МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ БІОРЕСУРСІВ
І ПРИРОДОКОРИСТУВАННЯ УКРАЇНИ

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Посібник спрямований на підготовку студентів до роботи зі спеціальною літературою, навчання усним формам спілкування по науковій тематиці на матеріалі запропонованих текстів, системний розвиток комунікативних навичок студентів, розширення їх активного та пасивного лексичного та граматичного запасу.

Посібник призначений для аудиторної та самостійної роботи з дисципліни «Іноземна мова за професійним спрямуванням (англійська)» студентів ОС «Бакалавр» біотехнологічних та біологічних спеціальностей вищих навчальних закладів усіх рівнів акредитації.

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INTRODUCTION

Навчальний посібник призначений для студентів біотехнологічних та біоінженерних спеціальностей, які продовжують вивчення англійської мови на основі компетенцій, отриманих у середній школі, і можуть бути умовно розділені на 2 частини.

Перша частина - ввідна, вона включає в себе тексти ознайомчого характеру, які не мають складних граматичних конструкцій та спеціальних термінів. Їх метою є повторити, активізувати і систематизувати вже наявні знання студентів.

Відповідно, друга частина має більш складні граматичні конструкції та спеціалізований словниковий запас. Ця частина професійно орієнтована і включає в себе теми, які безпосередньо вивчаються студентами біотехнологічних і біологічних спеціальностей на рідній мові.

Основним завданням є досягнення набуття студентами навичок практичного володіння англійською мовою, тобто компетентне використання мови випускниками вищих навчальних закладів в їх практичній діяльності.

Даний посібник містить лексико-граматичний матеріал для професійного та побутового спілкування та читання наукової літератури, сприяє формуванню у майбутніх фахівців уміння працювати самостійно (реферування та анотування) з науково-популярними та науковими текстами, формує навички науково-технічного перекладу.

В кожному розділі пропонується нова лексика і терміни, вправи щодо використання професійної лексики, розуміння тексту та розширення кругозору студентів, вправи для розвитку навичок читання, творчі завдання та завдання для розвитку навичок письма.

Розділи складаються із загальних питань, основного тексту на певну тематику, ряду вправ, що сприяють розширенню та закріпленню активного словникового запасу, вміння говорити, розвитку монологічного та

діалогічного мовлення. Кінцевий етап роботи з текстом - це, як правило, вправи на задану тему звикористання нового лексичного матеріалу.

Далі запропоновано ряд вправ для повторення граматики. Граматичні вправи умисно використовують більш простий і іноді не пов’язаний із професійною лексикою словниковий запас, щоб студенти могли повністю сконцентруватися тільки на граматичних конструкціях.

Кожний розділ також містить додатковий текст, що відповідає основній темі, і ряд завдань до нього. В кінці кожного розділу запропоновані творчі завдання. Це можуть бути такі завдання як презентація, дискусія, розробка проекту або рольова гра. Такі завдання особливо подобаються студентам, так як вони імітують життєві ситуації та закріплюють словниковий запас у ігровому вигляді.

На додаток до аудиторних занять передбачається обов'язкова самостійна позааудиторна робота студентів, що включає виконання домашнього завдання, читання додаткової літератури, створення презентацій, дослідницької роботи, написання академічного есе тощо.

Unit 1

I AM BIOTECH STUDENT

1. Read and translate the text.

BIOTECHOLOGIST'S FAVORITE THINGS

Studying of biotechnology is a very high priority with me, especially as I dreamt to study biology and chemistry in complex from my childhood. So there're times when I break my agenda, go absolutely crazy and escape to my laboratory and work for the whole day without food and sleep. I really enjoy researching of undiscovered things. I've got a superb laboratory – over 200 various chemical devices as well as chemicals itself – so you can guess that I just adore making experiments. I really like the entire content of my laboratory – all these tubes, shakers, washers, automatic dispensers and photocolorimeters. Ever since I was young I've loved looking at chemical reactions. I'm very fond of rats and mice – I've got two white mice at home, Arethna and Flossie. I like outstanding scientists and I read their works on brilliant biotechnology. I watch scientific programs on the television, as well. Some of them are wonderful. Also on my list of likes must be Jamaica. I love going on holiday and I go back there as often as I can. I can find many new interesting species of flora and fauna there.

I tend to wear white overall – maybe because I couldn't afford it when I was a school pupil. I like wearing gloves and a mask, but I can't stand gloves when they are torn! One of my pet hates is when chemist's shops don't have gloves in my size. I think that's really awful.

There're lots of other things I don't like. I detest violence, and the idea of nuclear war is very frightening indeed. I don't mind being interviewed, but I get annoyed when I get too much attention to my personality. I absolutely hate when people say that biotechnology is a boring thing – such people promote ignorance.

I’m also not too keen on rude people and Australian soap operas – they are dreadful.

ESSENTIAL VOCABULARY

agenda *noun* – a plan of things to be done or problems to be addressed ● *He vowed to put jobs at the top of his agenda.*

attractive *adjective* – having qualities or features which arouse interest.

awful *adjective* – very bad or unpleasant the place smelled awful.

brilliant *adjective* – exceptionally clever or talented.

dispenser *noun* – an automatic machine or container which is designed to release a specific amount of something.

fond of *adjective* – having an affection or liking for ● *He was not too fond of dancing.*

ignorance *noun* – lack of knowledge or information.

outstanding *adjective* – exceptionally good.

overall *noun* – a loose–fitting coat or one–piece garment worn, typically over ordinary clothes, for protection against dirt or heavy wear/

promote *verb* – support or actively encourage.

superb *adjective* – very good; excellent.

tube *noun* – 1) a long, hollow cylinder of metal, plastic, glass, etc. for holding or transporting something, chiefly liquids or gases; 2) a rigid cylindrical container.

violence *noun* – behaviour involving physical force intended to hurt, damage, or kill someone or something.

2. Write down things that a biotechnologist likes and find things that he dislikes.

3. Paraphrase the following using the Possessive Case.

Example: *The son of our manager – our manager's son.*

1) the clinic of Mr. Smith

2) a doll of the girls
3) the works of Rembrandt
4) a toy of the baby
5) a meeting of the employees
6) the bags of those women
7) the orders of our boss
8) the books of the children
9) the cottage of my parents
10) a garage of her cousin
11) the mother of Kate and Mary
12) the children of my aunt Ann
13) the paintings by Picasso and Dali
14) the times of Ivan the Terrible
15) oil wells of Saudi Arabia.

4. Replace the nouns in the possessive case by the prepositional groups where possible.

Example: *He always takes his brothers' bocks. – He always takes books of his brothers.*

1) The only thing she wanted was to see her parents' house again.
2) No one could explain the young girl's behaviour at yesterday's supper.
3) Last Sunday's rugby match was disappointing. Our team lost.
4) The boy was looking through a children's magazine.
5) After an hour's break we resumed our work.
6) At that time he lived in a little flat for economy's sake.
7) It was four and a half hours' ride.
8) I don't like cow's milk.
9) He was puzzled by Ann and Peter's visit.
10) When Friday came, he was at his wit's ends.

11) She dropped in at the chemist's to buy some aspirin.

5. Open the brackets and put the verb into the Present Simple or the Present Continuous.

1) Be quiet, please. We (work) with electrophoresis's camera and you (make) a lot of noise.
2) He always (go) for a walk in the evening.
3) Where is Jack? – He (do) chromatography in the laboratory.
4) She (cry). Is something wrong?
5) In the morning I (have) little time, so I (plan) my experiment in the evening.
6) A decade (describe) a period of ten years.
7) Her brother–biochemists (work) in Canada at present.
8) She always (dream) but (do) nothing to realize her dreams.
9) He (be) so suspicious to me at the moment. I wonder why.
10) Hurry up, Jane! We all (wait) for you in laboratory.
11) Turn off the gas. Don't you see water in the tube (boil)?
12) The rats are still ill after experiment but they (get) better gradually.
13) Don't bother her. She (take) her Immunology lesson: she always (take) it in the morning.
14) The living standards (change). So, every month equipment (get) more expensive.
15) Tom and Mary (leave) for the Netherlands tomorrow.
16) I have just started Biochemistry courses. I (study) modification of proteins.
17) Mercury (boil) at 357.23 degrees Celsius.

6. Define if these sentences are correct.

1) I get up at seven in the morning.
2) I'm liking biochemistry.

3) He’s knowing interesting thing about biotechnology.
4) I think Mexico's a beautiful country.
5) Universities are staying open late in USA.
6) He's having a flat near the centre.
7) What are you thinking of Watson?
8) Peter's in the laboratory. He makes experiment.
9) What are you thinking about?

7. Translate the following sentences into English.

1) Він ходить в лабораторію двічі на тиждень.
2) Студент проводить експеримент.
3) Вся група сидить за столом та обговорює отримані результати.
4) Ми зберігаємо небезпечні речовини у витяжній шафі.
5) Інколи електроліз триває весь день.
6) Вони рідко помиляються в розрахунках.
7) Студент їде в університет.
8) Вони ходять в бібліотеку кожен день.
9) Хлопчик вчиться.
10) Всі люблять спостерігати за хімічними реакціями.

8. Form the general questions.

Example: *My brother likes skating. – Does my brother like skating?*

1) He translates a lot of letters into English.
2) I’m speaking on the phone.
3) Little children like to ask many questions.
4) Now we are carrying out the experiment.
5) She spends a lot of time on her English.

9. Form the alternative questions.

Example: *My brother likes skating. – Does your brother like skating or skiing? Does your or his brother like skating? Does your brother or Pete like skating?*

1) The film is exciting.
2) Thousands of people visit this international exhibition
3) He watches TV every day.
4) They are going to the country on Friday.
5) She is painting the walls.

10. Form the disjunctive questions.

Example: *She comes home at 3 pm. – She comes home at 3 pm, doesn't she?*

1) They are returning home next month.
2) We are buying a loaf of bread.
3) She opens the window every morning.
4) There is a theatre in the centre of the city.
5) I am right.

11. Form special questions and questions to the subject.

Example: *I have my English classes twice a week. – How often you have your English classes?*

1) I carry on different experiments during my biology classes.
2) I prepared a big report about newest technologies for my genetics class.
3) My friend Pete was absent yesterday.
4) I have A for my chemistry exam?
5) I'm going home with my classmates.
6) Professor Farnsworth knows all about this topic.

Unit 2

FOOD AND NUTRITION

Do you like to eat in restaurants?

How often do you eat out? Is price a consideration when you go out?

Have you ever eaten in a restaurant alone? Did you enjoy it?

