extends from the Rocky Mountains to the Pacific Coast and from Mexico to central British Columbia. Sapwood of Douglas-fir is narrow in old-growth trees but may be as much as 7 cm (3 in.) wide in second-growth trees of commercial size. Young trees of moderate to rapid growth have reddish heartwood and are called red-fir. Very narrowringed heartwood of old-growth trees may be yellowish brown and is known on the market as yellow-fir. The wood of Douglas-fir varies widely in weight and strength. When lumber of high strength is needed for structural uses, selection can be improved by selecting wood with higher density. Douglas-fir is used mostly for building and construction purposes in the form of lumber, marine fendering piles, and plywood. Considerable quantities are used for railroad crossties, cooperage stock, mine timbers, poles, and fencing. Douglas-fir lumber is used in the manufacture of various products, including sashes, doors, laminated beams, general millwork, railroad-car construction, boxes, pallets, and crates. Small amounts are used for flooring, furniture, ship and boat construction, and tanks. Douglas-fir plywood has found application in construction, furniture, cabinets, marine use, and other products.

Firs, True (Eastern Species)

Balsam fir (*Abies balsamea*) grows principally in New England, New York, Pennsylvania, and the Great Lake States. Fraser fir (*A. fraseri*) grows in the Appalachian Mountains of Virginia, North Carolina, and Tennessee. The wood of the eastern true firs, as well as the western true firs, is creamy white to pale brown. The heartwood and sapwood are generally indistinguishable. The similarity of wood structure in the true firs makes it impossible to distinguish the species by examination of the wood alone. Balsam and Fraser firs are lightweight, have low bending and compressive strength, are moderately low in stiffness, are soft, and have low resistance to shock. The eastern firs are used mainly for pulpwood, although some lumber is produced for structural products, especially in New England and the Great Lake States.

Firs, True (Western Species)

Six commercial species make up the western true firs: subalpine fir (*Abies lasiocarpa*), California red fir (*A. magnifica*), grand fir (*A. grandis*), noble fir (*A. procera*), Pacific silver fir (*A. amabilis*), and white fir (*A. concolor*). The western true firs are cut for lumber primarily in Washington, Oregon, California, western Montana, and northern Idaho, and they are marketed as white fir throughout the United States. The wood of the western true firs is similar to that of the eastern true firs, which makes it impossible to distinguish the true fir species by examination of the wood alone. Western true firs are light in weight but, with the exception of subalpine fir, have somewhat higher strength properties than does balsam fir. Shrinkage of the wood is low to moderately

high. Lumber of the western true firs is primarily used for building construction, boxes and crates, planing-mill products, sashes, doors, and general millwork. In house construction, the lumber is used for framing, subflooring, and sheathing. Some western true fir lumber is manufactured into boxes and crates. High-grade lumber from noble fir is used mainly for interior woodwork, moulding, siding, and sash and door stock. Some of the highest quality material is suitable for aircraft construction. Other special uses of noble fir are venetian blinds and ladder rails.

Hemlock, Eastern

Eastern hemlock (*Tsuga canadensis*) grows from New England to northern Alabama and Georgia, and in the Great Lake States. Other names are Canadian hemlock and hemlock–spruce. The production of hemlock lumber is divided fairly evenly among the New England States, Middle Atlantic States, and Great Lake States. The heartwood of eastern hemlock is pale brown with a reddish hue. The sapwood is not distinctly separated from the heartwood but may be lighter in color. The wood is coarse and uneven in texture (old trees tend to have considerable shake); it is moderately lightweight, moderately hard, moderately low in strength, moderately stiff, and moderately low in shock resistance. Eastern hemlock is used principally for lumber and pulpwood. The lumber is used primarily in building construction (framing, sheathing, subflooring, and roof boards) and in the manufacture of boxes, pallets, and crates.

Hemlock, Western and Mountain

Western hemlock (*Tsuga heterophylla*) is also known as West Coast hemlock, Pacific hemlock, British Columbia hemlock, hemlock–spruce, and western hemlock–fir. It grows along the Pacific coast of Oregon and Washington and in the northern Rocky Mountains north to Canada and Alaska. A relative of western hemlock, mountain hemlock (*T. mertensiana*) grows in mountainous country from central California to Alaska. It is treated as a separate species in assigning lumber properties. The heartwood and sapwood of western hemlock are almost white with a purplish tinge. The sapwood, which is sometimes lighter in color than the heartwood, is generally not more than 2.5 cm (1 in.) wide. The wood often contains small, sound, black knots that are usually tight and dimensionally stable. Dark streaks are often found in the lumber; these are caused by hemlock bark maggots and generally do not reduce strength. Western hemlock is moderately light in weight and moderate in strength. It is also moderate in hardness, stiffness, and shock resistance. Shrinkage of western hemlock is moderately high, about the same as that of Douglas-fir (*Pseudotsuga menziesii*). Green hemlock lumber contains considerably more water than does Douglas-fir and requires longer kiln-drying time. Mountain hemlock has approximately the same density as that of western hemlock but is somewhat lower in bending strength and stiffness. Western hemlock and mountain hemlock are used principally for pulpwood, lumber, and plywood. The lumber is used primarily for building material, such as sheathing, siding, subflooring, joists, studding, planking, and rafters, as well as in the manufacture of boxes, pallets, crates, flooring, furniture, and ladders.

Incense-Cedar

Incense-cedar (*Calocedrus decurrens* (synonym *Libocedrus decurrens*)) grows in California, southwestern Oregon, and extreme western Nevada. Most incense-cedar lumber comes from the northern half of California. Sapwood of incense-cedar is white or cream colored, and heartwood is light brown, often tinged with red. The wood has a fine, uniform texture and a spicy odor. Incense-cedar is light in weight, moderately low in strength, soft, low in shock resistance, and low in stiffness. It has low shrinkage and is easy to dry, with little checking or warping. Incense-cedar is used principally for lumber and fence posts. Nearly all the high-grade lumber is used for pencils and venetian blinds; some is used for chests and toys. Much incense-cedar wood is more or less pecky; that is, it contains pockets or areas of disintegrated wood caused by advanced stages of localized decay in the living tree. There is no further development of decay once the lumber is dried. This low-quality lumber is used locally for rough construction where low cost and decay resistance are important. Because of its resistance to decay, incense-cedar is well suited for fence posts. Other uses are railroad crossties, poles, and split shingles.

Larch, Western

Western larch (*Larix occidentalis*) grows in western Montana, northern Idaho, northeastern Oregon, and on the eastern slope of the Cascade Mountains in Washington. About two-thirds of the lumber of this species is produced in Idaho and Montana and one-third in Oregon and Washington. The heartwood of western larch is yellowish brown and the sapwood, yellowish white. The sapwood is generally not more than 2.5 cm (1 in.) wide. The wood is stiff, moderately strong and hard, moderately high in shock resistance, and moderately heavy. It has moderately high shrinkage. The wood is usually straight grained, splits easily, and is subject to ring shake. Knots are common but generally small and tight. Western larch is used mainly for rough dimension wood in building construction, small timbers, planks and boards, and railroad crossties and mine timbers. It is used also for piles, poles, and posts. Some high-grade material is manufactured into interior woodwork, flooring, sashes, and doors. The properties of western larch are similar to those of Douglas-fir (*Pseudotsuga menziesii*), and these species are sometimes sold mixed.

Pine, Eastern White

Eastern white pine (*Pinus strobus*) grows from Maine to northern Georgia and in the Great Lake States. It is also known as white pine, northern white pine, Weymouth pine, and soft pine. About one-half the production of eastern white pine lumber occurs in New England, about one-third in the Great Lake States, and most of the remainder in the Middle Atlantic and South Atlantic States. The heartwood of eastern white pine is light brown, often with a reddish tinge. It turns darker on exposure to air. The wood has comparatively uniform texture and is straight grained. It is easily kiln dried, has low shrinkage, and ranks high in stability. It is also easy to work and can be readily glued. Eastern white pine is lightweight, moderately soft, moderately low in strength, low in shock resistance, and low in stiffness. Practically all eastern white pine is converted into lumber, which is used in a great variety of ways. A large proportion, mostly second-growth knotty wood or lower grades, is used for structural lumber. High-grade lumber is used for patterns for castings. Other important uses are sashes,

doors, furniture, interior woodwork, knotty paneling, caskets, shade and map rollers, and toys.

Pine, Jack

Jack pine (*Pinus banksiana*), sometimes known as scrub, gray, and black pine in the United States, grows naturally in the Great Lake States and in a few scattered areas in New England and northern New York. Jack pine lumber is sometimes not separated from the other pines with which it grows, including red pine (*Pinus resinosa*) and eastern white pine (*Pinus strobus*). Sapwood of Jack pine is nearly white; heartwood is light brown to orange. Sapwood may constitute one-half or more of the volume of a tree. The wood has a rather coarse texture and is somewhat resinous. It is moderately lightweight, moderately low in bending strength and compressive strength, moderately low in shock resistance, and low in stiffness. It also has moderately low shrinkage. Lumber from Jack pine is generally knotty. Jack pine is used for pulpwood, box lumber, and pallets. Less important uses include railroad crossties, mine timber, slack cooperage, poles, posts, and fuel.

Pine, Pitch

Pitch pine (*Pinus rigida*) grows from Maine along the mountains to eastern Tennessee and northern Georgia. The heartwood is brownish red and resinous; the sapwood is wide and light yellow. The wood of pitch pine is moderately heavy to heavy, moderately strong, stiff, and hard, and moderately high in shock resistance. Shrinkage ranges from moderately low to moderately high. Pitch pine is used for lumber, fuel, and pulpwood. The lumber is classified as a minor species in grading rules for the Southern Pine species group.

Pine, Ponderosa

Ponderosa pine (*Pinus ponderosa*) is also known as ponderosa, western soft, western yellow, bull, and blackjack pine. Jeffrey pine (*P. jeffreyi*), which grows in close association with ponderosa pine in California and Oregon, is usually marketed with ponderosa pine and sold under that name. Major ponderosa pine producing areas are in Oregon, Washington, and California. Other important producing areas are in Idaho and Montana; lesser amounts come from the southern Rocky Mountain region, the Black Hills of South Dakota, and Wyoming. The heartwood of ponderosa pine is light reddish brown, and the wide sapwood is nearly white to pale yellow. The wood of the outer portions of ponderosa pine of sawtimber size is generally moderately light in weight, moderately low in strength, moderately soft, moderately stiff, and moderately low in shock resistance. It is generally straight grained and has moderately low shrinkage. It is quite uniform in texture and has little tendency to warp and twist. Ponderosa pine is used mainly for lumber and to a lesser extent for piles, poles, posts, mine timbers, veneer, and railroad crossties. The clear wood is used for sashes, doors, blinds, moulding, paneling, interior woodwork, and built-in cases and cabinets. Low-grade lumber is used for boxes and crates. Much intermediate- or low-grade lumber is used for sheathing, subflooring, and roof boards. Knotty ponderosa pine is used for interior woodwork.

Pine, Spruce

Spruce pine (*Pinus glabra*), also known as cedar, poor, Walter, and bottom white pine, is classified as a minor species in the Southern Pine species group. Spruce pine grows most commonly on low moist lands of the coastal regions of southeastern South Carolina, Georgia, Alabama, Mississippi, and Louisiana, and northern and northwestern Florida. The heartwood of spruce pine is light brown, and the wide sapwood is nearly white. Spruce pine wood is lower in most strength values than the wood of the major Southern Pine species group. Spruce pine compares favorably with the western true firs in important bending properties, crushing strength (perpendicular and parallel to grain), and hardness. It is similar to denser species such as coast Douglas-fir (*Pseudotsuga menziesii*) and loblolly pine (*Pinus taeda*) in shear parallel to grain. In the past, spruce pine was principally used locally for lumber, pulpwood, and fuelwood. The lumber reportedly was used for sashes, doors, and interior woodwork because of its low specific gravity and similarity of earlywood and latewood. In recent years, spruce pine has been used for plywood.

Pine, Sugar

Sugar pine (*Pinus lambertiana*), the world's largest species of pine, is sometimes called California sugar pine. Most sugar pine lumber grows in California and southwestern Oregon. The heartwood of sugar pine is buff or light brown, sometimes tinged with red. The sapwood is creamy white. The wood is straight grained, fairly uniform in texture, and easy to work with tools. It has very low shrinkage, is readily dried without warping or checking, and is dimensionally stable. Sugar pine is lightweight, moderately low in strength, moderately soft, low in shock resistance, and low in stiffness. Sugar pine is used almost exclusively for lumber products. The largest volume is used for boxes and crates, sashes, doors, frames, blinds, general millwork, building construction, and foundry patterns. Like eastern white pine (*Pinus strobus*), sugar pine is suitable for use in nearly every part of a house because of the ease with which it can be cut, its dimensional stability, and its good nailing properties.

Redcedar, Eastern

Eastern redcedar (*Juniperus virginiana*) grows throughout the eastern half of the United States, except in Maine, Florida, and a narrow strip along the Gulf Coast, and at the higher elevations in the Appalachian Mountain Range. Commercial production is principally in the southern Appalachian and Cumberland Mountain regions. Another species, southern redcedar (*J. silicicola*), grows over a limited area in the South Atlantic and Gulf Coastal Plains. The heartwood of redcedar is bright or dull red, and the narrow sapwood is nearly white. The wood is moderately heavy, moderately low in strength, hard, and high in shock resistance, but low in stiffness. It has very low shrinkage and is dimensionally stable after drying. The texture is fine and uniform, and the wood commonly has numerous small knots. Eastern redcedar heartwood is very resistant to decay. The greatest quantity of eastern redcedar is used for fence posts. Lumber is manufactured into chests, wardrobes, and closet lining. Other uses include flooring, novelties, pencils, scientific instruments, and small boats. Southern redcedar is used for the same purposes. Eastern redcedar is reputed to repel moths, but this claim has not been supported by research.

Redcedar, Western

Western redcedar (*Thuja plicata*) grows in the Pacific Northwest and along the Pacific Coast to Alaska. It is also called canoe-cedar, giant arborvitae, shinglewood, and Pacific redcedar. Western redcedar lumber is produced principally in Washington, followed by Oregon, Idaho, and Montana. The heartwood of western redcedar is reddish or pinkish brown to dull brown, and the sapwood is nearly white. The sapwood is narrow, often not more than 2.5 cm (1 in.) wide. The wood is generally straight grained and has a uniform but rather coarse texture. It has very low shrinkage. This species is lightweight, moderately soft, low in strength when used as a beam or posts, and low in shock resistance. The heartwood is very resistant to decay. Western redcedar is used principally for shingles, lumber, poles, posts, and piles. The lumber is used for exterior siding, decking, interior woodwork, greenhouse construction, ship and boat building, boxes and crates, sashes, and doors.