1. Read and translate the text.

YOU ARE WHAT YOU EAT

All living things need food to sustain life. Plants can make their own food from soil, water, and sunshine. Animals eat either other animals or plants. Human beings eat all kinds of different foods from animal and plant sources, depending on what is available where they live and sometimes, too, on the restrictions of religious customs. Food supplies nutrients, the substances needed by the body for life and growth. They are proteins, fats, carbohydrates, vitamins, minerals, and water. A healthy balanced diet must consist of all six. In prehistoric times people ate what they could find by hunting and gathering wild plants. Later they learned to keep animals and grow cereals and vegetables. Settled communities then became established. The plants that were cultivated were the plants that grew naturally in any particular climate.

Nutrition is the process by which plants and animals take in and use food. Food is needed to keep the body running smoothly. It provides energy for work.

The building material for muscles, bones, and blood comes from food. You cannot have a healthy body without healthy eating and drinking. Not enough of some foods, or too much of others, can lead to illness.

Experts on nutrition are called nutritionists. The food and drink you take in are called your diet. (This word is sometimes used in another way, to mean eating less food than normal in order to lose weight, as in "going on a diet".) A person's

diet is so important because growth and health depend on it. Dieticians are people with knowledge of special diets (dietetics), such as those used for sick people in hospital. We should never forget that across the world 40 million people die each year from starvation and the diseases it brings. Fifteen million of them are babies and young children. For the millions more who suffer from malnutrition (not enough of the right foods), healthy eating is out of the question. It is hard enough just to stay alive.

The body needs many different nutrients. These are various substances necessary to provide energy and the materials for growth, body-building, and body maintenance. Every day millions of cells in the body die and must be replaced by new ones. Not all foods contain all nutrients. So it is not just the quantity of food eaten that is important, but also the variety. People who have enough food available may still become ill because they are eating too much of one kind of food and not enough of another. To stay healthy, we need to eat a balanced diet. This means a diet containing the right proportions of the main nutrients: carbohydrates, proteins, fats, fiber, minerals, vitamins, and fluids. Many foods are a mixture of these basic nutrients.

A balanced diet also contains enough energy (in the form of food) to power the chemical reactions of living. Some people worry that a vegetarian diet will be short of protein, but this is not the case. Plenty of protein can be obtained from the great variety of nuts, seeds, pulses, cereals, and soy products (such as tofu) which are now widely available, and from eggs and milk products. It was once thought that plant proteins were inferior to animal proteins, being deficient in some amino acids. It is now known that a mixture of plant proteins complement one another.

For example, a shortage of an amino acid in one plant food, such as pulses, is counterbalanced by an excess of that amino acid in a different plant food, such as a cereal. Protein combinations such as beans on toast, rice and lentils, bean stew with pot barley, oats and nuts (as in muesli), provide very high quality protein. All other nutrients are present in adequate quantities in the lactovegetarian diet. If dairy products are not eaten, a supplement of vitamin B12 becomes essential.

Many vegetarian foods are fortified with this vitamin (yeast extracts, some soy milks, some breakfast cereals, and so on). Vegetarians obtain iron from dried fruit, leafy green vegetables, wholemeal flour, pulses, oats, nuts, and brown rice. They obtain calcium from cheese, nuts, sesame seeds, leafy green vegetables, and soy. Vegetarians have been responsible for the invention of foods such as peanut butter; cornflakes, muesli, and high-protein vegetable foods made to taste like meat.

ESSENTIAL VOCABULARY

amino acid *noun* – a simple organic compound containing both a carboxyl and an amino group ● *Amino acids occur naturally in plant and animal tissues and form the basic constituents of proteins. There are about twenty common amino acids, of which the simplest is glycine.*

bone *noun* – any of the pieces of hard whitish tissue making up the skeleton in humans and other vertebrate.

carbohydrate *noun* – any of a large group of organic compounds occurring in foods and living tissues and including sugars, starch, and cellulose. They contain hydrogen and oxygen in the same ratio as water (2:1) and typically can be broken down to release energy in the animal body.

cereals *noun* – a breakfast food made from roasted grain, typically eaten with milk ● *A bowl of cereal.*

dairy *noun* – milk and milk products collectively.

diet *noun* – the kinds of food that a person, animal, or community habitually eats.

disease *noun* – a disorder of structure or function in a human, animal, or plant, especially one that produces specific symptoms or that affects a specific location and is not simply a direct result of physical injury ● *Bacterial meningitis is quite a rare disease.*

fat *noun* – any of a group of natural esters of glycerol and various fatty acids, which are solid at room temperature and are the main constituents of animal and vegetable fat.

fiber *noun* – a thread-like structure forming part of the muscular, nervous, connective, or other tissue in the human or animal body ● *There were degenerative changes in muscle fibres.*

fluid *noun* – a substance that has no fixed shape and yields easily to external pressure.

malnutrition *noun* – lack of proper nutrition, caused by not having enough to eat, not eating enough of the right things, or being unable to use the food that one does eat.

mineral *noun* – an inorganic substance needed by the human body for good health.

nutrient *noun* – a substance that provides nourishment essential for the maintenance of life and for growth ● *Fish is a source of many important nutrients, including protein, vitamins, and minerals.*

nutrition *noun* – the process of providing or obtaining the food necessary for health and growth.

oats *noun* – the grain yielded by the oat plant, used as food

proteins *noun* – any of a class of nitrogenous organic compounds which have large molecules composed of one or more long chains of amino acids and are an essential part of all living organisms, especially as structural components of body tissues such as muscle, hair, etc., and as enzymes and antibodies

shortage *noun* – a state or situation in which something needed cannot be obtained in sufficient amounts.

soil *noun* – the upper layer of earth in which plants grow, a black or dark brown material typically consisting of a mixture of organic remains, clay, and rock particles.

starvation *noun* – extreme suffering or death, caused by lack of food ● *Over three hundred people have died of starvation since the beginning of the year.*

substance *noun* – a particular kind of matter with uniform properties ● A *steel tube coated with a waxy substance.*

vitamin *noun* – any of a group of organic compounds which are essential for normal growth and nutrition and are required in small quantities in the diet because they cannot be synthesized by the body.

2. Give Ukrainian equivalents for the following words.

to sustain life, restriction, supply, nutrients, proteins, fats, carbohydrates, vitamins, minerals, consist of, cereals, nutrition, take in, to keep the body running smoothly, muscles, bones, blood, illness, starvation, substance, to provide, body maintenance, replace, fiber, minerals, vitamins, fluids, chemical reaction, inferior, deficient, mixture, complement, counterbalance, excess, supplement, essential.

3. Translate the sentences into English.

1) Амінокислоти – органічні сполуки, у молекулі яких одночасно містяться карбоксильні та амінні групи.
2) В добовому раціоні людей і тварин переважають вуглеводи.
3) Хлібні та злакові зернові культури вирощуються на всіх континентах нашої планети.
4) Соя – один з найбагатших білком рослинних продуктів харчування.
5) Голодування – стан організму, викликаний недостатнім надходженням в організм речовин необхідних для підтримання гомеостазу.
6) Концентрація вітамінів в тканинах і добова потреба в них невелика, але при недостатньому надходженні вітамінів в організм наступають характерні небезпечні патологічні зміни.
7) При недоїданні спостерігається дефіцит енергетичної цінності їжі, також людині може не вистачати білків, вітамінів, мікроелементів.

8) Дієти різних культур можуть суттєво відрізнятися і включати або виключати конкретні продукти харчування.
9) Молочні продукти – продукти харчування, виготовлені з молока (коров'ячого та козячого).
10) Вода і мінеральні речовини регулюють різноманітні функції в організмі, але не є джерелами енергії.

4. Are the following statements true or false?

1) Human beings eat all kinds of different foods from animal and plant sources.
2) In prehistoric times people ate what they could find in the shop.
3) Nutrition is the process 'by which plants and animals take in and use food.
4) The building material for muscles, bones, and blood comes from fluid.
5) Experts on nutrition are called dieticians.
6) Every day millions of cells in the body die and must be replaced by new ones.
7) People who have enough food available may still become ill because they are eating too much different kind of food.
8) Plenty of protein can be obtained from the meat.
9) If dairy products are not eaten, a supplement of vitamin B12 becomes essential.
10) Vegetarians have been responsible for the invention of foods such as milk, sugar, butter.

5. Divide the following words into two columns (countable and uncountable nouns).

furniture, coffee, leaf, food, computer, list, blood, job, work, language, country, advice, information, money, progress, permit, permission, baggage, luggage, beach, traffic, weather, window, knowledge, air, water, holiday, damage,

accommodation, scenery, scene, pigeon, bread, mountain, kick, news, accident, laugh, flour, laughter.

6. Quantifiers. Fill in the spaces with much, many, few, a few, little, a little, a lot of, plenty of, a great number of, a great amount of, a great deal of ***(you may get several variants).***

1) The living conditions in the district were very poor and there were only _____ doctors available. 2) He is a very intelligent man. Do you know that he speaks _____ foreign languages? 3) The situation was becoming worse and worse. _____ projects had to be postponed. 4) The show was poor. There was _____ applause. 5) There were _____ people at the meeting, but most of them left early so there aren't _____ left now. 6) Have you finished the chromatography of that protein solution? There is _____ solution in the fridge if you need more. 7) We haven't had _____ rain this summer. The garden needs watering. 8) The party was a failure. Unfortunately, they invited _____ interesting people. 9) He didn't know _____ facts about genetic engineering. 10) Did the storm make _____ damage to the crops?

7. Translate the sentences into English. Use quantifiers.

1) Він написав доволі багато статей на цю тему.
2) Я не можу іти з вами сьогодні в театр. У мене багато роботи в лабораторії.
3) В нашій бібліотеці мло книг по біотехнології.
4) На конференції було багато людей.
5) В пробірці було мало води і він налив ще трохи.
6) Мало хто розуміє його. Він робить занадто багато помилок.
7) В минулому році було опубліковано мало наукових статей по біохімії.
8) Професор дав студентам кілька статей для ознайомлення.

9) Я зустрічав мало хороших біотехнологів в своєму житті.
10) Можна мені трохи кави? – Ні, вона занадто міцна для тебе.

10. Remember articles with countable and uncountable nouns. Speak about the difference. Make an exercise. Fill in the blanks with the appropriate article where necessary.

1) He lives in _____ south of _____ Australia.
2) In his book James Dewey Watson, _____ famous American scientist, described _____ main process of _____ human organism.
3) Nothing could break _____ silence. Suddenly there was _____ scream, then _____ second and _____ third.
4) Can you plan _____ experiment?
5) He came in one morning when we were doing _____ dialysis in _____ laboratory of _____ university and introduced himself.
6) _____ world tour costs _____ lot of money.
7) I don't believe you. I think you're telling _____ lie.
8) Did you have _____ lovely time in _____ Hague's laboratory?
9) It was _____ early evening but I was feeling sleepy.
10) He made _____ gross mistake.
11) Don't worry, we'll finish _____ experiment before _____ sunset.
12) I'd like to have _____ salad with _____ oil for _____ breakfast.
13) My favourite subject at _____ school was _____ biology.

11. Translate into English paying attention to the articles.

1) Передай мені, будь ласка, індикаторний папір.
2) Вечір був вологий та прохолодний.
3) Вино – типовий продукт біотехнології.
4) Вона знайшла хорошу методику для проведення експерименту.

5) Не можна порушувати хід реакції.
6) В цьому році нобелівську премію дали за винайдення нового методу аналізу білків.
7) Погода погана. Ніч була дуже холодна. Я не хочу іти в лабораторію в таку холодну погоду. Але я маю завершити аналіз.
8) Вчені відкрили інсулін багато років тому назад.
9) Це неочікувана новина.
10) Він володіє ґрунтовними знаннями в області біотехнології.
11) Нафту використовують для виробництва бензину.
12) Де зупинилися учасник конференції? – В готелі «Континенталь» на Хай-стріт.

12. Put the words into the gaps to complete the article. Read and translate it.

disease	found	author	likely
leaving	amount	expert	sales
welcome	different	better	outside
heat	weight	although	choose

SCIENTISTS DISCOVERED HEALTHIER PIZZA

Food scientists and dieticians have _____ new ways to make pizza that is good for you. This is very _____ news for overweight pizza lovers and those who worry about their _____. Researchers in the USA looked at different ways of baking the pizza base. The team from Maryland University discovered that _____ pizza dough in the oven for a longer time made it healthier to eat. They said that doubling the _____ of baking time increased the levels of antioxidants in the mix by up to 100 per cent. Antioxidants help fight cancer and heart _____ and are found in most healthy food. Furthermore, the team experimented with _____ cooking temperatures. Their results showed a higher _____ also made the dough healthier to eat. This new research may help pizza _____

around the world. However, some diet experts warned that even though this research looks good, it is still _____ to eat fruit and vegetables. In addition, pizza that is baked longer may not be so healthy if people _____ unhealthy toppings. Jacqui Lowdon, a British diet _____, warned that although the pizza base might be good for you, people might be “more _____ to choose extra cheese”. She added: "This isn't teaching people about healthy eating." Nevertheless, the study’s _____, Jeffrey Moore, said his findings were good for people who like deep pan pizzas. Meanwhile, _____ London’s Pizza Hut today, pizza fan Jo Lambert said: "This new pizza sounds healthy, _____ not if we have too much or have cola and fries with it.”

13. Look at the following article’s headline and tell whether these sentences are true or false from your point of view.

1) Scientists have discovered a pizza that helps you lose weight.
2) The secret to the new pizza is in how to bake the base.
3) Antioxidants in food help fight some life threatening diseases.
4) Cooking the pizza at a low temperature means it is healthier.
5) Diet experts said the new pizza is healthier than eating fruit.
6) Another expert said people should choose their toppings carefully.
7) The expert said this research teaches us about healthy eating.
8) This study is good news for deep-pan pizza lovers.

14. Find synonyms and arrange them in pairs.

dietician, fat, welcome, enthusiast, overweight, pastry, dough, food, furthermore, writer, diet, nutritionist, choose, conclusions, author, also, findings, good, fan, select.

15. Match the following phrases from the article (sometimes more than one combination is possible).

1. dieticians have found new ways	a) amount of baking time
2. welcome	b) the pizza base
3. different ways of baking	c) people who like deep-pan pizzas
4. doubling the	d) may not be so healthy
5. antioxidants help fight	e) to make pizza that is good for you
6. this new research may help pizza	f) with it
7. pizza that is baked longer	e) sales around the world
8. people might be more	g) news for overweight pizza lovers
9. his findings were good for	h) cancer and heart disease
10. have cola and fries	j) likely to choose extra cheese

16. Work in pairs/groups. Talk about the food below. Rank them from the healthiest to the least healthy. Which do you eat regularly?

- pizza
- burgers
- fried chicken
- noodles
- rice dishes
- fish and chips

17. Talk about each of these pizza toppings. Would you choose to have them on your pizza? Why?

mashed potato, pineapple, corn, chocolate, French fries, seaweed, curry sauce, apple, raisin.

18. With your partner(s), design a new kind of pizza. What are the toppings? How is it different from a normal pizza? Have a class vote on the tastiest-sounding ones.

Unit 3

CHEMISTRY AND ITS BRANCHES

Do you like chemistry?

What was your mark on chemistry at school?

What do you know about the history of chemistry?

Do you know the branches of chemistry?

What branches of chemistry do you prefer?

1. Read and translate the text.

ANCIENT SCIENCE

Chemistry is the science of matter and the changes it undergoes. Chemistry is concerned with the composition, behaviour (or reaction), structure, and properties of matter, as well as the changes it undergoes during chemical reactions.

Ancient Egyptians pioneered the art of synthetic wet chemistry 4,000 years ago. Wet chemistry is a term used to refer to chemistry generally done in the liquid phase. By 1000 BC civilizations were using more complex forms of chemistry such as using plants for medicine, extracting metal from ores, fermenting wine and making cosmetics.

The genesis of chemistry can be traced to the widely observed phenomenon of burning that led to metallurgy – the art and science of processing ores to get metals. The greed for gold led to the discovery of the process for its purification.

The earliest pioneers of chemistry, and inventors of the modern scientific method, were medieval Arab and Persian scholars. They introduced precise observation and controlled experimentation into the field and discovered numerous chemical substances. The emergence of chemistry in Europe was primarily due to

the recurrent incidence of the plague and blights there during the so called Dark Ages. This gave rise to a need for medicines.

Chemistry indeed came of age when Antoine Lavoisier, developed the theory of Conservation of mass in 1783; and the development of the Atomic Theory by John Dalton around 1800.The discovery of the chemical elements has a long history from the days of alchemy and culminating in the discovery of the periodic table of the chemical elements by Dmitri Mendeleev and later discoveries of some synthetic elements.

Modern disciplines within chemistry are traditionally grouped by the type of matter being studied or the kind of study. These include inorganic chemistry - the study of inorganic matter, organic chemistry – the study of carbon based matter, biochemistry – the study of substances found in biological organisms, physical chemistry – the study of chemical processes using physical concepts and analytical chemistry – the analysis of material samples to gain an understanding of their chemical composition and structure. Many more specialized disciplines have emerged in recent years, e.g. neurochemistry the chemical study of the nervous system.

ESSENTIAL VOCABULARY

behaviour *noun* – the way in which a machine or natural phenomenon works or function.

biochemistry *noun* – the branch of science concerned with the chemical and physico-chemical processes and substances which occur within living organisms.

complex *adjective* – consisting of many different and connected parts.

extract *verb* – obtain (a substance or resource) from something by a special method ● *Lead was extracted from the copper*.

give rise to *phrasal verb* – cause to happen decisions which give rise to arguments

inorganic chemistry *noun* – the branch of chemistry that deals with inorganic compounds.

matter *noun* – that which occupies space and possesses rest mass, especially as distinct from energy ● *The structure and properties of matter.*

observation *noun* – the action or process of closely observing or monitoring something or someone.

organic chemistry *noun* – the branch of chemistry that deals with carbon compounds (other than simple salts such as carbonates, oxides, and carbides)

physical chemistry *noun* – the branch of chemistry concerned with the application of the techniques and theories of physics to the study of chemical systems.

precise *adjective* – marked by exactness and accuracy of expression or detail

property *noun* – an attribute, quality, or characteristic of something.

purification *noun* – the process of making something pure, free from anything that debases, pollutes, adulterates, or contaminates.

sample *noun* – a small part or quantity intended to show what the whole is like.

undergo *verb* – experience or be subjected to something.

wet chemistry *noun* – a form of analytical chemistry that uses classical methods such as observation to analyze materials. It is called wet chemistry since most analyzing is done in the liquid phase.

2. Give Ukrainian equivalents for the following word combinations.

the science of matter, liquid phase, complex forms of chemistry, fermenting wine, the genesis of chemistry, widely observed phenomenon, the greed for gold, the modern scientific method, numerous chemical substances, due to the recurrent incidence, a need for medicines, the theory of Conservation of mass, the days of alchemy, the discovery of the periodic table of the chemical elements, the kind of study, carbon based matter, physical concepts, an understanding of chemical composition and structure.

3. Translate the sentences into English.

1) Хімія вивчає речовини, їх властивості і перетворення, що відбуваються в результаті хімічних реакцій.
2) Відповідно до властивостей речовин хімію поділяють на органічну та неорганічну.
3) Багато хімічних речовин при перетворенні можуть набувати складних форм.
4) Ці зразки можна роздивитися під мікроскопом.
5) Сіль сильної кислоти і сильної основи не піддається гідролізу.
6) В останньому випуску університетського опублікували ряд статей про властивості складних карбонових сполук.
7) Хімія як наука виникла доволі давно.
8) Як і всі органічні сполуки пінополістирол горить із виділенням великої кількості тепла.

4. Answer the following questions.

1) What phenomena are studied by chemistry?
2) Who pioneered chemistry?
3) What is “wet chemistry”?
4) What forms of chemistry did civilizations use by 1000 BC? Give examples.
5) When was the genesis of chemistry?
6) What did the greed for gold lead to?
7) Who were the earliest inventors of the modern scientific methods of chemistry?
8) How did chemistry emerge in Europe?
9) When did chemistry indeed come of age?
10) Who discovered the periodic table of the chemical elements?
11) How are disciplines within chemistry traditionally grouped?

12) What is studied by inorganic chemistry, organic chemistry?

13) What is studied by biochemistry, physical chemistry?