Redwood

Redwood (*Sequoia sempervirens*) grows on the coast of California and some trees are among the tallest in the world. A closely related species, giant sequoia (*Sequoiadendron giganteum*), is volumetrically larger and grows in a limited area in the Sierra Nevadas of California, but its wood is used in very limited quantities. Other names for redwood are coast redwood, California redwood, and sequoia. Production of redwood lumber is limited to California, but the market is nationwide. The heartwood of redwood varies from light “cherry” red to dark mahogany. The narrow sapwood is almost white. Typical old-growth redwood is moderately lightweight, moderately strong and stiff, and moderately hard. The wood is easy to work, generally straight grained, and shrinks and swells comparatively little. The heartwood from old-growth trees has high decay resistance; heartwood from second-growth trees generally has low to moderate decay resistance. Most redwood lumber is used for building. It is remanufactured extensively into siding, sashes, doors, blinds, millwork, casket stock, and containers. Because of its durability, redwood is useful for cooling towers, decking, tanks, silos, wood-stave pipe, and outdoor furniture. It is used in agriculture for buildings and equipment. Its use as timbers and large dimension in bridges and trestles is relatively minor. Redwood splits readily and plays an important role in the manufacture of split products, such as posts and fence material. Some redwood veneer is produced for decorative plywood.

Spruce, Eastern

The term eastern spruce includes three species: red (*Picea rubens*), white (*P. glauca*), and black (*P. mariana*). White and black spruce grow principally in the Great Lake States and New England, and red spruce grows in New England and the Appalachian Mountains. The wood is light in color, and there is little difference between heartwood and sapwood. All three species have about the same properties, and they are not distinguished from each other in commerce. The wood dries easily and is stable after drying, is moderately lightweight and easily worked, has moderate shrinkage, and is moderately strong, stiff, tough, and hard. The greatest use of eastern spruce is for

pulpwood. Eastern spruce lumber is used for framing material, general millwork, boxes and crates, and piano sounding boards.

Spruce, Engelmann

Engelmann spruce (*Picea engelmannii*) grows at high elevations in the Rocky Mountain region of the United States. This species is also known as white spruce, mountain spruce, Arizona spruce, silver spruce, and balsam. About two-thirds of the lumber is produced in the southern Rocky Mountain States and most of the remainder in the northern Rocky Mountain States and Oregon. The heartwood of Engelmann spruce is nearly white, with a slight tinge of red. The sapwood varies from 2 to 5 cm (3/4 to 2 in.) in width and is often difficult to distinguish from the heartwood. The wood has medium to fine texture and is without characteristic odor. Engelmann spruce is rated as lightweight, and it is low in strength as a beam or post. It is also soft and low in stiffness, shock resistance, and shrinkage. The lumber typically contains many small knots. Engelmann spruce is used principally for lumber and for mine timbers, railroad crossties, and poles. It is used also in building construction in the form of dimension lumber, flooring, and sheathing. It has excellent properties for pulp and papermaking.

Spruce, Sitka

Sitka spruce (*Picea sitchensis*) is a large tree that grows along the northwestern coast of North America from California to Alaska. It is also known as yellow, tideland, western, silver, and west coast spruce. Much Sitka spruce timber is grown in Alaska, but most logs are sawn into cants for export to Pacific Rim countries. Material for U.S. consumption is produced primarily in Washington and Oregon. The heartwood of Sitka spruce is a light pinkish brown. The sapwood is creamy white and shades gradually into the heartwood; the sapwood may be 7 to 15 cm (3 to 6 in.) wide or even wider in young trees. The wood has a comparatively fine, uniform texture, generally straight grain, and no distinct taste or odor. It is moderately lightweight, moderately low in bending and compressive strength, moderately stiff, moderately soft, and moderately low in resistance to shock. It has moderately low shrinkage. On the basis of weight, Sitka spruce rates high in strength properties and can be obtained in long, clear, straight-grained pieces. Sitka spruce is used principally for lumber, pulpwood, and cooperage. Boxes and crates account for a considerable amount of the remanufactured lumber. Other important uses are furniture, planing-mill products, sashes, doors, blinds, millwork, and boats. Sitka spruce has been by far the most important wood for aircraft construction. Other specialty uses are ladder rails and sounding boards for pianos.

White-Cedar, Northern and Atlantic

Two species of white-cedar grow in the eastern part of the United States: northern white-cedar (*Thuja occidentalis*) and Atlantic white-cedar (*Chamaecyparis thyoides*). Northern white-cedar grows from Maine along the Appalachians and westward through the northern part of the Great Lake States. Atlantic whitecedar grows near the Atlantic Coast from Maine to northern Florida and westward along the Gulf Coast to Louisiana. It is strictly a swamp tree. Production of northern white-cedar lumber is greatest in Maine and the Great Lake States. Production of Atlantic white-cedar centers in North Carolina and along the Gulf Coast. The heartwood of white-cedar is light brown, and

the sapwood is white or nearly so. The sapwood is usually narrow. The wood is lightweight, rather soft, and low in strength and shock resistance. It shrinks little in drying. It is easily worked and holds paint well, and the heartwood is highly resistant to decay. Northern and Atlantic white-cedar are used for similar purposes, primarily for poles, cabin logs, railroad crossties, lumber, posts, and decorative fencing.

Regis B. Miller "Characteristics and Availability of Commercially Important Woods" from Forest Products Laboratory. 1999. Wood handbook—Wood as an engineering material. Gen. Tech. Rep. FPL–GTR–113. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 463 p.

CONVERSION OF LOGS INTO TIMBER

When trees are felled it is sometimes known precisely what use will be made of them, as when small, young trees are removed during the thinning of plantations. But with larger trees the sawmiller must use his judgement in deciding how best to convert a log to obtain the maximum yield of reliable timber cut into the sizes that he anticipates his customers will require.

Trees with a butt diameter of less than 9 in (23 cm) are seldom sawn up in this country but are cross-cut and used either as posts or as pit-props for supporting the roofs of mines. Large quantities of the smaller thinnings go straight to the pulp mills to be made into paper or chipboard. It is estimated that by 1975 rather less than half the consumption of wood in North America and Europe will be sawn, as the greater quantity will be used to make paper and panel products.

Trees rather larger than the first thinnings are removed in subsequent thinnings and these provide poles used for carrying overhead telephone lines and electricity supply cables. Today these are usually of only moderate size as the main telephone lines that formerly required very large poles are now carried underground. Posts and poles that have to be impregnated with a wood preservative before they are used must have the bark removed and be stacked to season. Ingenious machines which scrape off the bark, even though the logs are uneven or twisted, have been devised, so the tedious task of removing the bark with a draw knife is seldom undertaken nowadays in the developed countries. Formerly all this bark was either burnt or just left to rot, but recent studies have shown that if it is pulverised, it can be used in place of peat, and it is useful as a mulch to conserve moisture and smother weeds amongst shrubs.

Conversion of felled trees and logs into usable timbers is carried out in a number of different ways, most of which are very ancient and some now almost obsolete. The main processes are hewing, cleaving, slicing, peeling and sawing.

Hewing. Before the introduction of mechanically driven saws the easiest way to produce a square beam from a round log was to chop away the outer layers on four sides. For this work a broad axe with a blade tapered on one side only was used. For finer work the hewer used an adze, which is essentially an axe with a curved blade set inwards at right angles to the handle like a draw hoe. A worker skilled in the use of the

adze could produce an almost perfectly smooth surface, as can be seen in the beams of many old houses and the tops of old refectory tables. Hollow wooden vessels such as pig troughs were sometimes hewn out of the solid and the adze was also used to hollow out the elm seats of Windsor chairs made in the Chilterns. Nowadays the adze is used in the shaping of large timbers for boat-building and in the tropics for squaring logs of mahogany and similar timbers.

Cleaving. Some kinds of straight-grained wood can readily be split, especially in a radial direction, and the art of cleaving wood to produce thin material from logs is an ancient one. Cleft material is often stronger than sawn pieces of the same size because the cleft pole or slat follows the grain of the wood which is nowhere cut across.

Cleaving is a process that is not easily mechanised and therefore many of the woodland crafts (so delightfully described in H.L. Edlin's book) have largely died out, the cost of labour having increased so much as to make the work no longer profitable. Cleft chestnut paling is however still in demand, as the wood of the sweet chestnut, even from small logs, is naturally very durable. Cleavers prefer poles that are 4-5 in thick at 6 ft from the ground, a size that they reach on the coppiced trees after 10 or 12 years. Some 25 000 pales, enough for a mile of fencing, can be obtained from an acre of chestnut coppice.

Trackway paling, used to provide a rough road for lorries over sandy ground, was made in great quantities for the invasion of the Normandy beaches in 1944.

The best ash handles are made from cleft pieces of the wood in which the grain is undamaged. The final shape is achieved with the use of a spokeshave or a draw knife.

Slicing is the term applied to the process of cutting thin slices of wood with a knife moving to and fro across the long axis. It is the method generally used for preparing decorative veneers that display the grain of the wood to the best advantage.

If the wood to be cut is a hard one, the baulk of umber may - be steamed or heated in hot water to soften it before cutting. If the wood has been heated throughout to about 88°C (190°F) boards up to half an inch thick can be cut by slicing. An added advantage is that no timber is wasted as sawdust.

Peeling. The preparation of thin veneers by turning the log 4. against a fixed knife is known as peeling. It is the process used in the production of plywood.

Sawing. The origin of the sharp toothed metal saw is lost in history but it is known to have been used in Britain before the coming of the Romans. At first it was used mainly for cutting timber across the grain, the squaring up of logs being done mainly with the broadaxe and adze. For sawing logs by hand into boards the log was supported above a saw pit and moved forward as the sawing proceeded. Two men were needed to work the saw. The top 'sawyer' stood on the log and lifted the saw for each stroke and the 'pitman' pulled it down. A sawpit of this kind was still in use in Essex as late as 1948, and pit sawing is still practised in parts of Africa.

Sawmills driven by water power were in use in mediaeval times, and I have myself seen one in Scotland since the last war. The circular saw was patented in 1777 by one Samuel Miller and this idea was taken up by Brunei who, in 1799, started the first

steam-driven sawmill at Chatham Dockyards. By 1824 circular saws were in regular use but since then they have been improved and developed in many ways. They have now been superseded in many mills by the bandsaw. This has a steel band with teeth along one edge revolving around two wheels. The simple circular saw, however, is still widely used in portable sawmills in the woods, and it is the main tool for the cross-cutting of wood. In Northern Europe logs are generally converted by 'frame saws' consisting of a vertically reciprocating frame in which a number of saw blades are mounted.

Logs can be sawn up into boards or planks in either the tangential or the radial direction. The simplest way is to saw the log straight through from one side to the other, thus obtaining a number of tangentially cut boards and one radially cut including the centre of the tree. Boards cut in this way are said to be 'plain' or 'flat' sawn.

The alternative is to saw up the log so that every board is cut more or less in a radial direction; that is to say, the rings meet the surface of the board at an angle of more than 45°. Boards cut in this way are said to be 'quarter' sawn.

In some trees the central core of the trunk is much weaker and less durable than the rest of the heartwood and it may therefore be desirable to 'box the heart' and use the core wood only for rough work, pulp wood or fuel.

Plain sawn timber is cheaper to produce than quarter sawn but the boards tend to cup more, and if used for flooring the softer parts of the annual rings tend to wear away so that the rings may 'shell out' and this may lead to splinters forming on the surface. Quarter sawn wood shrinks and wears more evenly and if the timber is one with wide rays such as oak it displays a much more attractive figure.

When a log is sawn through and through the planks are sometimes reassembled into the original form of the log for seasoning. This is then known as a 'boule'. The term is generally applied to European timber such as oak. The original rounded surface of the tree remaining in a piece of such converted timber is known as 'wane'.

After conversion and seasoning the timber may either be used as it is, or re-sawn into smaller sizes and sold as 'rough sawn', or as 'prepared stock' after it has been planed. Such planed timber is often said to be 'wrot', or in Scotland 'dressed'.

The technology of sawmilling and the maintenance of saws are subjects on which many volumes have been written and for further information reference should be made to those listed in the bibliography.⁷

WOOD-BASED COMPOSITE PRODUCTS

Manufacturers produce many products using wood together with at least one other material. By combining materials, they can take advantage of the best properties of each. Wood-based composite products include plywood and particleboard, which are made by combining wood with adhesive resins.

Plywood consists of a number of veneers that are glued together. The veneers are arranged so that the grain direction in each layer is at a right angle to the grain direction of the next layer. This arrangement gives plywood several advantages over lumber. For example, plywood shrinks and swells less than lumber, and it can be easily nailed near the edges without splitting. The construction and furniture industries use large amounts of plywood.

Particleboard is made from wood shavings, flakes, wafers, splinters, or sawdust. Some of these materials come from scrap left over in sawmills and paper mills. Particleboard makers mix the wood with an adhesive and press it at a high temperature and pressure to form large sheets or panels. Particleboard shrinks and swells little in length and width. It may be used as a base for flooring and furniture. One type of particleboard, called *oriented strand board* (OSB), has the strength of plywood and many of the same uses. To make OSB, manufacturers use waxes and resins to bond layers of wood flakes positioned with their grains running in alternating directions.

Other wood-based composite products are made by combining wood with such materials as fiberglass, metals, polyvinyl chloride, polypropylene, and portland cement. Wood-based composites commonly substitute for lumber. For example, laminated veneer lumber is made of parallel laminated sheets of veneer manufactured to standard lumber dimensions.

Fiber products

Wood is made up of many tiny fibers. Manufacturers produce paper and paperboard, hardboard, and insulation board from wood fibers. Wood fiber is also used as attic insulation, as a protective soil covering called *mulch*, and even as a dietary fiber in breakfast cereals.

Paper and paperboard are made from wood chips that have been reduced to a fiber pulp by chemicals, heat, or mechanical treatment. The pulp is then formed into a mat, filtered, drained, and pressed. Paper products include bags, books, cartons, packaging materials, and tissue.