5. Match 1 – 8 to a – h.

1)	analytical chemistry	a)	is the study of the structure, properties, composition, mechanisms, and reactions of organic compounds
2)	biochemistry	b)	is the study of the properties and reactions of inorganic compounds
3)	inorganic chemistry	c)	is the study of the physical and fundamental basis of chemical systems and processes
4)	materials chemistry	d)	is the analysis of material samples to gain an understanding of their chemical composition and structure
5)	neurochemistry	e)	is the study of the chemicals, chemical reactions and chemical interactions that take place in living organisms
6)	nuclear chemistry	f)	is the study of how subatomic particles come together
7)	organic chemistry	g)	is the preparation, characterization, and understanding of substances with a useful function

8) physical chemistry

h) is the study of neurochemicals including transmitters, peptides, proteins, lipids, sugars, and nucleic acids

6. Read the sentences and say if they are true to the text or false. Correct the mistakes.

1) Chemistry is the science about immune system.
2) Chemistry is concerned with the changes matter undergoes during chemical reactions.
3) Ancient Egyptians pioneered the art of dry chemistry 4,000 years ago.
4) Wet chemistry means that chemistry is done in the solid phase.
5) The genesis of chemistry can be traced to the widely observed phenomenon of cooling.
6) Starving led to the discovery of the process of purification.
7) In the XXI century an epidemic of plague gave rise to a need for medicines.
8) Gregor Mendel developed the theory of Conservation of mass.
9) Dmitri Mendeleev discovered the periodic table of the chemical elements.
10) Inorganic chemistry is the study of carbon based matter.
11) Analytical chemistry is the analysis of material samples.

7. Study the OPSHACOM rule and adjective word order. Put the following words into the correct order.

The word OPSHACOM will help you remember:

OPINION SHAPE AGE COLOUR ORIGIN MATERIAL

Here are some examples of adjectives:

OPINION	SHAPE	AGE	COLOUR	ORIGIN	MATERIAL
lovely	big	young	red	British	steel
excellent	square	old	brown	Chinese	cotton
silly	round	ancient	yellow	Canadian	liquid

1) elderly / tall / Englishman.
2) oval / Venetian / ancient / valuable / glass.
3) shiny / large / expensive / brown / leather / case.
4) square / wooden / old / nice / table.
5) modern / stone / large / beautiful / cottage.
6) porcelain / tea / blue / thin / old / cup.
7) young / blonde / handsome / tall / man.
8) old / several / English / beautiful / castles.
9) pretty / French / young / a lot of / girls.
10) dark blue / best / silk / my / shirt.
11) young / many / factory / German / workers.

8. Give the plural forms of the following words came from Latin and Greek and give their Ukrainian translations.

phenomenon, basis, bacterium, thesis, index, focus, criterion, datum, equilibrium, medium, synthesis, analysis, curriculum, symposium, spectrum, maximum, vacuum, stratum, hypothesis, phases, nucleus.

9. Choose the correct variant of the given nouns.

1) This phenomena/phenomenon follows the Newton Law.
2) Data/datum speaks in favour of this theory.
3) This hydrolysis/hydrolyses follows the above scheme.
4) Conclusive proof for the dioxin structure of IV was acquired through independent synthesis/syntheses.
5) This thesis/theses holds for more general cases of isomerization.
6) The free proton resembles a particle consists of a nuclei/nucleus without planetary electrons.

7) The motion of a valence electron in its orbital is equivalent to the flow of a current in the loci/locus of its motion.
8) The data fit accurately into this formulae/formula.
9) Give the report when analysis/analyses are complete.
10) These workers examined the spectra/spectrum of seventy nitrides.

10. Revise your knowledge about simple tenses. Open the brackets using Present, Past or Future Simple.

1) I (to go) to bed at ten o'clock every day.
2) 2(to go) to bed at ten o'clock yesterday.
3) I (to go) to bed at ten o'clock tomorrow.
4) I (not to go) to the cinema every day.
5) I (not to go) to the cinema yesterday.
6) I (not to go) to the cinema tomorrow.
7) You (to watch) TV every day?
8) You (to watch) TV yesterday?
9) You (to watch) TV tomorrow?
10) When you (to leave) home for university every day?
11) When you (to leave) home for university yesterday?
12) When you (to leave) home for university tomorrow?
13) My brother (to go) to work every day. He (to leave) home at a quarter past eight. He (to walk) to his office. He (not to take) a bus. Yesterday he (not to go) to work. Yesterday he (to get) up at nine o'clock.
14) What you (to buy) at the shop yesterday? - I (to buy) a book.
15) Yesterday my father (not to read) newspapers because he (to be) very busy. He (to read) newspapers tomorrow.

11. Read and translate the text.

GAS CHROMATOGRAPHY

Gas chromatography is a method for separating components of mixtures of volatile compounds. In most applications the separations are made to identify and determine the quantity of each component of a sample of the mixture, and analytical gas chromatographic apparatus includes additional devices for this purpose. In some applications, separations are made for preparative purposes, but the scale is not generally greater than that required for quantities of the order of 100 g.

The central item in the apparatus for gas chromatography is the chromatographic column, a long tube packed permeably with some adsorbent. In the commonest technique of gas chromatography, the elution technique, a stream of inert gas, the carrier gas, passes continuously through the column, and the mixture to be separated is introduced at the beginning of the column as a sample either of a gas or a volatile liquid. Let us suppose that the sample consists of one pure component. After introduction, it is swept by the carrier gas on to the column, first evaporating to form a vapour if it is introduced as a liquid. When it reaches the column, it is largely adsorbed, but the equilibrium is set up between the column and the gas in the interstices of the column so that a proportion of the sample always remains in the gas phase. This portion moves a little further along the column in the carrier gas stream, where it again equilibrates with the column. At the same time, material already adsorbed in the column re-enters the gas phase so as to: restore equilibrium with the clean carrier gas which follows up the zone of vapour.

The speed at which the zone moves depends on two factors, the rate of flow of the carrier gas and the extent to which the vapour is adsorbed. The faster the flow of carrier gas, the faster the zone moves; and the more strongly the vapour is adsorbed on the column, the more slowly the zone moves. When two or more components are present in the sample, each usually behaves, independently of the others so that for a given carrier gas flow rate, the speed of the zone of each component will depend on the extent to which it is adsorbed. Since different

substances differ in their adsorption, they may therefore be separated by making use of their different speeds of progress through the column. If they are eluted to the far end of the column they will appear one after the other in the gas stream, the fastest first and the slowest last.

Adsorbents such as carbon, alumina, or silica gel are used as the packing material for columns, but in more than 90% of applications, the column material is a liquid held in place on the column by being adsorbed on an inert solid support. Gas chromatography with this kind of column is called Gas Liquid Chromatography (G.L.C.). This method is used for separating solutes from mixed solutions.

12. Give Ukrainian equivalents to the following phrases.

gas chromatography, components of mixtures of volatile compounds, analytical gas chromatographic apparatus, additional devices, for preparative purposes, long tube, elution technique, stream of inert gas, carrier gas, volatile liquid, pure component, restore equilibrium, zone of vapour, separating solute.

***13. Answer the following questions*.**

1) What does gas chromatography mean?
2) What is the central item in the apparatus for gas chromatography?
3) What gas passes through the column?
4) How does the process of chromatography pass?
5) What are adsorbents such as carbon, alumina, or silica gel used for?
6) What method is used for separating solutes from mixed solutions?

14. Make a report or presentation about the famous chemist you know. Tell it to your group and vote for the most interesting report/ presentation.

Unit 4

BIOLOGY

How does biology refer to biotechnology?
Why should biotechnologists study biology?

1. Read and translate the text.

THE SCIENCE OF LIFE

Biology is the study of living things and their vital processes. Because biology covers such a broad area, it has been traditional to separate the study of plants (botany) from that of animals (zoology), and the study of structure of organisms (morphology) from that of function (physiology). Despite their apparent differences, all the subdivisions are interrelated by basic principles, so current practice investigate those biological phenomena that all living things have in common. The advancement of knowledge and technology has resulted in further categorizations that include: cell biology, population biology, ecology, genetics, biochemistry, molecular biology, microbiology, physical anthropology, etc.

The foundations of modern biology include four components: cell theory; that life is made of fundamental units called cells; evolution, that life is not deliberately designed by rather evolves incrementally through random mutations and natural selection; gene theory, that tiny molecular sequences of DNA dictate the entire structure of an organism and are passed from parents to offspring; and homeostasis, that each organism's body includes a complex suite of processes designed to preserve its biochemistry from the entropic effects of the external environment.

It is not known when the study of biology originated, but it can be safely assumed that early humanoids had some experimental knowledge of the animals

and plants around them. One's very survival relied on the recognition of poisonous plants and on the basic understanding of the habits of predators. Many of the earliest records of biology come from the bas-reliefs left behind by the Assyrians and Babylonians. There is growing evidence from China and India as early as 2500 BC that there were general practices of therapeutic healing, silkworm use to produce silk, biological control of crops, and agricultural cultivation.

With the arrival of Greek civilization, the study of biology shifted dramatically to a belief that every event has a cause and that a particular cause produces a particular effect. These philosophers of science assumed the existence of a natural law governing the universe. Although they established the science of biology, their greatest contribution to science was the idea of rational thought.

The basic picture in biology has stayed roughly the same since DNA was first imaged using x-ray crystallography in the 1950s, although there are constant refinements to the details, and life is so complex that it could be centuries or even millennia before we begin to understand it in its entirety. But it should be made clear that we are moving towards complete understanding: life, while complex, consists of a finite amount of complexity that only appreciably increases on relatively long timescales of hundreds of thousands or millions of years. Evolution, while creative, operates slowly.

In recent years, much excitement in biology has centred on the sequencing of genomes and their comparison, called genomics, and the creation of life with custom-written DNA programming, called synthetic biology. These fields are sure to continue grabbing the headlines in the near future.

ESSENTIAL VOCABULARY

cause *verb* – make (something, especially something bad) happen ● *This disease can cause blindness.*

cell *noun* – he smallest structural and functional unit of an organism, which is typically microscopic and consists of cytoplasm and a nucleus enclosed in a membrane.

consist of *verb* – be composed or made up of ● *The crew consists of five men.*

constant *adjective* – occurring continuously over a period of time ● *The constant background noise of the city.*

evolution *noun* – 1) the process by which different kinds of living organism are believed to have developed from earlier forms during the history of the earth ● *The idea of organic evolution was proposed by some ancient Greek thinkers but was long rejected in Europe as contrary to the literal interpretation of the Bible. Lamarck proposed a theory that organisms became transformed by their efforts to respond to the demands of their environment. Lyell demonstrated that geological deposits were the cumulative product of slow processes over vast ages. This helped Darwin towards a theory of gradual evolution over a long period by the natural selection of those varieties of an organism slightly better adapted to the environment and hence more likely to produce descendants. Combined with the later discoveries of the cellular and molecular basis of genetics, Darwin's theory of evolution has, with some modification, become the dominant unifying concept of modern biology.* 2) the gradual development of something the forms of written languages undergo constant evolution.

evolve *verb* – 1) develop gradually ● *The company has evolved into a major chemical manufacturer* 2) (with reference to an organism or biological feature) develop over successive generations as a result of natural selection.

finite *adjective* – limited in size or extent ● *Every computer has a finite amount of memory.*

fundamental *noun* – unit each of a set of unrelated units of measurement, which are arbitrarily defined and from which other units are derived.

gene *noun* – 1) (in informal use) a unit of heredity which is transferred from a parent to offspring and is held to determine some characteristic of the offspring ● *Playing tennis is in my genes.* 2) (in technical use) a distinct sequence of nucleotides forming part of a chromosome, the order of which determines the order of monomers in a polypeptide or nucleic acid molecule which a cell (or virus) may synthesize.

homeostasis *noun* – the tendency towards a relatively stable equilibrium between interdependent elements, especially as maintained by physiological processes.

morphology *noun* – 1) the study of the forms of things, in particular. 2) the branch of biology that deals with the form of living organisms, and with relationships between their structures.

natural selection *noun* – the process whereby organisms better adapted to their environment tend to survive and produce more offspring. The theory of its action was first fully expounded by Charles Darwin, and it is now regarded as be the main process that brings about evolution.

offspring *noun* – person's children or an animal's young.

physiology *noun* – the branch of biology that deals with the normal functions of living organisms and their parts.

preserve *verb* – maintain (something) in its original or existing state ● *All records of the past were zealously preserved.*

refinement *noun* – the improvement or clarification of something by the making of small changes.

separate *verb* – divide into constituent or distinct elements.

subdivision *noun* – 1) a secondary or subordinate division 2) any taxonomic subcategory, especially (in botany) one that ranks below division and above class.

survival *noun* – the state or fact of continuing to live or exist, typically in spite of an accident, ordeal, or difficult circumstances ● *The animal's chances of survival were pretty low.*

2. Give Ukrainian equivalents.

a broad area, apparent differences, biological phenomena, the foundations of modern biology, random mutations, tiny molecular sequences of DNA, a complex suite of processes, early humanoids, poisonous plants, the habits of predators, growing evidence, therapeutic healing, every event has a cause, a natural law,

greatest contribution, rational thought, constant refinements to the details, complete understanding, finite amount of complexity, sequencing of genomes, custom-written DNA programming.

3. Answer the following questions according the ideas of the text.

1) What is biology?
2) How is biology traditionally separated?
3) How are the subdivisions of biology interrelated?
4) What components do the foundations of modern biology include?
5) When did the study of biology originate?
6) Who were the first people having biological knowledge?
7) Where did the first records about biology come from?
8) What practiced in China in 2500 BC?
9) What did Greek civilization bring to biological knowledge?
10) When did the picture in biology become stable?
11) When will we probably understand the biological entity?
12) What is the most developing modern area of biology?

4. Say if these statements true or false according to the text. Correct where necessary.

1) Biology is the study of living things and their vital processes.
2) All the subdivisions of biology are interrelated by chemical structures of organisms.
3) The foundations of modern biology include five components.
4) Cell theory says that life is not designed by mutations and natural selection
5) Gene theory says that our genetic structure is passed from parents to offspring.
6) We definitely know when the study of biology originated

7) The earliest records of biology come from China.
8) With the arrival of Greek civilization people started to believe in the idea of rational thought.
9) The basic picture in biology has stayed stable since x-ray crystallography was used in Ukrainian hospitals.
10) Evolution operates fast.
11) Synthetic biology deals with new agricultural products.

5. The Preposition. Fill in the blanks with the prepositions of time in, on, at ***where necessary.***

1) I usually finish work early _____ Friday. I don't work _____ the weekend. Let's meet _____ five _____ Sunday, July 14.
2) I am busy _____ the moment. Come _____ ten minutes' time, please.
3) There was a boat race in Southampton _____ Easter Day. A lot of people usually come there _____ Easter to see the race.
4) Can you imagine what the world will be _____ the year 2100?
5) When will you have your holiday, _____ winter or _____ summer? – I'll have it late _____ August.
6) We started the off _____ midnight and reached the place of destination _____ twelve hours _____ noon.
7) I was in France in 1997. _____ that time I was working as a waiter in a small cafe.
8) _____ the age of sixteen he left his parents' house.
9) _____ her wedding day she got up _____ dawn.
10) You must come and start doing electrophoresis _____ next Thursday. Are you free _____ Thursday?
11) I received a lot of presents _____ my birthday.
12) Leonardo da Vinci lived and worked _____ the Middle Ages.

13) _____ every day he got up early _____ the morning and went to bed late _____ night.
14) _____ the 19th century many people died of cholera and smallpox.

6. Fill in the blanks with prepositions of place at, in, on.

1) Excuse me, can you tell me where the concert hall is? – Turn _____ the right _____ the roundabout. It's _____ the corner of the square.
2) We spent our holiday _____ the south coast of France.
3) He lives _____ the tenth floor _____ the centre of the city.
4) There was a black spot _____ the back of the cultivation tray.
5) There were no vacant chairs to sit _____ so he sat _____ the armchair _____ the corner.
6) Do you know that Englishmen drive _____ the left?
7) Look, how many stars there are _____ the sky!
8) I'm going to the concert _____ the Central Concert Hall tomorrow.
9) The delegation was met _____ the airport.
10) I don't want to sit _____ the back row, let's sit _____ the front.
11) At first it seemed that there wasn't his name _____ the list, but then he found it _____ the bottom of the page.
12) _____ my way home I saw Helen. She was standing _____ the bus stop.
13) She did not want anybody to see her, so she sat _____ the back of the car.
14) We were ___ the restaurant yesterday. There were a lot of delicious things _____ the menu.

7. Fill in the blanks with the appropriate prepositions where necessary.

1) I got lost _____ Mike's house! I went _____ my bedroom, walked _____ a corridor, came _____ the lounge, walked _____ an arch,

went _____ some stairs and _____ tend I found myself _____ my bedroom again.

2) Do you know that Alice is _____ love _____ Pete?
3) While you dress _____ dinner, I'll go _____ the shop _____ the road. I'll be _____ time.
4) The news _____ the accident came _____ a great shock _____ him.
5) Let's look at my school photo. Can you recognise me _____ it? – I think you are _____ left corner. – No, you are mistaken. I am _____ the back _____ the last row.
6) _____ the Middle Ages London was rather a big city. _____ the 16th century it became a prosperous capital.
7) Sit _____ the armchair and write your name _____ block letters _____ the top of the page. Write all dates _____ words, not _____ figures.
8) Sicily isan island _____ the coast _____ Italy.
9) I am afraid, I won't be able to find the theatre. – Oh, our town is rather small and you'll find it easily. Go _____ bus till Victoria Station. Turn right _____ the square. _____ the theatre there are two palms, and _____ the theatre there is a swimming pool. _____ the theatre there is a coffee bar.
10) The typist sits _____ the chair, with a lamp _____ her.

8. Read and translate the text.

CYTOLOGY AS A SCIENCE

Cytology means "the study of cells". Cytology is that branch of life science, which deals with the study of cells in terms of structure, function and chemistry. Based on usage it can refer to cell biology.

Cell biology is a scientific discipline that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division and death. This is done both on a microscopic and molecular level. Cell biology research encompasses both the great diversity of single-celled organisms like bacteria, as well as the many specialized cells in multicellular organisms such as humans.

The cell is the functional basic unit of life discovered by Robert Hooke. It is the smallest unit of life that is classified as a living thing, and is often called the building block of life. Some organisms, such as most bacteria, are unicellular (consist of a single cell). Other organisms, such as humans, are multicellular. Humans have about 100 trillion cells; a typical cell size is 10 micrometres and a typical cell mass is 1 nanogram. The largest known cells are unfertilized ostrich egg cells, which weigh 3.3 pounds.

The cell theory, first developed in 1839 by Matthias Jakob Schleiden and Theodor Schwann, states that all organisms are composed of one or more cells, that all cells come from pre-existing cells, that vital functions of an organism occur within cells, and that all cells contain the hereditary information necessary for regulating cell functions and for transmitting information to the next generation of cells.

The word *cell* comes from the Latin *cellula*, meaning a small room. The descriptive term for the smallest living biological structure was coined by Robert Hooke in a book he published in 1665 when he compared the cork cells he saw through his microscope to the small rooms monks lived in.

The cell consists of different proteins. Each type of protein is usually sent to a particular part of the cell. Most proteins are synthesized by ribosomes in the rough endoplasmic reticulum. This process is known as protein biosynthesis.

Appreciating the similarities and differences between cell types is particularly important to cell and molecular biology as well as to biomedical fields such as cancer research and developmental biology. Therefore, research in cell biology is

closely related to genetics, biochemistry, molecular biology, immunology and developmental biology.

9. Give English equivalents.

Багатоклітинні організми, молекулярна біологія, ділення, клітина, спадкова інформація, органели, яйцеклітина, дослідження раку, розділ (науки), мати справу з, бактерії, молекулярний рівень, цитологія.

10. Answer the questions.

1) What is cytology?
2) Is cytology and biology of a cell the same science?
3) What does cell biology study?
4) Who discovered the cell?
5) Is a cell the smallest unit of life?
6) Give examples of unicellular and multicellular organisms.
7) What cells are the largest known cells?
8) Who developed the cell theory?
9) Where does the word cell come from?
10) What is it inside the cell?
11) What is biosynthesis?
12) What sciences are related to the cell biology closely?

11. Put the words in the right order and write down the sentences.

1) that studies cells / is / scientific / a/ cell biology / discipline /
2) basic / the /cell / life / functional / of / is / the /unit /
3) of / called/ life / the cell / often / the building block / is /
4) and / 10 /mass /a /typical/ size / nanogram/ is / a cell / is /1/cell / μm / typical /

5) for / that /the next / functions / and / regulating / all / the / information / contain / for / cell / hereditary/ to / necessary / generation / cells / cells / information / of / transmitting
6) a / differences / these / unifying / similarities / and / theme fundamental / provide

12. Translate the sentences into Ukrainian.

1) Біологія клітини – розділ біології, який вивчає живі клітини, їх органели, будову, функціонування, процеси клітинного старіння та смерті.
2) Найважливішим доповненням клітинної теорії стало твердження відомого німецького натураліста, що кожна клітина утворюється в результаті ділення іншої клітини.
3) Біологія розвитку – розділ сучасної біології, що вивчає процеси індивідуального розвитку організму.
4) Завдяки досягненням в області імунології створюються нові технології для діагностування та лікування захворювань, виробництва та застосування лікарських препаратів.
5) Цей процес необхідно вивчати на клітинному рівні.
6) Життєвий цикл – закономірна змін всіх поколінь, характерних для даного виду живих організмів.