Medium density fiberboard (MDF) is made from wood that has been reduced to individual fibers or fiber bundles and then been bonded with adhesive. MDF is used primarily to make tops with molded edges for tables or other furniture.

Hardboard is made by pressing wood fibers into flat sheets at a high temperature and pressure. The fibers are held together primarily by *lignin*, a substance that naturally occurs in and between wood fibers. Hardboard is used chiefly in furniture, siding, and paneling.

Insulation board is manufactured from wood fibers that are formed into a mat, pressed lightly, and dried. It weighs less than hardboard. Insulation board is used for acoustical tile and under siding in construction.

Chemical products. Many wood products are made from wood or bark that has been broken down into such basic chemical parts as cellulose and lignin. Cellulose is the main ingredient of wood fibers.

Cellulose products. Cellulose may be chemically treated to change its properties and to produce such compounds as *cellulose acetate* and *cellulose nitrate*. Both of these compounds are used in adhesives, lacquers, and plastics. Plastic items molded from cellulose compounds include piano keys, tool handles, and table tennis balls. Cellulose nitrate is also an ingredient in explosives. Other cellulose compounds have specialized uses in such products as paint, foods, and textiles.

Textile manufacturers process cellulose to produce rayon and acetate fibers, which are used for clothing, draperies, and upholstery. Rayon cords strengthen tires. Other materials made from cellulose include cellophane and photographic film.

Lignin products. Lignin has far fewer uses than cellulose. It is used in making printing inks, dyes, and concrete. Manufacturers use it to *bind* (hold together) animal food pellets and textiles. Artificial vanilla, a flavoring in many foods, is also made from lignin.

Naval stores include turpentine and rosin - materials once essential to the operation of wooden sailing ships. Almost all naval stores come from the processing of pine pulp.

Fuel products. In many developing countries, wood has long served as the primary fuel for cooking and heating. In industrialized countries, wood has been burned mainly in fireplaces and charcoal grills. After petroleum prices rose in the 1970's, wood became a popular fuel in communities near forested areas. Fuel products made from wood include split, dried logs; compressed wood pellets; charcoal; and sawmill by-products. In addition, the forest products industry burns the thick liquid that results from pulping wood.

Other forest products

Although most forest products are made from wood, some come from the bark, fruit and seeds, gum, leaves, and sap of trees. By-products from sawmills include wood chips, shavings, and sawdust. These by-products may be used in making particleboard and other products, in bedding for animals, and in floor-sweeping compounds.

The bark from the cork oak tree provides cork for such products as bottle stoppers, bulletin boards, and insulation. The bark of the hemlock and other trees furnishes tannic acid used in processing animal hides. Bark is sometimes used as fuel, ground cover, or mulch.

Fruit and seeds harvested from forest trees include many kinds of nuts. The seedpods of the kapok, or silk-cotton, tree provide kapok fibers. Kapok is widely used

as filler in jackets and sleeping bags. Latex is a milky substance produced by plants and trees of the sapodilla family. Latex is the source of natural rubber, which is used to make balloons, hoses, tires, and other items.

The leaves of some forest trees furnish ornamental greenery for Christmas wreaths and similar products. Certain evergreen and eucalyptus leaves are distilled to produce oil used in perfumes, household cleaners, soaps, and certain drugs. Sap from certain kinds of maple trees is made into maple syrup and maple sugar.

The forest products industry

The manufacture of forest products is a major industry in many industrialized countries. The United States, China, and India are the world's leading producers of forest products.

In the United States, the forest products industry employs more than 1 1/2 million people and produces more than \$300 billion worth of goods annually. The industry has more than 50,000 manufacturing plants. United States forest products companies own about 70 million acres (28 million hectares) of commercially valuable forestland. They harvest timber in state and national forests under government contracts. They also buy logs from the owners of small wooded areas.

In China, economic reforms that began in 1980 have led to a greater demand for private housing. This demand has, in turn, brought a huge increase in the production of forest products for use as construction materials. In India, millions of people depend on gathering and selling forest products for cash.

Canada's forest products industry is a leading source of export income. More than 350,000 Canadians work for companies that make forest products. Each year, these firms produce goods worth more than \$50 billion in U.S. dollars. Canada is the world's leading producer of *newsprint*, the paper on which newspapers are printed. It produces more than a fourth of the world's total supply each year.

FURNITURE INDUSTRY

Furniture industry, all the companies and activities involved in the design, manufacture, distribution, and sale of functional and decorative objects of household equipment.

The modern manufacture of furniture, as distinct from its design, is a major mass-production industry in Europe, the U.S., and other advanced regions. It is very largely a 20th-century industry, its development having awaited the growth of a mass consumer market as well as the development of the mass-production technique. Earlier furniture making was a handicraft, going back to the most ancient civilizations.

History Examples of ancient furniture are extremely rare, but there is considerable knowledge of the pieces made by craftsmen in China, India, Egypt, Mesopotamia, Greece, and Rome from pictorial representations. Beds, tables, chairs, boxes, stools, chests, and other pieces were nearly always made of natural wood,

though veneering was known in Egypt, where it was used to produce coffin cases of great durability. The Romans too used veneers, though chiefly for decorative purposes. Bronze was also used in Roman tables, stools, and couch frames. Pompeian wall paintings show that plain, undecorated wooden tables and benches were standard in kitchens and workshops and that panelled cupboards were common. Chests for valuables were covered with plates or bound with iron.

The early Middle Ages were much poorer in household furnishings of every kind than the Roman world, but in the 14th and 15th century a growing affluence brought a major revival of furniture making, with many new types of cupboards, boxes with compartments, and various sorts of desks appearing. The religious houses in particular were well supplied with furniture. Framed panelling, reintroduced in the Burgundian Netherlands, quickly spread. The mortise and tenon and mitre provided greatly improved joints.

The growing sophistication in technique brought a revolutionary change in the men who made furniture. Where previously carpenters and joiners had made furniture along with every kind of building construction in wood, several circumstances combined to create a new profession: that of cabinetmaker. The most important technical factor was the introduction, or reintroduction, of veneering, first in western Europe, then in Britain, North America, and elsewhere.

In the earlier system of framework and panel, the framing gave the required strength in both length and width, the panel being a mere filling held in grooves. Its attractive appearance was the result of highlights and shadows produced by the framing, moldings, and carving, which formed the chief means of decoration. The grain of the wood was incidental.

The introduction of veneering coincided with the use of walnut as a furniture wood. It was soon realized that the grain of such a wood could be of decorative value, especially as veneering made it possible to use such visually attractive parts of the wood as burrs, butts, and curls, unreliable if used as solid wood. It became the custom to have the grain of the veneer generally run crosswise because of its decorative appearance. Marquetry (a form of inlay in veneer) was another example of the decorative use of the grain and colour of wood in surfaces unbroken by panelling.

In addition to veneering and the new system of construction it involved, an impetus to the establishment of the trade of furniture making came from the increasing market demand provided by the growing affluence of the 17th and 18th centuries. In the new system of construction, plain, flat parts are dovetailed together and then veneered. It can be contrasted with the traditional framed method of rails and stiles put together with mortise and tenon joints, the panels fitting in grooves.

Coinciding with this change, or preceding it by a few years, was another breakaway: that of the chairmaker, who had become another specialized craftsman. At first chairmaking was closely associated with wood turning but by the 18th century turned legs were largely replaced by shaped legs of the cabriole type. Chairmaking has remained a separate branch of furniture making ever since.

This growth of cabinetmaking as a trade of its own eventually resulted in a considerable degree of standardization of methods of construction, particularly in the types of joints used and in the thicknesses of wood for the various parts. It also resulted in an increased division of labour. Turnery became a separate trade, while the cabinetmaker assembled the turned parts; veneer and marquetry cutting was not done by the cabinetmaker although he laid both; carving too called for the skill and experience and tools of a craftsman who did nothing else. Another specialist, the upholsterer, did his work after the chairmaker had made the frame; and it seems likely that finishing was seldom done by the cabinetmaker. This was certainly the case later in the 19th century when French polishing became the standard method of finishing furniture.

An important 19th-century change was the separation within the industry of those who made furniture from those who sold it. Previously the customer commissioned a cabinetmaker, perhaps after consulting a design book by Chippendale, Hepplewhite, or Sheraton. Or he might work out his requirements in consultation with the cabinetmaker or, if he were sufficiently wealthy, employ an architect or designer. After the midyears of the 19th century the showroom gained popularity. A large store often retained its own workshops where special items were made to customers' requirements, but for the greater part it became the practice to buy wholesale from furniture making firms.

MODERN FURNITURE MANUFACTURING

Materials Modern methods of furniture construction are largely based on the availability of man-made materials such as reliable plywood, laminated board, chipboard, and hardboard as distinct from natural solid wood. It is not merely that manufacturers prefer the one to the other but rather that these substances are free from the great drawback fundamental to wood—movement. Natural wood shrinks as it dries or swells as it absorbs moisture from an atmosphere more humid than itself, and this movement must be allowed for in the method of construction. Unless this is done troubles may arise: splits along the grain or open joints on the one hand or jammed drawers or doors on the other. Over the years cabinetmakers have worked out ingenious systems to avoid these troubles in the use of solid wood, but today made-up materials may be regarded as inert if of good quality. To an extent solid wood has still to be used, notably for items that have to be turned, cut to shape, or molded, and for lippings to conceal the edges of manufactured boards; but virtually everything in the form of flat panels is made up.

NATURAL WOOD

The increase in the demand for reasonably priced furniture has placed a premium on the economical use of wood. Natural wood is extremely wasteful as a material. Hardly more than 25 percent of the natural substance of a tree actually goes into the furniture made of solid wood. When account is taken of the loss in sawdust in conversion from the tree trunk (taking off the outer slab portions and sapwood) and the further loss in bringing the lumber to usable size in the workshop (the offcuts, waste in

sawing shapes, in turning, in planing, cutting joints, and final cleaning up), it becomes evident that much more wood is wasted than used.

PLYWOOD

In making plywood, the veneers are peeled rotary fashion from the log by a long knife fitted to a lathe-like machine. The resulting veneer can be of unlimited width to be cut up as required. There is no loss in sawdust, and the peeling is continued until only a pole-like centre is left. Much the same applies to laminated board in which both the core material and the outer plies are peeled. In the case of chipboard the timber is merely regarded as raw material to be reduced to fine chips that are dried, compressed, and assembled into boards, with resin glue as an adhesive. Where a natural wood grain is desired, a veneer is flat sliced from a flitch (longitudinal section) selected for the beauty of its grain.

Certain materials, notably chipboard, must be machined, because trimming at the edges by hand almost always shows as a deterioration. It cannot be planed; the plane merely forms dust rather than taking shavings and, owing to the abrasive nature of the material, the edge of the cutter is quickly lost. Consequently, when a panel of a certain size is required, it needs to be machine sawed to size, no further trimming being needed. This is only practicable with a precision saw capable of fine adjustment. Furthermore it requires a saw blade having tungsten teeth to resist abrasion. The same applies to any plywood or laminated board assembled with resin glue.

Another influence on the construction of furniture is the introduction of new types of adhesives in place of the traditional animal glue. Many are highly water resistant, some waterproof. Some can be applied cold, avoiding the complication of heating joints before assembly. They can be cured by heat in a matter of minutes, leaving presses and other apparatus free for other work.

OTHER MATERIALS

Although wood has always been regarded as the traditional material for furniture making, several other materials are now used, either entirely replacing wood or combined with it. Plastic laminate, widely used for table and other tops, is obtainable in various colours and designs and in photographically reproduced natural wood grain. Its advantages are that it resists all liquid stains, is largely heat proof against burn marks, is mark free, and is easily wiped clean. It is laid as a form of veneer on any of the man-made materials—multiplied, laminated board, or chipboard, usually with a contact adhesive. As a plastic edging is needed that must be applied before the main top is put down, an essential machine tool is the portable router with veneer-trimming unit. It trims the overlapping edges of the main plastic panel without cutting into the edging.

Metal is also used to some extent, particularly for the stands and legs of furniture. Iron is generally preferred, the parts joined by welding.

Finishes too have been revolutionized. French polish, the traditional finish of the Victorian period, and indeed up to the 1930s, has been largely replaced by gloss or eggshell lacquers, which are sprayed on and are heat and water resistant and are so hard as to be practically mark free.

Storage and transport

Two technologies important to furniture making are storage and transport. The space taken up by furniture in relation to the actual material used in its construction is disproportionately large; when furniture is mass-produced an enormous amount of storage space is required. This applies equally to its transport, especially when it has to be shipped abroad. Consequently, a great deal of furniture is made of the “knockdown” type; that is, it can be taken to pieces and stacked flat. A wardrobe made in this way may occupy only a quarter of its assembled space when disassembled. Originally, parts were joined by screw fastenings, but a whole range of fittings has been devised to achieve the same result more easily and with more precision. Most such fittings require little more than recessing or the boring of holes, operations easily machined. Most work on cam, screw, or wedge action.

WOODWORKING MACHINERY

The decline of the direct link between customer and maker, due to the rapid development of retail trade, was largely made possible by the invention of several woodworking machines, mostly steam powered. Much handwork remained, however, and only large manufacturers could afford major machinery installation. In the early 20th century it was still possible for a cabinetmaker in Britain or Europe to earn a living, though in most cases he installed a basic machine such as a circular saw or worked in a district in which machine shops were available. Thus in Shoreditch, London, whole streets of houses were occupied by cabinetmakers, often several in one house, who made pieces that varied from the finest individual items to the cheapest, turned out in pairs or perhaps six at a time. These men had their machining done in the trade machine shops that abounded in the district. The shops produced nothing themselves but performed any machining that was brought to them: sawing, spindle molding, fretting, turning, planing, and so on. These practices continued up to the beginning of World War I and for a time afterward, although most of the large stores also had their workshops where they made not only individual items for customers but also furniture in quantity to pattern.

Modern commercial furniture production may be roughly divided into groups: general furniture—bookcases, wardrobes, tables, etc.; chairs and upholstered suites; and specialized items. Each of these may be further subdivided according to quality and type. In addition to this commercial furniture there are the specialized items made by a few hand craftsmen to special commission. Such goods are necessarily expensive, partly because they are individual pieces made singly to design and also because the best selected materials are used. Furthermore, hand methods are largely used that are costly because they are time-consuming. Even in this field, however, the machine has encroached to an extent. Thus a circular saw is invariably installed because its

advantages are so obvious. There is no merit in laboriously ripping boards to size when a machine will do the work as well or better.