13. Think about unreal cell or cells of your dream and describe them (100-150 words). How do they look like? What properties do they have?

14. Write an essay on the following topics.

The future of cytology.
How cytology can help the mankind?

Unit 5

EMBRYOLOGY

1. Read and translate the text.

WHAT IS EMBRYOLOGY?

Embryology is the study of the formation of life, part of the studies with which developmental biology is concerned. Developmental biology examines how all forms of life begin, and how they develop into fully formed and functioning organisms.

Embryology looks at the very beginning of life from the one-celled organism, egg or sperm. Embryologists examine fertilization and track the development of the embryo until it bears a resemblance to its progenitors. For example, in human conception, embryologists would be interested in both sperm and egg, and the meeting of the two, and then would follow egg implantation and the growth of an embryo until it reaches the fetal stage. So in humans, the study of an embryo would last until about the second month of a pregnancy.

Aristotle was one of the first to champion the theory of epigenesis, the concept that life forms develop into complex organisms from fertilization. This was not a popular concept and was largely discarded in favour of the theory of preformation, which suggested that each human sperm was already a person in waiting. In the mid 18th century, Caspar Fredriech Wolff again set forth the concept of epigenesis. Through his study of chick embryos, Wolff realized that the body of an organism has stages of development. Through vivisection, he observed the complexity of specific organs and contended that their development could not simply have occurred spontaneously, but must have developed over time.

Later scientists followed his studies, and with the development and subsequent improvements of the microscope, Wolff's theories were found to be

quite accurate. Wolff is credited as the "Father of Embryology," even though he did not first conceptualize epigenesis. Today, the theories of embryology are easier to prove because of the accuracy with which we can examine DNA codes within a cell.

There are several practical applications of embryology in the modern world. Embryology has given doctors the tools to create fertilized eggs for in vitro implantation. Embryology can also identify risk factors for serious genetic conditions within the fertilized egg and select the most viable eggs for implantation. The study of embryology has led directly to the concept of cloning, either for a whole organism or parts of an organism.

ESSENTIAL VOCABULARY

accuracy *noun* – the quality or state of being correct or precise.

accurate *adjective* – (especially of information, measurements, or predictions) correct in all details; exact accurate information about the illness is essential.

application *noun* – the action of putting something into operation.

developmental *adjective* – concerned with the development of someone or something ● *Developmental biology.*

doubt *verb* – feel uncertain about.

embryo *noun* – an unborn or unhatched offspring in the process of development.

embryology *noun* – the branch of biology and medicine concerned with the study of embryos and their development.

examine *verb* – inspect (someone or something) thoroughly in order to determine their nature or condition.

fertilization *noun* – the action or process of fertilizing an egg or a female animal or plant, involving the fusion of male and female gametes to form a zygote.

fetal *adjective* – relating to a fetus.

fetus *noun* – an unborn or unhatched offspring of a mammal, in particular, an unborn human more than eight weeks after conception.

implantation *verb* – (in a mammal) the attachment of the fertilized egg or blastocyst to the wall of the womb at the start of pregnancy.

in vitro *adverb & adjective* – (of processes or reactions) taking place in a test tube, culture dish, or elsewhere outside a living organism.

legislation *noun* – laws, considered collectively.

pregnancy *noun* – the condition or period of being pregnant.

resemblance *noun* – 1) the state of resembling or being alike ● *There was a close resemblance between herself and Anne* 2) a way in which two or more things are alike ● *The physical resemblances between humans and apes.*

epigenesis *noun* – the theory, now generally held, that an embryo develops progressively from an undifferentiated egg cell.

preformation *noun* – the theory, now discarded, that an embryo develops from a complete miniature version of the organism.

vivisection *noun* – the practice of performing operations on live animals for the purpose of experimentation or scientific research (used only by opponents of such work).

2. Translate the sentences into English.

1) Ембріологія – наука, що вивчає розвиток зародку.
2) Зародком називають будь-який організм на ранніх етапах розвитку до народження або вилуплювання чи моменту проростання.
3) Розрізняють ембріологію тварини і людини та ембріологію
4) Багато вчених не сумніваються в істинності даного припущення.
5) Під час дослідження була виявлена коммітована (commited) клітина-попередник.
6) На стадії зародку можна оцінити якість ембріону по ступеню фрагментації.

3. Use dictionary and write down the definitions to the following words.

cloning

fetal stage

4. Say if these statements are true or false.

1) Cytology is the study of the formation of life.
2) Embryology looks at the very beginning of life from the multi-celled organism, egg or sperm.
3) Embryologists examine fertilization.
4) So in humans, the study of an embryo would last until about the first month of a pregnancy.
5) Caspar Fredriech Wolff was one of the first to champion the theory of epigenesis.
6) Wolff realized that the body of an organism has stages of development.
7) Aristotle is credited as the "Father of Embryology," even though he did not first conceptualize epigenesis.
8) Today, the theories of embryology are easier to prove because of the accuracy with which we can examine RNA codes within a cell.
9) Embryology has given doctors the tools to create fertilized eggs for in vivo implantation.

5. Revise you knowledge about pronouns and choose the correct form in brackets.

1) What colour is the litmus paper? It is so far that I can't see (it's/its/it) colour.
2) They rarely drive to (their/them/ theirs) lab. They live near (it's/it/its).
3) Look at (me/ mine/my) new watch. Do you like (it/them/its)?
4) These books are (her/hers). Give (them/their/theirs) to (hers/ her).

5) Do you like (you/your/yours) new car? – Oh, (it's/it/its) has never let me down yet.
6) (Theirs/Their/ Them) work is much more difficult than (you/yours/ your) or (me/mine/my).
7) Why are (you/your/yours) sitting here? It is not (you/your/yours) desk, it is (me/mine/my).
8) This tape recorder of (her/hers/she) is always out of order. – But so is (you/your/yours)!
9) She has not read a line of (you/your/yours), how can she criticize (you/your/yours) books?
10) The clock has stopped. Something may be wrong with (it's/it/its) spring.

6. Translate the sentences into English.

1) Хто там? – Відкрийте, це я.
2) Мій будинок на правій стороні вулиці, а їх – на лівій.
3) Їх човен був швидший за наш.
4) Як звати вашого собаку? Його звати Квін.
5) В цьому районі будують нову дорогу. Її довжина більш трьохсот кілометрів.
6) Це ваша ручка, а це його, але де ж моя?
7) Вона взяла мої ключі замість своїх.
8) Найкращий план – ваш.
9) Чию роботу будуть перевіряти – Джона чи Кет?
10) Його машина невелика, але її двигун дуже потужний.

7. Read and translate the text.

PHYSIOLOGY OF PLANTS AND ANIMALS

Although you may place organisms without difficulty in either the plant or the animal kingdom, it is essential to know the basic differences between these two groups. That`s why we can distinguish physiology of plants and animals.

Plant physiology. It is a subdiscipline of botany concerned with the functioning, or physiology of plants. Closely related fields include plant morphology (structure of plants), plant ecology (interactions with the environment), photochemistry (biochemistry of plants), cell biology, and molecular biology. The scope of plant physiology as a discipline may be divided into several major areas of research.

First, the study of photochemistry (plant chemistry) is included within the domain of plant physiology. To function and survive, plants produce a wide array of chemical compounds not found in other organisms. Photosynthesis requires a large array of pigments, enzymes, and other compounds to function. Secondly, plant physiology includes the study of biological and chemical processes of individual plant cells. Plant cells have a number of features that distinguish them from cells of animals, and which lead to major differences in the way that plant life behaves and responds differently from animal life. Thirdly, plant physiology deals with interactions between cells, tissues, and organs within a plant. Different cells and tissues are physically and chemically specialized to perform different functions. Fourthly, plant physiologists study the ways that plants control or regulate internal functions. Like animals, plants produce chemicals called hormones which are produced in one part of the plant to signal cells in another part of the plant to respond. Finally, plant physiology includes the study of how plants respond to conditions and variation in the environment, a field known as environmental physiology.

Animal physiology. It is the study of animal functions. Animal physiology is subdivided into the four main parts, such as general physiology, special physiology, comparative physiology and age physiology.

General physiology deals with the analysis of such universal and important processes as blood circulation, metabolism, respiration etc. Special physiology

applies general physiological principles in order to investigate characteristics of a particular animal species. Comparative physiology concentrates on similarities and differences of physiological functions of various living organisms. The problem of how physiological functions change with animal age is of special interest to age physiology.

The main approach in animal physiology is to study the evolutionary origins of the physiological mechanisms in order to understand the significance of these mechanisms for modern animals. Modern physiology which is based on chemical, physical and anatomical methods investigates biological organization of the animal body at different levels, that is, cells, tissues, organs.

One of the parts of special physiology is devoted to farm animal physiology. The aim of this science is not only to study physiological functions of the farm animal body, but to control them in order to increase the production of eggs, offspring, milk, meat and wool.

Other major branches of scientific study that have grown out of physiology research include biochemistry, biophysics, biomechanics, pharmacology, cytology as well as genetics which are known as the biological bases for rational animal husbandry.

8. Translate the sentences into English.

1) Фізіологія рослин – це наука про функціональну активність рослинних організмів.
2) Завдання фізіології рослин: вивчення закономірностей життєдіяльності рослин, розробка теоретичних основ отримання максимальних врожаїв сільськогосподарських культур, розробка установок для здійснення процесів фотосинтезу в штучних умовах.
3) Фотосинтез – процес утворення органічних речовин з вуглекислого газу і води на світлі за участю фотосинтетичних пігментів.

4) Фізіологія рослин – біологічна наука, що вивчає загальні закономірності життєдіяльності рослинних організмів.
5) Сьогодні молекулярна біологія має в своєму розпорядженні великий арсенал методів, що дозволяють вирішувати найскладніші завдання, що стоять перед вченими.
6) Вся історія людства – це історія його боротьби за виживання, історія взаємодії з навколишнім середовищем.
7) Кожна клітина рослин даного виду містить в своєму ядрі однаковий набір (або набори) хромосом.
8) Циркуляція крові може бути відновлена, наприклад, за допомогою харчових добавок.
9) Вікова фізіологія – розділ фізіології людини і тварин, що вивчає закономірності становлення і розвитку фізіологічних функцій організму протягом онтогенезу - від запліднення яйцеклітини до кінця життя.