Modern factory layout

Most modern factories are laid out on mass-production lines. The earlier factories often had a cabinet shop, which had its rows of benches for individual work; a cabinetmaker needing machining done carried his wood to the machinist. Today the timber is cut to usable sizes in a main conversion shop and brought to the required moisture content in a kilning section. In the kiln, air is forced through stripped stacks by fans that periodically change the direction of the air flow. In recent years radio-frequency heating has been widely used to dry both natural wood and plywood. The applied radio frequency produces molecular activity in wood and resins (such as those in plywood glue); part of the molecular energy is converted into heat that greatly reduces the time required to dry the wood thoroughly and evenly and to set the glue. The wood is placed in a press between two metal plates to which the power is applied; great thicknesses of wood can be dried evenly by this method.

From the drying section the wood proceeds to the planing and jointing shop, in which it is reduced to the required section and any tenoning, dowelling, or dovetailing carried out. There is also a veneer department, and in many respects this has become one of the most important departments. In it veneers are jointed in width where necessary, and a remarkable recent invention is a machine that sews veneers together with fine fibreglass, the stitching passing through half the thickness of the veneer only. It does this with amazing speed and accuracy. Where required, veneers are matched, giving a balanced appearance; and any small defects are repaired by placing a waste veneer beneath, cutting through both simultaneously, and interchanging the cutout pieces. Veneer pressing follows, and, although multiplate presses are still used to an extent, the tendency in large-production work is toward the progressive presser. At one end of this the resin glue is applied with a spreader, the veneers placed in position on the groundwork, and the whole passed in batches beneath the presser where it is heat cured in about a minute and ejected at the other end ready for further operations.

It is in the assembly shop that the line or conveyor-belt system begins. This is not usually in continuous movement but takes the form of a series of loose rollers over which the work can easily be pushed by one man. Special cramping jigs are set up so that, for example, a wardrobe can be glued up in one operation by power-driven rams. The jig ensures squareness, and the resin glue is cured in a matter of seconds by radio-frequency heating. In fact, by the time the operator has applied glue to the joints of one set of parts, the previous assembly has hardened and can be removed to the conveyor, leaving the jig free for another cramping operation.

From this point onward the work remains on the conveyor belt, passing to a sanding shop where joints are levelled and finally to the finishing shop where it is stained, spray polished, and fine sanded and waxed. Lastly there is a fitters' shop, where doors are hinged, handles put on, mirrors fitted, and so on.

Before passing to stock or to the packers' department every piece has to be passed by an examiner who chalks any defect or attaches a small, coloured label indicating that there is a fault in either the woodwork or the finish.

The production process

A basic preliminary in all furniture production is the provision of working drawings. In a firm of any size there is invariably a special department where full-size drawings are prepared from small-scale drawings provided by the designer. In some cases the designer may make his own full-size, detailed drawings; but in a large firm it is more usual for a draftsman to work out the practical details, though usually in consultation with the designer, who advises on proportions and decorative details. The hand craftsman, in contrast, usually does the whole thing himself. In the small-scale drawing the general form and essential requirements are worked out; the full-size drawing shows proportions and constructional details. A sample piece is made to check the design and cutting problems. Cutting lists are prepared; the cost of materials, fittings, finish, etc. figured; and an estimate of machining and assembly time worked out. When the work is to be produced in quantity, costs are lowered considerably because only one setting of the machine and only one set of cutters are needed for the whole run of any particular part.

Selection of timber, already passed through the seasoning kiln and converted to standard thicknesses, follows. The wood passes to the machine shop, where it is sawed to size, planed, molded, grooved, or rebated as required. When a number of parts must be cut exactly alike, they are clamped in forms having the proper contour and are then brought in contact with high-speed rotating knives that shape the part to proper size as the form rides against a guide on hand or automatic shapers and routers. Intricately carved pieces such as legs are roughly carved on multiple-spindle carving machines. These duplicate a master leg by means of a follower point that is guided along the surface of the model and imparts the same motions to as many as 32 high-speed rotating knives as they whittle the leg blanks. After the rough carving, the pieces are machine sanded and finished by a hand carver.

If veneering is required, this is now done. Jointing follows—tenoning, dowelling, dovetailing, etc. Automatic machines often combine several operations. Exposed parts are sanded on edge belt sanders, three-drum travelling-bed sanders, or belt sanders. Rounded parts are sanded on soft pneumatic drums, and carved parts are sanded on a buffer, a machine in which shredded sandpaper is supported by brushes on a revolving wheel.

Finally, the work passes to the assembly shop where door frames are put together, drawers glued up, and carcasses assembled. After the glue has set, the parts may be returned to the machine department for machining that could not be performed before assembly, such as sanding the joints and shaping the edges. Then it returns to the assembly department for final assembly. Air-driven clamps are used when the design permits; otherwise the piece is pressed by hand clamps. Unless electronically cured glues are used, clamps must be applied long enough to ensure a good bond. The

completed article is cleaned to remove excess glue, inspected, and hand sanded. Finally, staining and spray polishing is done and fittings added.

In individually crafted work there is always a great deal of fitting to be done - doors trimmed and drawers made to run easily without slackness. In mass-production work this problem would be serious. It is almost entirely avoided by making drawers an easy rather than snug fit and by sanding the edges of doors to templet size so that they automatically fit the carcasses, which in their turn are made to standard size.

The art of chairmaking

Chairmaking has been a separate branch of furniture making since the mid-17th century. One of the most intricate branches of woodwork, it involves odd angles, compound shapes, and awkward joints and at the same time calls for maximum strength, chairs being subjected to more strain than most other furniture. There are three main types of chairs: the Windsor chair, made largely from turned parts, with solid wood seat; the framed type of dining chair with either loose or stuff-over seat; and the upholstered chair.

In Britain, the Windsor chair belongs traditionally to the High Wycombe District of Buckinghamshire where beech trees abound. Until relatively recent times men worked in huts in the beech woods making turned parts for chairs. They felled the trees, cut the trunks and larger branches into suitable lengths, and split them into pieces of a section large enough to permit chair legs and uprights to be turned and also to provide lighter members for rails, etc. They turned the parts on a primitive pole lathe in which a cord was attached to a treadle, taken around the wood to be turned and up to a springy sapling anchored at the lower end to pegs outside the hut. The power was supplied by treadle, the cord revolving the wood; then as the foot was raised the spring of the sapling lifted the treadle and at the same time turned the work backward. The turning gouge or chisel could be used on the downward stroke of the foot only, but the economy of effort was amazing. A complete leg could be rounded, the curves and beads formed, and the ends brought to the required diameter in a matter of seconds. Of course, working in green timber enabled the turning to be done much more easily and quickly than if the wood were dry.

These bodgers, as they were called, made only the turned parts and delivered them to chairmaking firms for assembling. They had no overhead expenses, no power costs, and the only lighting they needed in winter was an oil lamp or candles. They were long able to compete with powered workshops.

The manufacture of the Windsor chair of Victorian and Edwardian times was a specialized trade. The seat, invariably of elm, was hollowed out (bottomed) with a form of adze, and the holes for the legs were bored with a brace fitted with a spoon bit held at the required angle solely by judgment. The better chairs had a hooped back of yew. Today this hand work has been replaced by boring machines that are fitted with a jig to maintain the correct angle. The hollowing of the seat is machined to an extent, but the depth is only slight, compared with the early hand work. Furthermore, traditional timbers—elm, beech, and yew—are frequently replaced by imported timbers.

The quality of framed chairs of the dining type varies widely, but perhaps the outstanding general feature of modern dining chairs is the wide use of dowelled joints rather than mortise and tenon. In the late 19th century this had already occurred to a large extent, the chairmaker's kit of tools invariably including a dowel plate with a series of holes through which the craftsman hammered roughly squared pegs to form the dowels. Today machine-made dowels are universal, with a glue-escape slot cut in. Dowelling is a far quicker and consequently cheaper process than mortising and tenoning, especially in shaped work where the curved part frequently must be joined at odd angles.

When a chair has compound curvature it becomes difficult and expensive to make. A chair back may be shaped in both front and side elevation (and often in plan as well). Taste and experience are indispensable in providing a continuous curve that will be aesthetically satisfying from every angle. Over the years, experience has been built up, especially on traditional models following period lines; a chairmaker's workshop invariably carries bundles of templets in plywood for the various parts of chairs, with the fullness provided (where necessary) for a good line.

Dining chairs may be made in sets of half-dozens or dozens, or more cheaply in batches of 50 or 100, depending upon the capacity of the factory. In some cases parts are standardized and interchangeable in different designs of chairs.

The upholstering of dining chairs is a separate trade, though carried out in the same factory, and may be of the loose seat, stuff-over, or plywood-covered type. Traditional stuffing materials such as horsehair have largely been replaced by foam rubber and synthetics.

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<http://www.britannica.com/topic/furniture-industry>

VOCABULARY

A	
abundance n	достаток
account for	пояснювати
achene n	сім'янка
acknowledgement n	визнання, підтвердження
acorn n	жолудь
activity n	діяльність
adequate a	достатній, адекватний
advanced p.p.	передовий
aerial stem	надземний стовбур
affected p.p.	пошкоджений (хворобою)
alder n	вільха
alive a	живий
almond n	мигдаль
alter v	змінювати(ся)
alternate leaves	почергове листя
alternate v	чергуватися
altitude n	висота
anchor n	якір
Angel n	ангел
angiosperms n (pl)	покритонасінні
animal husbandry	тваринництво
apex n	верхівка
appear v	з'являтися
application n	застосування, вживання
arboretum n	розсадник дерев
aril n	оболонка
arranged p.p.	розташований
article n	предмет, річ
ash n	ясен, попіл
asparagus n	спаржа
aspen n	осика
assess v	оцінювати
assimilation n	засвоєння, асиміляція
at least	принаймні, щонайменше
attack v	уражати (хворобою), піддаватися нападу
attempt n	спроба, намагання
attempt v	намагатися, старатися, робити спробу
average a	середній
award v	присуджувати
axil n	пазуха

axis n	головне стебло, центральна вісь рослин
В	
bachelor n	бакалавр
bald cypress	туя, кипарис болотний
balsa n	бальза, пробкове дерево
bare a	голий
bark n	кора
barking drum	барабан для обдирання кори
barking n	знімання кори
barley n	ячмінь
barrel staves n	дошки для діжок
base n	база
basswood n	липа американська
be concerned with	мати справу з, займатися
be engaged in	займатися
beech n	бук
bee-keeping n	бджільництво
besides adv	крім
Bible n	Біблія
bind v	зв'язувати
black iron n	залізне дерево, кругіодендрон залізний
blaze n	полум'я, спалах, виблиск
bleach v	відбілювати
blue-stain n	синява, синь (фаут деревини)
blunt n	тупий, округлий
bog n	болото
bother v	турбувати(ся), непокоїтися, хвилюватися
branch n	гілка, галузь
branchlet n	гілочка, невеликий пагін
breed n	порода
breeze n	легкий вітерець
bright a	яскравий, світлий
brittle a	крихкий, ламкий
broadleaved a	листяний
bucking n	розкряжування (дерев)
buckwheat n	гречка
bud n	брунька
bunching n	зв'язування в пачки
bundle n	пучок, вузол
butt rot n	комлева гниль
С	
cabbage n	капуста
cable n	трос, канат, кабель
cable skidder n	тросова механічна лебідка

cable-crane n	кабель-кран
calcareous a	вапнистий (грунт)
calorific a	тепловий
cambium n	камбій
campus n	університетське містечко
canker n	червоточина
canoe n	каное, байдарка
canopy n	полог крони
capable a	здібний, умілий, вправний
capsule n	бот. насіннева коробочка
careless a	недбалий
carp n	короп
carrot n	морква
carry out v	виконувати
carve v	вирізати (з дерева)
catkin n	сережка (форма суцвіття)
cattle breeding	скотарство
cattle n	велика рогата худоба
cauliflower n	цвітна капуста
cause v	спричиняти
cereals n, pl	злаки
charcoal n	деревне вугілля
chip n	тріска, стружка
chipping	різання тріски
choir n	хор
Christ	Христос
Christianity n	християнство
Christmas n	Різдво
climb v	витися (про рослини)
clog n	засмічення, перешкода, черевик (на дерев'яній підшві)
clog v	перешкоджати, засмічувати
cluster n	китиця (суцвіття) скупчення
columnar a	колоноподібний
combustion n	горіння
compaction n	ущільнення
compliment v	доповнювати
compound n	суміш, сполука
comprise v	включати, охоплювати, вміщувати
concerned with (be)	мати справу з, займатися
cone n	шишка
cone-bearers n (pl)	дерева-шишконосні
conformance to the requirement	відповідність вимогам
confuse v	переплутувати

coniferous a	хвойний
conifers n, pl	хвойні
consecutive a	послідовний
consist of v	складатись з
conspicuous a	помітний
constituent n	складова частина
constitute v	утворювати, складати
constitute v	утворювати, складати
contain v	містити в собі
contribution n	внесок
conventional adj	звичайний, традиційний
convert v	переробляти, перетворювати
convey v	проводити
corresponding a	відповідний, подібний
cotton-wood n	тополя канадська
cover n	покриття
crab apple n	дика яблуня, кислиця
crack v	тріскатися, розколюватися
crane n	підйомний кран, домкрат
crate n	каркасний ящик
create v	створювати
creep v	повзти, стелитися
creeper n	повзуча рослина
crew n	бригада, команда
crop growing	рослинництво
cross section	поперечний зріз
crown n	крона
cucumber n	огірок
cure n	ліки, курс лікування
curriculum n	курс навчання, навчальний план
D	
date n	фінік, фінікова пальма
deal n	дільс (дошка L=12 фунтів)
decade n	десятиріччя
decay n; v	гниття, розкладання; гнити, розкладатися
deciduous a	листяний, листопадний
decline n	погіршення, нахил
define v	визначати
degree n	ступінь
density n	щільність
department n	відділення (кафедра)
descent n	спуск, зниження
descriptive geometry	нарисна геометрія
destined p.p.	визначати, призначати