9. Fill in the gaps in the following sentences.

1) Plant physiology is a subdiscipline of _____ concerned with the functioning, or physiology of plants.
2) To function and survive, plants produce a wide array of _____ not found in other organisms.
3) Plant cells have a _____ which restricts the shape of plant cells and thereby limits the flexibility and mobility of plants.
4) Different cells and tissues are physically and chemically specialized to perform different _____.
5) Like animals, plants produce chemicals called _____ which are produced in one part of the plant to signal cells in another part of the plant to respond.
6) Animal physiology is subdivided into the four main parts, such as_____, _____, _____ and _____.

7) The main approach in animal physiology is to study the _____ of the physiological mechanisms in order to understand the significance of these mechanisms for modern animals.

10. Answer the questions.

1) What does physiology study?
2) What are the main parts of physiology?
3) What stimulated the development of animal physiology?
4) What problems are of special interest to animal physiologists?
5) What are the main principles of physiological study?
6) How can the knowledge of physiological reactions help to maintain healthy farm animals?
7) What sciences are based on physiology research?
8) What is the main approach in animal physiology?

11. Arrange the following statements in their logical order.

- Plant physiology deals with interactions between cells, tissues, and organs within a plant.
- Plant physiology includes the study of biological and chemical processes of individual plant cells.
- Plant physiology is a subdiscipline of botany concerned with the functioning, or physiology of plants.
- Other major branches of scientific study that have grown out of physiology research.
- Plant physiology includes the study of how plants respond to conditions and variation in the environment.
- Animal physiology is the study of animal functions.

- The field of plant physiology includes the study of all the internal activities of plants
- The study of phytochemistry (plant chemistry) is included within the domain of plant physiology.
- The main approach in animal physiology is to study the evolutionary origins of the physiological mechanisms.

12. Make a report "What problems are animal and plant physiologists investigating now?"

Unit 6

BIOCHEMISTRY

Do you know the subject of biochemistry?

What is a biomolecule?

What kind of biomolecules do you know?

What is DNA?

1. Read and translate the text.

BIOLOGICAL CHEMISTRY

Biochemistry, sometimes called biological chemistry, is the study of chemical processes in living organisms, including, but not limited to, living matter.

Biochemistry governs all living organisms and living processes. By controlling information flow through biochemical signalling and the flow of chemical energy through metabolism, biochemical processes give rise to the incredible complexity of life. Much of biochemistry deals with the structures and functions of cellular components such as proteins, carbohydrates, lipids, nucleic acids and other biomolecules although increasingly processes rather than individual molecules are the main focus. Over the last 40 years biochemistry has become so successful at explaining living processes that now almost all areas of the life sciences from botany to medicine are engaged in biochemical research. Today the main focus of pure biochemistry is in understanding how biological molecules give rise to the processes that occur within living cells which in turn relates greatly to the study and understanding of whole organisms.

Among the vast number of different biomolecules, many are complex and large molecules (called biopolymers), which are composed of similar repeating subunits (called monomers). Each class of polymeric biomolecule has a different set of subunit types. For example, a protein is a polymer whose subunits are

selected from a set of 20 or more amino acids. Biochemistry studies the chemical properties of important biological molecules, like proteins, and in particular the chemistry of enzyme-catalysed reactions.

The biochemistry of cell metabolism and the endocrine system has been extensively described. Other areas of biochemistry include the genetic code (DNA, RNA), protein synthesis, cell membrane transport, and signal transduction.

Researchers in biochemistry use specific techniques native to biochemistry, but increasingly combine these with techniques and ideas from genetics, molecular biology and biophysics. There has never been a hard-line between these disciplines in terms of content and technique. Today the terms molecular biology and biochemistry are nearly interchangeable.

ESSENTIAL VOCABULARY

amino acid *noun* – a simple organic compound containing both a carboxyl and an amino group ● *Amino acids occur naturally in plant and animal tissues and form the basic constituents of proteins. There are about twenty common amino acids, of which the simplest is glycine.*

biopolymer *noun* – a polymeric substance occurring in living organisms, e.g. a protein, cellulose, or DNA.

cell membrane *noun* – the semipermeable membrane surrounding the cytoplasm of a cell.

complex *adjective* – consisting of many different and connected parts endocrine system.

engage *verb* – to be doing or to become involved in an activity.

enzyme *noun* – a substance produced by a living organism which acts as a catalyst to bring about a specific biochemical reaction ● *Most enzymes are proteins with large complex molecules whose action depends on their particular molecular shape. Some enzymes control reactions within cells and some, such as the enzymes involved in digestion, outside them.*

catalyse *verb* – cause or accelerate (a reaction) by acting as a catalyst.

reaction *noun* – a chemical process in which substances act mutually on each other and are changed into different substances, or one substance changes into other substances.

give rise to *verb* – cause or induce to happen.

govern *verb* – control, influence, or regulate (a person, action, or course of events).

in terms of – with regard to the particular aspect or subject specified ● *There has never been a hard-line between these disciplines in terms of content and technique.*

interchangeable *adjective* – things that are interchangeable can be exchanged with each other without it making any difference.

lipids *noun* – any of a class of organic compounds that are fatty acids or their derivatives and are insoluble in water but soluble in organic solvents. They include many natural oils, waxes, and steroids.

metabolism *noun* – the chemical processes that occur within a living organism in order to maintain life ● *Two kinds of metabolism are often distinguished: constructive metabolism, the synthesis of the proteins, carbohydrates, and fats which form tissue and store energy, and destructive metabolism, the breakdown of complex substances and the consequent production of energy and waste matter.*

nucleic acid *noun* – a complex organic substance present in living cells, especially DNA or RNA, whose molecules consist of many nucleotides linked in a long chain.

occur *verb* – exist or be found to be present in a place or under a particular set of conditions.

protein *noun* – any of a class of nitrogenous organic compounds which have large molecules composed of one or more long chains of amino acids and are an essential part of all living organisms, especially as structural components of body tissues such as muscle, hair, etc., and as enzymes and antibodies.

subunit *noun* – a distinct component of something. ● *Chemical subunits of human DNA.*

transduction *noun* – the process by which foreign DNA is introduced into a cell by a virus or viral vector.

2. Fill in the gaps.

1) Biochemistry is the study of _____ in living organisms.
2) Much of biochemistry deals with _____of cellular components such as _____.
3) Over the last _____ years biochemistry has become so successful at explaining living processes.
4) Today the main focus of pure biochemistry is in _____ how biological molecules give rise to the processes that _____within living cells.
5) Each class of polymeric _____ has a different set of subunit types.
6) _____ is a polymer whose subunits are selected from a set of 20 or more amino acids.
7) The biochemistry of cell _____and the _____system has been extensively described.
8) Researchers in biochemistry use specific _____ native to biochemistry.
9) Today the terms _____and biochemistry are nearly interchangeable.

3. Study additional notions concerning biochemistry and explain them.

Chromotography

Coomassie dye

Electrophoresis

Peptides

ELSA

IgG

Enzyme

Isoelectric point

Centrifuge

Peptin

Polyacrylamide gel

Distillated water

4. Translate the sentences into English.

1) Білки складаються з амінокислот.
2) Імунноферментний аналіз застосовується для якісного та кількісного визначення біомолекул.
3) Ферменти каталізують як прямі, так і зворотні реакції.
4) Передача нервових імпульсів відбувається за допомогою медіаторів.
5) Хромографія – метод розділення білків за масою.
6) Який барвник використовується для забарвлення поліакриламідного гелю?
7) Дистильована вода використовується для миття лабораторного посуду, додавання в розчини і багатьох інших цілей.
8) Нуклеїнові кислоти несуть закодовану інформацію.
9) При підвищенні температури тіла людини до 40° відбувається денатурація білка.

5. Open the brackets and use the comparative form of the adjectives and adverbs.

1) This exercise is (simple) than that one.
2) Why are you talking? Please be (quiet).
3) New districts of Kyiv are (beautiful) than the old ones.
4) He is (clever) than his brother.
5) My (old) sister is 4 years (old) than me.

6) There are (many) customers on Saturdays than on weekdays.
7) Are expensive things (good) than cheap ones?
8) Is English grammar (difficult) than Russian grammar?
9) He has made (few) mistakes than yesterday.
10) She had to give us (far) information though she didn't want to.

6. Translate into English.

1) Візьміть цю валізу, вона легша ніж ваша.
2) В районі Вест-Енд знаходяться найдорожчі магазини.
3) Що ти будеш робити пізніше?
4) Я думаю, що він старше ніж ви, але молодше за мене.
5) Він найталановитіший студент в нашій групі
6) Хоча у нас були найгірші місця, нам дуже сподобалась вистава.
7) Де знаходиться найближче поштове відділення?
8) Останній поїзд прибував опівночі.
9) Останні новини були зовсім нецікаві.
10) Білети у бізнес-клас завжди найдорожчі.

7. Put the adverbs in the right place.

Example: *These books are old (very). — These books are very old.*

1) I hate travelling by air (really).
2) She trusted him (entirely).
3) I understand your situation (fully).
4) It is not his fault. He did not want it to happen (at all).
5) The rain spoiled my day (completely).
6) We did the job quickly (fairly).

7) Though he tried to persuade her, she believed his story (hard, half).
8) He believes that he is right (firmly).
9) The prices are cheap at the hotel (reasonably).
10) I was tired to eat (too).

8. Open the brackets and give the comparative or superlative degree of the following adjectives and adverbs. Add articles if necessary.

1) That is (incredible) story I have ever heard.
2) It is not always (bright) students who do well in tests.
3) I think, cotton shirts are much (comfortable) to wear!
4) Which is (deep), Lake Michigan or Lake Superior?
5) She is far (self-confident) than she used to be.
6) (tall) man among the guests is a basketball player.
7) I like both of them, but I think Kate is (easy) to talk to.
8) Most people are (well off) than their parents used to be.
9) She has a lot to be thankful for; but (sad) thing of all is that she does not realize it. You look a lot (sad) than you did last time I saw you.

9. Read and translate the text.

BIOCHEMICAL PATHWAYS AND PROCESSES

Biochemical processes mediate the interaction of cells with their environment and are responsible for most of the information processing inside the cell. Networks of interacting proteins underlie many of these processes. Three major types of biochemical processes are distinguished:

Metabolic pathways are sequences of chemical reactions, each catalysed by enzymes, where certain product molecules are formed from other small substrates. Metabolites are usually small molecules while enzymes are proteins.

Signal transduction networks are pathways of molecular interactions that provide communication between the cell membrane and intracellular end-points, leading to some change in the cell. Signals are transduced by modification of one protein's activity or location by another protein.