deteriorate v	погіршувати(ся), псувати(ся)
dicotyledonous a	двосім'ядольні рослини
dietary a	дієтичний
diffuse porous	розсіяно-пористий
dig v	копати
digest v	засвоювати
discourage v	бентежити, відбивати бажання
disparity n	невідповідність, нерівність
disperse v	розганяти, розповсюджувати, розсіювати
dissimilarity n	несхожість, відмінність
dissolved p.p.	розчинені
distinct adj	чіткий, виразний, відмінний
distinguish v	відрізняти, розрізняти
disturbance (of soil) n	порушення (структури ґрунту)
diverge v	розходитися
diverse a	різний, різноманітний, відмінний
divide v	поділяти
doctoral candidate	докторант (амер.)
drain n	водостік
drain v	дренажувати, осушувати (ґрунт)
drawing n	графіка
droop v	в'янути
drooping a	похилий, схилений
dull a	тьмяний
durable a	довговічний, стійкий, тривалого користування, міцний, стійкий, тривкий
dwarf n	карлик
dye n	фарба
dyestuff n	барвник
Е	
edge n	край
edible a	їстівний
educational establishment	навчальний заклад
elder n	бузина
emerge v	з'являтися, виникати
energy-saving	енергозбереження
engaged in (be)	займатися
enhance v	підвищувати (ціну, якість)
erode v	роз'їдати, руйнувати; вивітрювати, розмивати
establish v	засновувати, встановлювати
even adv	навіть
eventually adv.	в кінці кінців, з часом
exceed v	перевищувати
Excelsior n	деревна стружка для упакування

exhibit v	виставляти напоказ
expansion	збільшення, розширення
expend v	витрачати, затрачувати
explore v	вивчати, досліджувати
extensive a	розлогий
external doctorate student	здобувач, пошукач
extraction n	видобуток
F	
faculty n	факультет
fairly adv	достатньо
faller n	лісоруб, звальщик
farm mechanization	механізація сільського господарства
fatten v	відгодовувати
fault n	вада, хиба
fell v	зрубувати, валити
felling n	рубка (лісу)
felt n	фетр, повсть
fibrous a	волокнистий
filling n	навантаження, насип
fir n	ялиця
fire-resistant a	вогнестійкий
firewood n	дрова, паливо, пальне
fish farming n	рибництво
flat a	плаский, рівний
flaw n	недолік, вада
flax n	льон
fleshy a	м'ясистий
flooding n	повінь, повідь
floodplains n (pl)	заливні луки
floor-board n	дошка для підлоги
flooring n	настил, підлога
floriculture n	квітникарство
fodder plants	кормові культури
for cj	оскільки, тому що
forage plants	кормові культури
forest estimation (forest mensuration)	лісова таксація
forestry n	лісогосподарський
forward v	відправляти, переміщати
fossil n	окам'янілість
foul adj	кепський, смердючий, смердючий
found v	засновувати
foundation n	заснування, організація
fragrant a	духмяний, запашний, ароматний

front-end loader	ковшовий навантажувач
fruits n,	плоди
fulfil v	виконувати
fungi (pl) n (fungus)	гриби
fungus n (Pl fungi)	грибок, плісень
fur n	хутро
furnish v	постачати, давати, доставляти
furrow v	борознити, зморщувати
further a	подальший
G	
garlic n	часник
genus n (genera – pl)	рід
germinate v	проростати
glossy a	глянсуватий
gluing techniques	технологія склеювання
goddess n	богиня
graceful a	граційний, граціозний
graduate (from) v	закінчувати вищий навчальний заклад
grain crops	зернові культури
gravity n	тяжіння, сила ваги
grind v	перемелювати
grinding stone	точильний камінь
grove n	гай
grow v	рости, вирощувати
growth n	ріст
gymnosperms n (pl)	голонасінні
H	
habit n	властивість, особливість; стан (рослини)
habitat n	місце проживання, місце розповсюдження, ареал
hairy a	волохатий, ворсистий
halt v	зупиняти
handle n	ручка, держак
handling n	навантажувально-розвантажувальні операції
hang v	висіти
hang v (hung, hung)	вішати, підвішувати
hardness n	твердість, міцність
hardy a	морозостійкий, зимостійкий
haul v	перевозити, транспортувати, буксирувати, тягти
heartwood n	ядро дерева
hedge n	огорожа, живопліт
held p. p. від hold	тримати, держати, вміщувати
hemlock n	тсуга канадська

hence adv	отже
herbaceous plants	трав'янисті рослини
hoary n	вкритий інієм, сивий
holly n	бот. падуб
horticulture n	садівництво
host n	господар
hue n	відтінок
husk n	шкаралупа, лущиння
I	
impact n	поштовх, удар, імпульс
impermeable a	водонепроникний
implementation n	виконання, здійснення
impregnation n	насичування
include v	включати
incorporate v	об'єднувати, включати
increment n	приріст
indigenous adj	місцевий, аборигенний
industrial crops	технічні культури
inexhaustible a	невичерпний
injure v; n	пошкодити; пошкодження
injury n	пошкодження
inscribe v	надписувати, писати, креслити (на дереві)
inside	усередині, усередину
instruction n	навчання
insulating a	ізоляційний
intermediate a	проміжний, середній
introduction n	запровадження
irrespective of	незалежно від
J	
Jack pine	сосна Банкса
jay n	сойка
jet n	струмінь
join v	приєднувати(ся), об'єднувати(ся)
joinery n	столярне ремесло; столярні вироби
joint a	сумісний, спільний, об'єднаний
junior	молодший
juniper n	ялівець
K	
keep doing smth	весь час (безперервно) щось робити
keep v	тримати, зберігати
kind n	вид, рід, різновид, сорт
knock n	стук
L	
lain p.p. (to lie)	лежати

land management	землевпорядкування
landscape architecture	ландшафтна архітектура
landscaping	ландшафтна архітектура
lateral (leaves)	бічні (листя)
lawn n	газон
layer n	шар, пласт
layout v	планувати, розбивати (сад, ділянку)
lbs per cu ft	фунтів на кубічний фут
leading a	провідний
leaf (leaves)	листок (листя)
leaf-blade n	листова пластина
lean n	схил
leather n	шкіра
leathery a	шкірястий
length n	довжина
level n	рівень
lignin n	лігнін
lignum Vitae	залізне дерево
limbing n	обрубання гілок
line n	лінія, канат, трос
linear a	подібний до лінії – вузький і довгий
liven v	збадьорити, додати жвавості, пожвавити(ся)
livestock breeding	тваринництво
load n; v	вантаж, навантажувати
lodge v	вилягати
log n	колода
logging n	лісозаготівлі
lumber n	будівельний матеріал, будівельний ліс, колоди; амер. пиломатеріали
М	
madrone n	суничне дерево
magnificent a	пишний, розкішний
mahogany n	червоне дерево
maize n	кукурудза
manually adv.	вручну, ручним способом
manufacture n, v	виробництво, виробляти
marsh n	болото
marsh n	болото
mast n	насіння лісових дерев, придатних для відгодівлі
master n	магістр
mature v	дозрівати, цілком розвинутися
meadows n (pl)	луки
meagre a	недостатній, бідний, мізерний

means n, pl	засоби, заходи
Meant -p.p. від mean v	означати
melon-growing n	баштанництво
mensuration n	таксація
millet n	просо
mineral nutrients	мінеральні поживні речовини
mink n	норка
misshapen a	деформований
mite n	кліщ
moisture meter n	вологомір
monocable a	однотросовий, одноканатний (кабельний)
monocotyledonous	односім'ядольні рослини
moonseed n	канадський плющ
mould n	перегній, пліснява
movable a	рухомий, переносний
N	
nail v	теслярувати, прибивати цвяхами
naked p.p.	голий, відкритий, без покриву
narrow a	вузький
naval stores	продукти перегонки живиці і смоли; каніфольно-скипидарні продукти
needed p.p.	потрібні
nematode n	нематода
nitrogen n	азот
nodule n	вузлик, наріст
nomenclature n	термінологія
nominal a	номінальний, загальний, умовний, символічний
noteworthy a	заслужуючий на увагу
nowadays adv	тепер, в наші дні
nucleus n	ядро
nuisance n	перешкода, неприємність, незручність
number n	число, кількість
nursery n	розсадник
nuthatch n	поповзень
nutria n	нутрія
nutrients n, pl	поживні речовини
O	
oats	овес
objective n	мета
oblong a	довгастий
obtain	отримувати
occur v	траплятися, зустрічатися, попадатися
odour n	запах

offer v	пропонувати
olericulture n	виращування овочів та зелені
onion n	цибуля
onset n	натиск, напад, початок
opencast a	що добувається відкритим способом
opposite a	супротивний
orchard n	сад
origin n	походження
ornamental a	декоративний
ornamental horticulture	декоративне садівництво
otter n	видра
outer adj	зовнішній
Outline n	обрис, контур
ovary n	зав'язь
oven n	сушильна піч
overcrowd v	переповнювати, товпитися, скупчуватися
overemphasize v	надавати особливо великого значення, підкреслювати
ovoid a	яйцеподібний
ovule n	сім'ядоля, насіння
Р	
pallet n	піддон, транспортний стелаж
panel n	обшивати панелями
partial a	частковий
pattern n	зразок, модель, шаблон
pavement n	панель, тротуар
peat n	торф
pecan n	горіх пекан
pedigree and dairy cattle	племінна та молочна худоба
peel v	чистити, дерти, обдирати
perform v	виконувати
persist v	продовжувати існувати, зберігатися
petiole n	бот. черешок листка
pheasant n	фазан
pig raising	свинарство
pile n	паля
piling n	складання в штабелі
pine moth n	шовкопряд
pine n	сосна
pioneer n	піонер, перший поселенець
pistillate a	бот. маточкова (про квітку); бот. маточний; жіночий
pitch n	дьоготь, смола, терпентин
pith n	серцевина

plant cultivation	рослинництво
plant food	поживні речовини рослини
pod n	біб (акації)
point n; at any point	пункт, в будь-якому місці
pole n	стовп, жердина, щогла
polish v	полірувати, шліфувати
pollen n	пилкок
pollinate v	опилювати
pomology n	помологія (наука про плодівництво)
post n	стовп
post-graduate student	аспірант
poultry industry	птахівництво
pound n	фунт
power engineering	енергетика
power saw	бензопила
power tool	моторний інструмент
praise n	похвала
prematurely adv	передчасно
preservative n	консервант
prickly a	колючий
process v	переробляти, обробляти
promote v	сприяти, допомагати
promptly adv	відразу, швидко, точно
prop n	підпора
provide v	забезпечувати
provide v	забезпечувати
prune v	підрізати (гілки), обрізати прибирати зайве
public official	посадова особа
pulpwood n	балансова деревина
purely adv	чисто, тільки
purpose n	мета
Q	
quail n	перепел
quarry n	кар'єр, каменоломня
quiver v	тремтіти, дрижати, тріпотіти
quote v	розцінювати, посилатися, цитувати
R	
railway sleeper n	шпала, поперечина
raise v	розводити, вирощувати
range v	коливатися у певних межах
rate n	швидкість, темп
ratio n	відношення, пропорція
raw materials	сировина
receive v	одержувати

recognition n	визнання
reddish a	червонуватий
remain v	залишатися
remnant n	залишок
reproductive organs	органи розмноження
require v	вимагати
reserve n	резервація, заповідник
resin duct	смоляний прохід, канал
resin n	смола, каніфоль, камідь
resistant adj	стійкий
resonant a	дзвінкий, резонансний, лункий
respiration n	дихання
rice n	рис
rigid a	твердий, жорсткий, негнучкий
ring-porous	кільце-пористий
ripen v	достигати, стигнути, дозрівати
rival v	суперничати, змагатися
roadside n	узбіччя дороги
rock garden n	альпійський сад
room n	перен. можливість
root n	корінь
rot v	гнити
rotate v	обертатися
rotting n	гниття
rough a	грубий, шершавий
rough a	необроблений
roughly adv	приблизно
row n	ряд
rub off v	стиратися
rye n	жито
S	
sap n	живиця, сік
sapwood n	заболонь
sash n	віконна рама
sash-door n	скляні двері
scale n	лусочка
scaly a	лускатий, пошарпаний, шаруватий
scar n	рубець
scatter v	розкидати, розсіювати
scholar n	вчений
scholarship n	вченість, ерудиція
screening n	сортування
screw v	викривляти, крутити, викручувати
season v	витримувати, сушити (деревину)

seed-bearing	насіннєносний
seed-bearing a	насіннєвий
seedling n	сіянець, саджанець
seek (sought p.p.)	шукати
segment n	частина, частка
separate units	відокремлені підрозділи
serve v	служити
shallow a	мілкий, поверхневий
sharp a	гострий, різкий
sheath n	оболонка, листкова пазуха
sheep farming n	вівчарство
sheet n	полотно
ship v	завантажувати, відправляти
shiver n	тремтіти, дрижати
shoot n	пагін, паросток
shortcoming n	недостача, вада, недолік
shot-hole beetle n	короїд, червиця
showy a	яскравий
shrub n	кущ, чагарник
signify v	означати
silky a	шовковистий, м'який
silver fox n	чорно-бура лисиця
silvics n	лісознавство
silviculture n	лісівництво
single a	єдиний, один, окремих
skid v	гальмувати, ковзати
skidder n	скіддер (транспортний засіб, що використовується при заготівлі лісу)
skillfully adv	уміло, вправно
sleepers n	залізнична шпала
slender a	тонкий, стрункий, слабкий, гнучкий
slight a	легкий, слабкий (вітер)
slope n	схил, нахил
smooth a	гладенький, рівний
soda process	натронний спосіб
soggy a	вологий, мокрий
soil fertility recovery	відновлення родючості ґрунту
solid a	суцільний, твердий, міцний, масивний
solution n	розчин
span n	короткий проміжок часу
sparse a	рідкий, розкиданий
species n	вид, види
specific gravity	питома вага
specific heat	питома теплоємність

spider n	павук
split v	розколювати
spool n	катушка, коток
spread v	поширювати(ся)
sprout n	паросток, пагін
spruce n	ялина
spur n	паросток, укорочений пагін
stalk n	стебло
staminate a	наділений тільки тичинками
staple n	основний продукт
state n	стан
statement n	заява, твердження, тип офіційного документа
steadily adv	постійно
steady a	постійний, сталий
store n	складати, зберігати
stretch v	розтягуватися
strip n	смужка
strip v	обдирати
strong a	твердий, міцний,
stump n	пеньок, обрубок
substantial a	обґрунтований, основний
subtend v	стягувати
sucker n	бот. паросток, бічний пагін
sugar-beet n	цукровий буряк
sulphite process	сульфітний процес
sunflower n	соняшник
supplemental a	додатковий
susceptible a	сприйнятливий, схильний до захворювань
sustained yield forest management	система безперервного відновлення лісу
sycamore a	сикомор, платан, явір
Т	
tablet n	дощечка (з надписом)
take up v	вбирати
tan v	дубити, вичинювати шкіру
tannin n	танін, дубильна речовина
tap v	робити надріз
taper v	звужувати, загостряти, звужуватися на кінці
tart a	кислий, терпкий
taxonomy n	систематика, класифікація
tear n	сльоза
temporary a	тимчасовий
terminal (leaves)	верхівкові
terminus n	кінцева станція, кінцевий пункт

texture n	текстура, структура
therefore adv	тому, отже
thoughtful a	вдумливий, уважний
thus adv	таким чином, отже
tie n	шпала
tiny a	крихітний
tolerate v	терпіти, переносити
toothpick n	зубочистка
topping n	обрізування верхівок
tough a	міцний, твердий, жорсткий
trailer n	тягач з причепом, трейлер
transform v	перетворювати
transpiration n	випаровування
treat v	обробляти, просочувати
treatment n	обробка
trembling a	тремтячий, тріпотливий
trim v	підрізати
trout n	форель
truck n	вантажний автомобіль
trunk n	стовбур
tube n	трубка, тут судина
tufted p.p. від tuft	пучкуватий, пупкоподібний
tumble v	падати, тут бити
turkey n	індик
turpentine n	скипидар
twig n	пагін, гілочка
type n	полігр. набір, шрифт
U	
undercut n	підрубка
underneath adv	під, знизу, нижче
uneven a	нерівний
uniformity n	однорідність
uniformly adv	рівномірно
unit n	підрозділ, частина, одиниця
unite v	об'єднувати
unite v	об'єднувати
unpredictable a	непередбачений
uphill adv	вгору, що йде вгору
upright adv	вертикально, сторчма
V	
variety n	сорт, вид, різновид
variously adv	по-різному, різним чином
varnish n	лак
vascular a	судинний

vascular bundle	судинно-волокнистий пучок
vegetation n	рослинність
vein n	жилка, прожилка
vine n	повзуча рослина, в'юнка або така, що стелиться рослина
volatile a	летючий, леткий, випарний
W	
wart n	бородавка
washing n	промивання
wavy a	хвилястий
wealth n	багатство
wedge n	клин, гребінь, трикутна призма
wedge-shaped	клиноподібний
wheat n	пшениця
whitish a	білуватий, білястий
whorled a	кільчастий
widely adv	широко
wild boar n	дикий кабан
wilt v	в'янути
winch n	лебідка
windbreak n	захисна смуга
wind-firm a	вітростійкий
wing n	крило
woke -p.p. від wake v	прокидатися
wood n	деревина
woodcarving n	різьба по дереву
woodturning n	токарна деревообробка
woody plant n	деревна рослина
worship v	поклонятися
wrap v	загортати, закутувати
wreck v	руйнувати, провалити(ся), пропасти

Appendix One

Elements of Conversation

Greetings. Possible Answers to Greetings (Привітання. Можливі відповіді на привітання)

How do you do? (a formal greeting)	Доброго дня! (офіційне привітання)
Hello! Hi!	Привіт!
Good morning! (up till 12 o'clock)	Доброго ранку!
Good afternoon! (after 12 o'clock)	Добрий день!
Good evening!	Добрий вечір!
Good night!	На добраніч!
Very glad to see you!	Дуже радий тебе бачити!
I haven't seen you for ages.	Я не бачив тебе цілу вічність.
What a lucky chance to meet you!	Яка щаслива зустріч!
What luck running into you!	Як добре, що зустрів тебе!
How are you?	Як ти (як почувашся)?
Fine (very well), thank you.	Дуже добре, дякую.
How are all at home? / How's all the family?	Як ваші домашні?
Thank you, all are well.	Дякую, всі здорові.
Glad to hear it!	Радий це чути!
Thanks, not bad (could be better), (could be worse).	Спасибі, не погано (буває і краще), (могло б бути і гірше).
Couldn't be worse.	Гірше не буває.
Sorry to hear it!	Співчуваю! / Прикро це чути.
How's your life?	Як життя?
What's the news?	Які новини?
No news is good news.	Немає новин - гарні новини.
Bad news has wings.	Погані новини на крилах летять.
How's your health?	Як здоров'я?
Thank you, not so well.	Дякую, не дуже добре.
I'm unwell.	Я нездужаю.
I'm quite well, thank you.	Досить добре, дякую.
I am all right, thank you.	Дуже добре, / все в порядку, дякую.
Bright. Great.	Блискуче. Відмінно.

Sending Compliments (Передати вітання)

Remember me to your father.	Передайте привіт від мене вашому батькові.
(Give) my best regards to your mother.	(Передайте) мої найкращі побажання вашій матері.
With pleasure.	Із задоволенням.
My compliments to your brother.	Привіт братові.
(Give) my love to your sister.	(Передай) привіт своїй сестрі.

I will, by all means.

Обов'язково передам.

Saying Good-Bye (Прощання)

Good-Bye!

До побачення!

Good luck!

Щастя!

Bye-bye (So long)!

Пока!

See you later

Побачимось пізніше

See you soon

Скоро побачимось.

See you tomorrow.

Побачимось завтра.

Till tomorrow.

До завтра.

See you on Sunday.

Побачимось в неділю

Have a nice day!

Бажаю добре провести день!

Acquaintance (Знайомство)

Let me introduce you to my friend.

Дозвольте мені познайомити тебе з моїм другом.

Let me introduce myself.

Дозвольте відрекомендуватися.

My name is M.

Мене звать М.

Permit me to introduce my friend to you.

Дозвольте мені відрекомендувати вам мого друга.

Meet Mr. Brown.

Познайомся з паном Брауном.

Nice to meet you.

Приємно познайомитись.

(I'm) (very) pleased to meet you.

Я (дуже) радий познайомитися з вами.

So am I.

Я також.

I am happy to make your acquaintance.

Я радий познайомитися з вами.

I am delighted (charmed) to have made your acquaintance.

Я радий (я у захваті), що познайомився з вами.

I have so often heard about you from my friend M.

Я так часто чув про вас від свого друга М.

What's your name?

Як тебе звати?

What's his nickname?

Яке у нього прізвисько?

My name is... / I am...

Мене звати...

My friends call me...

Друзі називають мене...

You can call me...

Можеш називати мене...

How do you spell your name?

Як пишеться ваше ім'я?

Haven't we met (before)?

Хіба ми вже не зустрічалися (раніше)?

I'm going to call you Bill for short.

Для стислості я буду звати вас Білл.

I think we've already met.

Думаю, ми вже зустрічалися.

I don't think we've met (before).

Я так думаю, що ви не знаєте один одного, вірно?

Gratitude/(Thanks) (Вдячність)

Thank you very much. / Thank you so much. / Thanks a lot.

Велике спасибі.

Thank you very much indeed. (Формальна форма.)	Дуже вдячний.
I am (very) grateful (to you).	Я (дуже) вдячний (тобі).
It's very kind of you.	Дуже люб'язно з твого боку.
I have no words to express my (deep) gratitude.	Не нахожжу слів, щоб виразити свою (глибоку) вдячність.
No thanks needed.	Не варто подяки.
Don't mention it.	Не варто подяки.
That's nothing.	Це дрібниці.

Apology. Possible Answers. (Вибачення. Можливі відповіді)

(I'm) so sorry.	Мені так шкода.
(I'm really) awfully sorry.	(Я дійсно) дуже шкодую.
Sorry to trouble you.	Вибачте, що турбую вас.
I shall not trouble you any longer.	Не смію вас більше турбувати.
I beg your pardon. (Pardon me).	Прошу вибачення.
Ten thousand pardons.	Тисяча вибачень.
I hope you will excuse/forgive me.	Сподіваюсь, ви мені пробачите.
I hope you don't mind.	Сподіваюсь, ви не заперечуєте.
I must apologize.	Я повинен вибачитися.
Excuse my changing the subject.	Вибачте, що поміняю тему розмови.
It's all right (O.K.).	Нічого. Все в порядку
(It) doesn't matter. (Never mind).	Нічого. (
It's not worth speaking.	Не варто говорити.

Agreement. Disagreement. (Згода. Незгода)

There are many reasons for...	Є багато причин (підстав)...
There is no doubt about it that...	Немає сумнівів у тому, що...
I am of the same opinion.	Я тієї ж думки.
I completely / absolutely agree with the author.	Я повністю згоден з автором.
That's for sure.	Це точно. / Це напевно.
That's exactly how I feel.	Саме так я і думаю.
No doubt about it.	Поза сумнівом. / Без сумніву. / Жодних сумнівів.
I suppose so. / I guess so.	Так, напевно. / Мабуть, так. / Скоріше всього.
I was just going to say that. / I was just coming to that. / I was just getting there.	Я як раз збирався сказати.
It is only partly true that...	Те, що ... вірно лише частково.
It is not as simple as it seems.	Це не так просто, як здається.
The problem is that...	Проблема в тому, що...
I (very much) doubt whether...	Я (сильно) сумніваюся...
I am of a different opinion because...	Я іншої думки тому, що...
I cannot share this / that / the view.	Я не поділяю цієї думки.

I'm afraid I disagree.
I'd say the exact opposite.
The way I see it... / From my point of view...
It seems to me that...
I might be wrong but...
If I am not mistaken...
What are your thoughts on all of this?

На жаль, я не згоден.
Я б сказав, зовсім навпаки.
З моєї точки зору... / По-моєму... / Я вважаю..
Мені здається, що...
Може бути, я помиляюся, але...
Якщо я не помиляюся...
Що ти думаєш з приводу всього цього?

Asking the way (Як запитати дорогу)

Excuse me. Could you tell me the way to ..?	Вибачте. Чи не могли б ви підказати мені шлях ... до?
I'm a foreigner and don't know the city. I've lost my way. Could you give me some information?	Я іноземець і не знаю місто. Я заблукав. Чи не могли б ви надати мені деяку інформацію?
Please tell me the name of this street (square).	Скажіть, будь ласка, назву цієї вулиці (площі).
Where's the nearest bus (tram) stop?	Де найближча зупинка автобуса (трамвая)?
How do I get to the centre of the city?	Як дістатися до центру міста?
What bus must I take to reach the museum of ... ?	На який автобус я повинен сісти, щоб дістатися до музею ...?
Get on the 20 th at the stop in ... street.	Сідайте на 20-й на зупинці на ... вулиці.
Where do I change trolley-bus 16 for 12?	Де мені пересісти з 16-го тролейбуса на 12?
Where does the bus go?	Куди їде автобус?
Am I OK for the Opers House?	Чи правильно я йду до оперного театру?
How much is the fare, please?	Скільки коштує проїзд?
Please tell me where to get off?	Скажіть мені де вийти, будь ласка.
It's two stops after this one.	Через дві зупинки після цієї.
It's a stop after next.	Через одну зупинку.
What's the next stop?	Яка наступна зупинка?
How long will it take it to get there?	Скільки потрібно часу, щоб туди дібратися?
It'll take you 10 minutes to get there.	У вас займе 10 хвилин, щоб дістатися туди.
It's not very far from here.	Це не дуже далеко звідси.
It's quite a distance.	Це досить далеко.
I'd say about 3 blocks.	По-моєму, близько 3 кварталів.
Go straight ahead.	Ідіть прямо.
Turn to the right (left).	Поверніть на право (на ліво).
First (second) street to the right.	Перша (друга) вулиця праворуч.
Is it on this side of the street?	Це на цьому боці вулиці?
It's around the corner.	Це за поворотом.
I'm going in the same direction myself, so I might as well show you the way there.	Я йду в тому ж напрямку, так що міг би показати вам дорогу.
Oh, thank you. It's very kind of you.	О, дякую. Це дуже мило з вашого боку.

Appendix Two

Conferences. Meetings.

Opening

Good morning/afternoon, everyone.

If we are all here, let's start the meeting.

We're pleased to welcome (names of participants)

Our main aim today is to ...

I've called this meeting in order to ...

Unfortunately, (name of participant) ... will not be with us today because he ...

I have received apologies for absence from (name of participant), who is in (place).

So, if there is nothing else we need to discuss, let's move on to today's agenda.

Shall we get down to business? I'd like to move on to today's topic.

Introducing the Agenda

Have you all received a copy of the agenda?

There are X items on the agenda. First, ... second, ... third, ... lastly, ...

Shall we take the points in this order? If you don't mind, I'd like to go in order today.

Let's skip item 1 and move on to item 3. I suggest we take item 2 last.

We will first hear a short report on each point first, followed by a discussion of ...

Let's make sure we finish by ... There will be five minutes for each item.

We'll have to keep each item to 15 minutes. Otherwise we'll never get through.

Introducing the First Item on the Agenda

So, let's start with .../I'd suggest we start with.../Why don't we start with...

So, the first item on the agenda is ... Shall we leave that item?

Why don't we move on to... If nobody has anything else to add, let's move onto the next item

The next item on today's agenda is... / Now we come to the question of ...

I'd like to hand over to (name of participant), who is going to lead the next point.

Next, (name of participant) is going to take us through ...

Now, I'd like to introduce (name of participant) who is going to ...

Summarizing

Before we close today's meeting, let me just summarize the main points.

Let me quickly go over today's main points.

OK, why don't we quickly summarize what we've done today. In brief, ...

Shall I go over the main points?

Finishing Up

Right, it looks as though we've covered the main items.

If there are no other comments, I'd like to wrap this meeting up.

Can we set the date for the next meeting, please?

So, the next meeting will be on ... (day), the . . . (date) of.. . (month) at ...

Let's next meet on ... (day), the . . . (date) of.. . (month) at ... What about the following Wednesday? How is that?

Thanking Participants for Attending

Closing the Meeting

The meeting is finished, we'll see each other next// I declare the meeting closed.

Appendix Three

Presentations

Morning/Okay everybody. Please take a seat. Let's get started. If you have any questions, please feel free to ask me at the end of the presentation. We'll hear a presentation and discuss it to see if there are any fresh ideas.

All right, let me start by saying thanks to all of you for the interest in this presentation.

I would like to talk to you today about for... minutes.

First I would like to talk about....

Then I would like you to take a look at...

Following that we're going to talk about...

Then I'm going to wrap things up with our team's recommendations.

Lastly we are going to discuss...

Any questions so far? Please feel free to interrupt me at any time.

Now we will look at...

I'd like now to discuss...

Let's now talk about...

Let's now turn to...

Let's move on to...

That will bring us to our next point...

Moving on to our next slide ...

Let's sum it up.

I would like to sum up the main points again...

So, in conclusion...

Finally let me just sum up today's main topics...

I think I answered your question earlier.

I'm glad you asked that...

Well, as I already said...

That's a very good question (of you to ask).

So you are asking about...

If I've understood you correctly you are asking about...

It is for this reason that ...

Touching upon this problem ...

It is enough to mention ...

To gain a deeper insight into ...

From this (my) point of view ...

It is in this connection that ...

Despite the many attempts to ...

I'm deeply convinced that ...

The main conclusion to be drawn from the presentation can be summarized in the following ...

Thank you for attention.

Appendix Four

List of Set Expressions

according to – згідно з
account for – пояснювати
a good/(great) deal of – багато
a number of – декілька, ряд
etc (et cetera –*Lat.*) – тощо
and so on – і так далі
(and) the like - і тому подібне
apart from - крім того
aside from – крім, за винятком
as – оскільки, як, так, коли, тому що, мов
as a matter of fact – по суті, само собою зрозуміло
as a whole – в цілому
as far as possible – наскільки це можливо
as is the case – як це буває
as the case may be – в залежності від ситуації може бути
as long as – поки
as much as – стільки, скільки, наскільки
as near ... as possible – по можливості ближче
as needed – як вимагається, при необхідності
as though – неначе
as time went on – з плином часу
as to – відносно, що стосується
as well – також
as well as – а також, так само, як
at best – в кращому випадку
at least – принаймні, щонайменше
be called upon – призначатися
because of – із-за, внаслідок
be referred to as – називатися, згадуватися як, бути віднесеним до
be responsible for – відповідати за, являтися причиною
bring into use – використовувати
by means of – шляхом, за допомогою
by no means – ні в якому разі, ніскільки
by reference to – з посиланням на
call for – вимагати
close to – близько до
depending on – залежно від
due to – завдяки, із-за
for – оскільки, для, тому що, бо
for example = e.g. (exempli gratia - *Lat.*) – наприклад
in addition to – на додаток до, окрім
in case of – у разі, у випадку
in conjunction with – разом з, в поєднанні з

in fact – фактично, насправді, насправді
in most cases – в більшості випадків
in no case – ні в якому разі
in part – частково
in regard to / in relation to – щодо, відносно
(in) so far as – оскільки
in some cases – в деяких випадках
in some instances – в деяких випадках
in some way – в деякому роді
in spite of – попри, незважаючи на, всупереч
instead of – замість
in this case – в цьому випадку
in this way – таким чином
in turn – в свою чергу, по черзі
much in contrast to – на відміну від
namely – а саме
on a wide scale – в широкому масштабі
on the contrary – навпаки
on the other hand – з іншого боку
owing to – завдяки
prevent from – запобігати, перешкоджати
rather than – скоріше, ніж; а не
result from – в результаті // result in - призводити до
set aside – відкласти
since - оскільки // so as to – так, щоб
take into account – брати/приймати до уваги
that is=i.e. (id est - Lat.) – тобто
the former // the latter – перший // останній (з двох згадуваних)
the only – єдиний
the point in question – розглядуване питання
to a great // (some) extent – в значній // (деякій) мірі
twice as much... as – вдвоє більший за
up to – аж до, по
vary from – відрізнятися від ... // vary in – відрізнятися по/в
vary with – змінюватися залежно від
whatever – що завгодно, будь що
whatever-(+імен.) – будь-який (+імен.)
whenever – будь-коли, всякий раз коли
whichever method – який би метод не ...

Appendix Five

	Прийменники	Приклади	
Прийменники місця	above — над, вище	<i>above the table</i>	<i>над столом</i>
	at* — біля, при, у, в, на, за	<i>at the table</i>	<i>за столом</i>
	among — серед, між	<i>among trees</i>	<i>між деревами</i>
	before — до, перед	<i>before us</i>	<i>перед нами</i>
	behind — за, позаду	<i>behind the house</i>	<i>за будинком</i>
	below — нижче, під	<i>below the level</i>	<i>нижче рівня</i>
	beside — поруч, біля,	<i>beside the house</i>	<i>поруч з будинком</i>
	between — між	<i>between the houses</i>	<i>між будинками</i>
	in* — в	<i>in the room</i>	<i>в кімнаті</i>
	inside — в, усередині	<i>inside the house</i>	<i>всередині будинку</i>
	near — поблизу, біля	<i>near the window</i>	<i>біля вікна</i>
	on* — на	<i>on the table</i>	<i>на столі</i>
	outside — зовні	<i>outside the house</i>	<i>зовні будинку</i>
	over — над, через	<i>over the river</i>	<i>через річку</i>
under — під	<i>under the table</i>	<i>під столом</i>	
Прийменники руху	about — навкруги, по	<i>about the town</i>	<i>по місту</i>
	across — через	<i>across the street</i>	<i>через вулицю</i>
	along — вздовж, по	<i>along the street</i>	<i>по вулиці</i>
	around — навкруги, навколо	<i>around the earth</i>	<i>навколо землі</i>
	down — вниз по	<i>down the river</i>	<i>вниз по річці</i>
	from* — від, із	<i>from London</i>	<i>із Лондона</i>
	into — в	<i>into the house</i>	<i>в дім</i>
	over* — через, по	<i>over the fence</i>	<i>через загорожу</i>
	round — кругом, за	<i>round the corner</i>	<i>за рогом (будинку)</i>
	to — до, в	<i>the way to London</i>	<i>(шлях) до Лондона</i>
	towards — у напрямі до	<i>towards the door</i>	<i>до дверей</i>
through — наскрізь, через	<i>through the hole</i>	<i>через отвір</i>	
up — угору по	<i>to town</i>	<i>у місто</i>	

Appendix six

Стійкі прийменникові словосполучення	Переклад
above all after all	— ГОЛОВНИМ ЧИНОМ — КІНЕЦЬ-КІНЦЕМ
at { all best most any rate once last least	— ВЗАГАЛІ — В КРАЦЬОМУ ВИПАДКУ — ЩОНАЙБІЛЬШЕ — В БУДЬ-ЯКОМУ ВИПАДКУ — ВІДРАЗУ — НА КІНЕЦЬ — ПО МЕНШІЙ МІРІ
before { long now	— НЕЗАБАРОМ — ДО ЦИХ ПІР
beyond { belief doubt me	— НЕЙМОВІРНО — БЕЗ СУМНІВУ — ВИЩЕ МОГО РОЗУМІННЯ
by { chance day the day heart no means all means mistake	— ВИПАДКОВО — ВДЕНЬ — ПОДЕННО — НАПАМ'ЯТЬ — НІ В ЯКОМУ ВИПАДКУ — ЗА ВСЯКУ ЦІНУ — ПОМИЛКОВО
for { good example the time being	— НАЗАВЖДИ — НАПРИКЛАД — ПОКИ ЩО
in { due course any case general the long run so far as return vain	— СВОЄЧАСНО — В БУДЬ-ЯКОМУ ВИПАДКУ — ВЗАГАЛІ — КІНЕЦЬ-КІНЦЕМ — ОСКІЛЬКИ — У ВІДПОВІДЬ — ДАРЕМНО
to { the amount the end the right	— НА СУМУ — ДО КІНЦЯ — ПРАВОРУЧ

	Прийменники	Приклади	
Прийменники часу	after — після	<i>after six</i>	<i>після шостої</i>
	at* — в, о, на,	<i>at nine o'clock</i>	<i>о 9-ій години</i>
	by — до	<i>by that time</i>	<i>до того часу</i>
	during — впродовж	<i>during that period</i>	<i>впродовж того періоду</i>
	for — впродовж	<i>for one week</i>	<i>впродовж тижня</i>
	from* — від	<i>from 9 till 12 o'clock</i>	<i>з 9 до 12 години</i>
	in* — в	<i>in May</i>	<i>у травні</i>
	on* — в	<i>on Sunday</i>	<i>в неділю</i>
	since — з	<i>since early morning</i>	<i>з раннього ранку</i>
past — після	<i>past eight o'clock</i>	<i>після восьмої години</i>	

Appendix seven

Роки та дати

1467 – *fourteen sixty-seven* (чотирнадцять + шістдесят сім)

1600 – *sixteen hundred* (шістнадцять + сотня)

1703 – *seventeen hundred and three* (сімнадцять + сотня + три)

1998 – *nineteen ninety-eight* (дев'ятнадцять + дев'яносто вісім)

Проте у випадку з роками, що йдуть з 2000 включно, вимова буде такою, як і для звичайного числа:

2000 – *two thousand* (дві тисячі)

2003 – *two thousand and three* (дві тисячі та три)

2010 – *two thousand and ten* (дві тисячі та десять)

Дробові числівники

$\frac{1}{7}$ *one-seventh*;

$2\frac{1}{8}$ *two and one-eighth*,

$\frac{2}{3}$ *two-thirds*.

Дроби $\frac{1}{2}$ і $\frac{1}{4}$ читаються відповідно *a (one) half* (половина) і *a (one) quarter* (чверть). Числівник $1\frac{1}{2}$ (півтора) читаємо *one and a half*, числівник $2\frac{1}{2}$ — *two and a half* і т. д.

Десяткові дроби читаються так:

2.75 – two point seven five.

25.05 – two five (або twenty-five) point nought (o) five

0.01 – nought point nought one / point nought one

0.02 – nought point nought two / point nought two

0.03 – nought point nought three / point nought three

3.36 – three point three six

6.92 – six point nine two

8.71 – eight point seven one

64.705 – six four point seven nought five

$\frac{1}{2}$ – *a half / one half*

$\frac{1}{3}$ – *a third / one third*

$\frac{1}{4}$ – *a fourth / one fourth / a quarter / one quarter*

$\frac{1}{5}$ – *a fifth / one fifth*

$\frac{1}{6}$ – *a sixth / one sixth*

$\frac{2}{3}$ – **two thirds**

$\frac{3}{4}$ – **three fourths / three quarters**

$\frac{4}{5}$ – **four fifths**

$\frac{5}{6}$ – **five sixths**

$\frac{1}{2}$ – *one and a half*

$2\frac{1}{4}$ – *two and a fourth*

$3\frac{1}{3}$ – *three and a third*

Appendix eight

Word Formation

In English grammar and morphology, affixation is the process of adding a morpheme — or affix— to a word to create either a different form of that word or a new word with a different meaning; affixation is the most common way of making new words in English.

The two primary kinds of affixation are prefixation, the addition of a prefix, and suffixation, the addition of a suffix, while clusters of affixes can be used to form complex words.

Головними способами словотворення в англійській мові є: афіксація, конверсія, словоскладання.

Афіксація (Affixation)

Афіксація – це утворення нової (похідної) основи з уже існуючої (вивідної) основи додаванням до останньої словотворчої частки – афікса. Афікси бувають двох типів: суфікси, або частки, які ставляться після вивідної основи, і префікси, або частки, які ставляться перед вивідною основою. Так, основа іменника teacher була утворена від основи дієслова to teach за допомогою

			суфікса			-er:
teach	+		er	=		teacher

Основа прикметника unlucky (нещасливий) була утворена від основи прикметника lucky за допомогою префікса -un:

un	+	lucky	=	unlucky
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Кожна частина мови характеризується певним набором афіксів (суфіксів і префіксів), які застосовуються для утворення нових слів (основ), що належать до цієї частини мови. Так, є афікси іменників, дієслів, прикметників, прислівників.

Префікси (Prefixes)

Серед найбільш уживаних префіксів можна відзначити наступні:

dis- – префікс дієслів, прикметників і іменників, за допомогою якого утворюється слово протилежного значення:

to appear – to disappear (з'являтися – зникати)

to continue – to discontinue (продовжувати – припиняти)

appearance – disappearance (поява – зникнення)

un-, in- – префікси прикметників і іменників, основним значенням яких являється заперечення чи відсутність того, що виражається коренем слова. Ці префікси часто називаються заперечними префіксами. Порівняйте:

usual – unusual
definite – indefinite

im-, il-, ir- – фонетичні варіанти префікса in-.

Порівняйте: possible – impossible (можливий – неможливий)
legal – illegal (легальний – нелегальний)
regular – irregular (регулярний – нерегулярний)

mis- – префікс дієслів і іменників, основним змістом якого є позначення неправильності чи неточності того, що виражається у корені слова. Цей префікс також часто називається заперечним префіксом:

to use – to misuse (вживати – неправильно вживати);

anti- – (= against/opposed to) – anti-government, anti-racist, anti-war;

auto- – (=self) – autobiography, automobile;

extra- – (= beyond) – extraordinary, extraterrestrial;

hyper- – (= extreme) – hyperactive, hypertension;

inter- – (= between) – interactive, international;

mega- – (= very big, important) – megabyte, mega-deal, megaton;

over- – (= too much) – overcook, overcharge, overrate;

out- – (= go beyond) – outdo, out-perform, outrun;

post- – (= after) – post-election, post-war;

pre- – (= before) – prehistoric, pre-war;

pro- – (= in favour of) – pro-communist, pro-democracy;

re- – (= again) – reconsider, redo, rewrite;

semi- – (= half) – semicircle, semi-retired.

Суфікси (Suffixes)

В англійській мові є низка суфіксів, найбільш характерних для іменників.
Наприклад:

-er, -or, -ar – суфікси діяча чи професії – worker, speaker, doctor, translator, beggar, liar,

-ist – суфікси, що означають професію чи наслідувача якоїсь теорії чи напрямку, pianist, telephonist, philologist, pacifist.

-ism – суфікс який утворює абстрактні іменники: pluralism (сумісництво, плуралізм), plagiarism (плагіат), часто означає навчання, філософський напрямок, течію і т.п.: Darwinism

-ian – служить для позначення національності, звання чи професії:

ukrainian – українець, politician – політик, captain – капіта

-y – служить для утворення абстрактних іменників від дієслів:

rob – robbery (грабувати – грабіж), enquire – enquiry (запитувати – опитування)

-ant – утворює іменники зі значенням особи і речовини: serve – servant (служити – слуга), accountant – accountant (рахунок – бухгалтер)

-age: haulage (буксирування), leakage (витікання), homage (повага).

-ture / -sure: pressure (тиск), mixture (суміш), capture (захоплення в полон), fracture (перелом), exposure (викриття)

-ry: trickery (обман), slavery (рабство)

-eer: engineer (інженер), volunteer (волонтер).

- ess**: hostess (господиня), fortress (фортеця).
- ive**: fugitive (утікач), executive (адміністратор).
- acy**: intricacy (складність), intimacy (близькість).
- ancy** / **ency**: constancy (постійність), tendency (тенденція).
- ia**: nostalgia (ностальгія), inertia (інерція).
- ic**: mosaic (мозаїка), neurotic (невротик).
- ics**: mechanics (механіка), statistics (статистика), mathematics (математика).
- sion** / **ssion**: mission (місія), excursion (екскурсія).
- ium**: stadium (стадіон), gymnasium (гімназія).
- ology**: ecology (екологія), gynaecology (гінекологія, амер. – gynecology).
- our**: labour (труд), clamour (шум).
- re**: centre (центр).

Багато прикметників утворюються від інших частин мови за допомогою різноманітних суфіксів. Найбільш уживані з них наступні:

- able**: comfortable, preferable, reliable
- ible**: sensible, visible, susceptible
- ant**: elegant, predominant, arrogant
- ent**: development, intelligent, innocent
- al**: cultural, musical, medical
- ic**: atomic, scientific, heroic
- ish**: childish, foolish, brownish
- ive**: attractive, expensive, talkative
- ful**: careful, useful, skilful
- less**: careless, helpless, useless
- ly**: brotherly, deadly, friendly
- ous**: dangerous, curious, anxious
- y**: dirty, dusty, sleepy

В англійській мові також є велика кількість слів, що закінчуються на **-ing** та **-ed**. Наприклад: surprising, offended. Серед прислівників найбільш уживаним суфіксом є **-ly**. Цей суфікс утворює прислівники, як правило, від основи прикметників чи іменників: usual – usually, hour – hourly.

Конверсія (Conversion)

Конверсія – це утворення нової (похідної) основи з уже існуючої (вивідної) основи простим переосмисленням останньої, без будь-якої зміни її форми. При цьому похідна основа завжди належить до іншої частини мови, ніж вивідна, і відповідно, набуває нових морфологічних і синтаксичних властивостей. Так, наприклад, дієслово to saw – пиляти було утворене конверсією від іменника saw – пилка. Переосмислення основи іменника в основу дієслова, природно, приводить до того, що остання утворює форми часу (I saw, he saws, I sawed, I have sawed і т. д.), способу, стану тощо, тоді як основа іменника saw могла змінюватися лише за числами: a saw – saws. Інший приклад конверсії: іменник a burn – опік був утворений конверсією від дієслова to burn – палити, обпикати.

За допомогою конверсії утворюються різні частини мови – іменники, дієслова, прикметники, прислівники та ін. Внаслідок конверсійного словотворення з'являються слова-омоніми, які збігаються за формою основ, але мають різні

значення і належать до різних частин мови, наприклад: a saw і to saw; a burn і to burn; a round (раунд боксу), to round (огинати), round (прикметник круглий), round (прислівник навкруги), round (прийменник навколо) та інші.

Словоскладання (Compounding)

When we use compounding, we link together two or more bases to create a new word. Normally, the first item identifies a key feature of the second word. For example, the two bases *back* and *ache* can combine to form the compound noun *backache*, and the two bases *post* and *card* combine to form the compound noun *postcard*.

Compounds are found in all word classes. The most common types of compounds are: Nouns: *car park*, *rock band*

Adjectives: *heartbreaking*, *sugar-free*, *airsick*

Verbs: *oven-bake*, *baby-sit*, *chain-smoke*

Adverbs: *good-naturedly*, *nevertheless*

It is sometimes difficult to know where to put hyphens in words that are compounded. It is also difficult to know whether to separate words (e.g. *post box*) or to join the words (e.g. *postbox*). In such cases, it is best to check in a good learner's dictionary.

Key-patterns to abstracts/summaries

1. The article (paper, book, etc.) deals with/is devoted to ...	1. Стаття (стаття, книга і т.д.) присвячена ...
2. As the title implies the article describes...	2. Згідно назви, в статті описується ...
3. It is specially noted...	3. Слід особливо відзначити ...
4. A mention should be made...	4. Слід згадати ...
5. It is spoken in detail...	5. Детально говориться ...
6. ...are noted	6. ... згадуються /відзначені
7. It is reported...	7. Повідомляється, ...
8. The text gives a valuable information on....	8. Текст надає цінну інформацію про ...
9. Much attention is given to...	9. Велика увага приділяється ...
10. The article is of great help to ...	10. Ця стаття дуже допоможе ...
11. The article is of interest to...	11. Ця стаття буде дуже цікава для ...
12. It (the article) gives a detailed analysis of	12. Вона (стаття) дає детальний аналіз
13. It draws our attention to...	13. Вона звертає нашу увагу на ...
14. The difference between the terms...and...should be stressed	14. Слід підкреслити різниця між термінами ... і ...
15. It should be stressed (emphasized) that...	15. Слід підкреслити (підкреслено), що ...
16. ...is proposed	16. ... пропонується
17. ...are examined	17. ... розглядаються
18. ...are discussed	18. ... обговорюються
19. An option permits...	19. Вибір дозволяє ...
20. The method proposed ...	20. Запропонований метод ...
21. It is described in short ...	21. Коротко описується ...
22. It is introduced	22. Вводиться
23. It is shown that	23. Показано, що
24. It is given ...	24. Надано/пропонується ...
25. It is dealt with	25. Розглядається
26. It is provided for ...	26. Забезпечується ...
27. It is designed for	27. Призначений для
28. It is examined, investigated ...	28. Розглядаються, досліджується ...
29. It is analyzed ...	29. Аналізується ...
30. The main idea of the article is...	30. Основна ідея статті
31. The need is stressed to employ...	31. Підкреслюється необхідність використання ...
32. Attention is drawn to...	32. Увага звертається ...
33. Data are given about...	33. Наведені дані про ...
34. Attempts are made to analyze, formulate ...	34. Робляться спроби проаналізувати, сформулювати ...
35. Conclusions are drawn....	35. Зроблено висновки
36. Recommendations are given ...	36. Налано рекомендації ...

ABBREVIATIONS

A.D. - Anno Domini (Lat.) нашої ери
B.C. - Before Christ (Lat.) до нашої ери
bf - board foot досковий фут
bhp - brake horse power – гальмівна (корисна) потужність в кінських силах
CI - compression ignition - займання від стиснення
cunit - cubic unit - куб. одиниця
cu. ft. - cubic foot - куб. фут
d.b.h. - diameter breast high - діаметр на висоті грудей
EEC - East European Countries
e.g. - exempli gratia (Lat.) наприклад
etc. - et cetera (Lat.) - і так далі, і т. д.
FAO - Food and Agricultural Organization - продовольча і с/господарська організація при ООН
f.o.b. - free on board - фоб, франко борт судна
fpm - feet per minute - футів на хвилину
ft - foot or feet - фут або фути
ft-lb - foot-pound - фут-фунт
FWD - four wheel drive - конструкція с 4-ма ведучими колесами
Gal - gallon - галон
gph - gallon per hour - галон на годину
hp - horse power - кінська сила
in - inch - дюйм
i.e. - id est (Lat.) - тобто
Lat. - Latin - Латинь
lb. - pound – фунт,
lb-ft - pound-foot - (див. вище)
mph - mile per hour - миль на годину
psi - pounds per square inch - фунтів на кв. дюйм
pto - power take off - відбір потужності
rpm - revolutions per minute - обертів на хвилину
SI - spark ignition – іскрове запалювання
\$ - долар
£ - фунт
' - foot - фут
" - inch - дюйм
60°C - sixty degrees Centigrade 60° - по Цельсію
50°F - fifty degrees Fahrenheit 50° - по Фаренгейту

NAMES OF TREES

Broad-leaved/deciduous/angiosperm/hardwood trees:

oak	дуб
beech	бук
birch	береза
alder	вільха
aspen	осика
ash	ясен
maple	клен
hornbeam	граб
elm	в'яз
linden	липа
locust	акація
poplar	тополя
willow	верба
chestnut	каштан
walnut	грецький горіх
hickory	гікорі
hazel	ліщина

Coniferous/needle-leaf/gymnosperm/softwood trees:

pine	сосна
spruce	ялина
fir	ялиця
larch	модрина
juniper	ялівець
yew	тис
cedar	кедр
cypress	кипарис
bald cypress	кипарис болотний, таксодій
hemlock	тсуга канадська
thuja (thuya)/arborvitae	туя
redwood	каліфорнійське мамонтове дерево

КОЕФІЦІЄНТИ ПЕРЕКЛАДУ АНГЛО-АМЕРИКАНСЬКИХ МІР У МЕТРИЧНІ

<i>Англійська назва</i>	<i>Українська назва</i>	<i>Метричні міри</i>
I. Measures of length - Міри довжини		
1 mile	1 миля	1609 метрів
1 rod	1 род	близько 5 метрів
1 yard	1 ярд	0,9144 м
1 foot	1 фут	0,3048 м
1 inch	1 дюйм	2,540 см
II. Square measures - Міри площ		
1 square mile	1 квадр. миля	2590 кв. метрів 258,989 гектара
1 acre	1 акр	4047 кв. метрів
1 square yard	1 кв. ярд	0,836 кв. метрів
1 square foot	1 кв. фут	0,0929 кв. метрів
1 square inch	1 кв. дюйм	6,4516 кв. см
III. Measures of capacity - Міри об'єму		
1 cub. yard	1 куб. ярд	0,764 куб. м
1 cub. foot	1 куб. фут	0,0283 куб. м
1 cub. inch	1 куб. дюйм	16,387 куб. см
1000 board feet	1000 дощових футів	2,359 куб. м
1 cord	1 корд	3,63 куб. м
1 load	1 лоад	1,416 куб. м пилен, і тесан, лесу / 1,133 куб. м круглого лесу
IV. Weights - Міри ваги		
1 long ton	1 «довга» тонна	1016 кг
1 short ton	1 «коротка» тонна	907,2 кг
1 hundredweight	1 центнер	50,8 кг
1 pound	1 фунт	453,6 г
1 ounce	1 унція	31,106 г
Temperature - Температура		
Fahrenheit	Фаренгейт	F
Centigrade	Цельсій	C
Reaumur	Реомюр	R

Для перерахування градусів однієї шкали в градуси іншої користуються наступними формулами:

$$\begin{array}{l}
 R = \frac{4C}{5}; \quad C = \frac{5R}{4}; \quad F = \frac{9C}{5} + 32; \\
 R = \frac{4(F - 32)}{9}; \quad C = \frac{5(F - 32)}{9}; \quad F = \frac{9R}{4} + 32.
 \end{array}$$

**ТАБЛИЦЯ ОСНОВНИХ НЕСТАНДАРТНИХ (НЕПРАВИЛЬНИХ)
ДІСЛІВ**

<i>Infinitive</i>	<i>Past Indefinite</i>	<i>Past Participle</i>	<i>Translation</i>
to arise	arose	arisen	виникати
to be	was, were	been	бути
to bear	bore	born	носити, виношувати
to become	became	become	ставати
to begin	began	begun	починати (ся)
to bend	bent	bent	гнути
to break	broke	broken	ламати, розбивати
to bring	brought	brought	приносити
to build	built	built	будувати
to burn	burnt	burnt	горіти, палати
to catch	caught	caught	ловити
to choose	chose	chosen	вибирати
to come	came	come	приходити
to cost	cost	cost	коштувати
to cut	cut	cut	різати, рубати
to deal	dealt	dealt	мати справу
to dig	dug	dug	копати
to do	did	done	робити
to draw	drew	drawn	малювати; тягти
to drive	drove	driven	везти; керувати
to eat	ate	eaten	їсти
to fall	fell	fallen	падати
to feed	fed	fed	годувати
to feel	felt	felt	відчувати
to fight	fought	fought	битися; боротися
to find	found	found	знаходити
to freeze	froze	frozen	замерзати
to get	got	got	діставати (ся)
to give	gave	given	давати
to go	went	gone	іти
to grow	grew	grown	рости; вирощувати
to have	had	had	мати
to hear	heard	heard	чути
to hold	held	held	тримати
to keep	kept	kept	зберігати; тримати
to know	knew	known	знати
to lay	laid	laid	класти
to lead	led	led	вести; очолювати
to learn	learnt (learned)	learnt (learned)	вивчати
to leave	left	left	залишати

to let	let	let	дозволяти
to lie	lay	lain	лежати
to light	lit	lit	запалювати
to lose	lost	lost	втрачати; програвати
to make	made	made	робити
to mean	meant	meant	означати
to meet	met	met	зустрічати
to pay	paid	paid	платити
to put	put	put	класти; ставити
to read	read	read	читати
to ring	rang	rung	дзвонити
to rise	rose	risen	підійматися
to run	ran	run	бігти
to saw	sawed	sawn	пиляти
to say	said	said	казати
to see	saw	seen	бачити
to send	sent	sent	надсилати
to set	set	set	встановлювати
to show	showed	shown	показувати
to sink	sank	sunk	тонути
to sit	sat	sat	сидіти
to sow	sowed	sown	сіяти
to speak	spoke	spoken	говорити
to split	split	split	розщеплювати
to spread	spread	spread	поширювати
to stand	stood	stood	стояти
to stick	stuck	stuck	приклеювати
to sweep	swept	swept	підмітати
to take	took	taken	брати
to teach	taught	taught	вчити
to tell	told	told	розповідати
to think	thought	thought	думати
to throw	threw	thrown	кидати
to thrust	thrust	thrust	штовхати
to understand	understood	understood	розуміти
to wear	wore	worn	носити (одяг)
to wind	wound	wound	заводити
to withstand	withstood	withstood	протистояти
to wring	wrung	wrung	скручувати
to write	wrote	written	писати

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