Gene regulation circuits determine whether or not a particular gene is expressed at any particular time. Transcription factors, proteins that promote or repress transcription, either directly or indirectly bind regulatory DNA elements.

Metabolic, transduction and regulatory circuits are interleaved and integrated. For example, gene regulation circuits are fed by external signals transmitted by signal transduction pathways. The high complexity of these systems makes their proper understanding difficult.

10. Make a report on the following topics.

1) Biochemistry in Ukraine: what is a prospective?
2) Modification of proteins as a protection of biopreparation.
3) Enzyme as a biocatalyst.
4) Branches of biochemistry: what is more perspective?
5) Synthesis of proteins as a main process in our organism.

11. BIMs or Biologically Important Molecules can be split into four categories: Proteins, Carbohydrates, Lipids, and Nucleic Acids. Each of these groups is composed of different subunits and each performs different tasks within the human body. What are their functions? Write a tale about proteins, lipids, nucleic acids and carbohydrates.

For example:

Once proteins, lipids and carbohydrates met and decided to find out who is the most necessary for …

12. Three biochemical methods are:

- ***Chromatography***
- ***Centrifugation***
- ***Electrophoresis***

With the group of your colleagues discuss advantages and disadvantages of each method.

13. Prepare a report about the role of biochemistry in modern life. Include the following ideas.

- What is biochemistry
- What is biomolecule and what is its importance
- Biochemical techniques and its importance
- The application of biochemistry in modern life

Unit 7

BIOPHYSICS

Have you studied biophysics? Say in your words what biophysics is.
What do biophysicists study?
How essential is biophysics to progress in biology and biotechnology?
What are the applications of biophysics?
Why is biophysics important right now?

1. Read the text and find the answers to the mentioned above question.

THE BRIDGE BETWEEN BIOLOGY AND PHYSICS

Biology studies life in its variety and complexity. It describes how organisms go about getting food, communicating, sensing the environment, and reproducing. On the other hand, physics looks for mathematical laws of nature and makes detailed predictions about the forces that drive idealized systems. Spanning the distance between the complexity of life and the simplicity of physical laws is the challenge of biophysics. Biophysicists study life at every level, from atoms and molecules to cells, organisms, and environments.

Biophysics discovers such questions as how atoms are arranged to work in DNA and proteins. Protein molecules perform the body's chemical reactions.

They push and pull in the muscles that move your limbs. Proteins make the parts of your eyes, ears, nose, and skin that sense your environment. They turn food into energy and light into vision. They are your immunity to illness. Proteins repair what is broken inside of cells, and regulate growth. They fire the electrical signals in your brain. They read the DNA blueprints in your body and copy the DNA for future generations.

So, biophysicists discover how proteins work. Understanding these differences in people's respond to proteins opens new possibilities in drug design, diagnosis, and disease control.

Biophysics is a wellspring of innovation for our high-tech economy. The applications of biophysics depend on society's needs. In the 20th century, great progress was made in treating disease. Biophysics helped to create powerful vaccines against infectious diseases. It described and controlled diseases of metabolism, such as diabetes. And biophysics provided both the tools and the understanding for treating the diseases of growth as cancers. Today we are learning more about the biology of health and society is deeply concerned about the health of our planet.

Advanced instruments created by biophysicists provide the life-saving treatment methods of kidney dialysis, radiation therapy, cardiac defibrillators, and pacemakers. Biophysicists invented instruments for detecting, purifying, imaging, and manipulating chemicals and materials.

Nowadays society is facing physical and biological problems of global proportions. How will we continue to get sufficient energy? How can we feed the world's population? How do we remediate global warming? How do we preserve biological diversity?

How do we secure clean and plentiful water? Biophysics provides the insight and technologies for meeting these challenges, based on the principles of physics and the mechanisms of biology.

Biophysics discovers how to modify microorganisms for biofuel (replacing gasoline and diesel fuel) and bioelectricity (replacing petroleum products and coal for producing electricity). Biophysics discovers the biological cycles of heat, light, water, carbon, nitrogen, oxygen, heat, and organisms throughout our planet. Biophysics harnesses microorganisms to clean our water and to produce lifesaving drugs.

ESSENTIAL VOCABULARY

advanced *adjective* – an advanced system, method, or design is modern and has been developed from an earlier version of the same thing.

arrange *verb* – put (things) in a neat, attractive, or required order ● *She had just finished arranging the flowers.*

bioelectricity *noun* – electricity or electrical phenomena produced within living organisms.

biofuel *noun* – a fuel derived immediately from living matter.

biological diversity *noun* – the variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.

challenge *noun* – a task or situation that tests someone's abilities ● *The traverse of the ridge is a challenge for experienced climbers. He took up the challenge of organizing a sports afternoon.*

complexity *noun* – the state of having many different parts connected or related to each other in a complicated way.

detailed *adjective* – having many details or facts; showing attention to detail ● *More detailed information was needed.*

prediction *noun* – a thing predicted; a forecast ● *A prediction that economic growth would resume.*

detect *verb* – discover or identify the presence or existence of ● *Cancer may soon be detected in its earliest stages.*

blueprint *noun* – a pattern that all living cells contain, which decides how a person, animal, or plant develops and what it looks like ● *By changing the tomato's genetic blueprint, scientists can alter the rate at which it ripens.*

force *noun* – an influence tending to change the motion of a body or produce motion or stress in a stationary body. The magnitude of such an influence is often calculated by multiplying the mass of the body and its acceleration.

generation *noun* – all the people in a group or country who are of a similar age, especially when they are considered as having the same experiences or

attitudes ● *David Mamet has long been considered the leading American playwright of his generation.*

image *verb* – make a visual representation of (something) by scanning it with a detector or electromagnetic beam.

law *noun* – a statement of fact, deduced from observation, to the effect that a particular natural or scientific phenomenon always occurs if certain conditions are present ● *The second law of thermodynamics.*

lifesaving *adjective* – life-saving medical treatments or equipment are used to help save people's lives ● *The boy needs a life-saving transplant operation.*

manipulate *verb* – handle or control (a tool, mechanism, information, etc.) in a skilful manner.

perform *verb* – carry out, accomplish, or fulfil (an action, task, or function) ● *I have my duties to perform.*

preserve *verb* – maintain (something) in its original or existing state ● *All records of the past were zealously preserved.*

pull *verb* – exert force on (someone or something) so as to cause movement towards oneself ● *He pulled her down on to the couch.*

push *verb* – exert force on (someone or something) in order to move them away from oneself ● *She pushed her glass towards him.*

purify *verb* – remove contaminants from ● *The filtration plant is able to purify 70 tons of water a day.*

regulate *verb* – control or maintain the rate or speed of (a machine or process) so that it operates properly ● *A hormone which regulates metabolism.*

respond *verb* – react quickly or positively to a stimulus or treatment ● *His back injury has failed to respond to treatment.*

secure *verb* – protect against threats; make safe ● *The government is concerned to secure the economy against too much foreign ownership.*

simplicity *noun* – the quality or condition of being easy to understand or do ● *For the sake of simplicity, this chapter will concentrate upon one theory*.

society *noun* – the aggregate of people living together in a more or less ordered community.

need *noun* – a thing that is wanted or required.

2. Explain the following terms.

Kidney dialysis
radiation therapy
cardiac defibrillator
pacemaker

3. Translate the sentences with into English.

1) Найважливішим завдання будь-якої держави є задоволення потреб суспільства.
2) На минулому занятті ми розглядали основні закони передачі спадкової інформації.
3) Білки регулюють ріст клітин в організмі.
4) Без збереження біологічного різноманіття неможливий стійкий розвиток біосфери.
5) Існують процеси, які направлені на отримання біопалива із целюлози та різноманітних органічних відходів.
6) Нікотин посилає в мозок хибні сигнали про ситість.
7) Передові інструменти, створені біофізиками, були застосовані для підвищення ефективності праці.
8) Останнім часом людство частіше стало стикатися з екологічними проблемами, що мають глобальний характер.

4. Answer the questions.

1) What does biology study?
2) What does physics study?
3) How does biophysics connect biology and physics?
4) What does biophysics discover about proteins?
5) Name the functions of proteins in our body.
6) What progress did biophysics make for society's needs in the 20th century?
7) What instruments or tool did biophysicists create?
8) What problems does modern society face?
9) Why does society need biofuel and bioelectricity?
10) Why does biophysics harness microorganisms?

5. Correct the order of the ideas according to how they were mentioned in the text.

1) Biophysics in the source of economical innovations.
2) Modern society faces many environmental problems.
3) Biophysics is the mixture of biology and physics.
4) Proteins' work is being discovered by biophysics.
5) Biofuel, bioelectricity, clean-up of water are the issues of biophysics.
6) Many life-saving tools are created by biophysics.

5. Write a summary of the text in your own words. Orally enlarge this summary and retell the text.

6. Remember Present Perfect tense. Insert the following markers in the correct place.

ever, never, for, since, already, just, yet

1) He's worked there many years, 1986, I believe.
2) I have loved anyone as much as I love you.
3) We've known Paul two years. Have you met him?
4) I've known him we went to school together, but I've met his parents.
5) We have sold two hundred tickets and there is still a month to go before the concert.
6) Have you thought of learning to fly?
7) I have received my exam result. It came ten minutes ago.

7. Find the difference between Present Perfect and Past Simple.

1) Barbara Lively_____ (write) a lot of books. She _____ (write) her first fifteen years ago.
2) _____ you ever _____ (try) Indian food?
3) I _____ never _____ (be) to Japan. When ___ you _____ (go) there?
4) I _____ (live) in London for eight years, and I don't want to move.
5) He _____ (live) in Oxford for two years, and then in 1995 he _____ (move) to London.
6) We _____ (meet) Tim and Maureen three years ago. How long _____ you _____ (know) them?

8. Complete the sentences with the verbs from the box using the Past Perfect Continuous Tense.

consider burn drive quarrel write practice work work rain try

1) He___the car for many hours before he came to the crossroads.
2) The pianist ___ the passage hour after hour till he mastered it.
3) When I met her, her eyes were red. She and Mike again____.
4) When I came, they___ this question for more than an hour.

5) It was evening and he was tired because he___since dawn.
6) He ___ to get her on the phone for 15 minutes before he heard her voice.
7) By 12 o'clock they _____ a composition for two hours.
8) The fire___for some time before a fire brigade came.
9) I___to meet her for ages when I bumped into her by chance.
10) When I left home, it was raining, and as it___since morning, the streets were muddy.

9. Present Perfect and Present Perfect Continuous. Choose the correct sentence from each pair.

1) I've cut my finger! - I've been cutting my finger!
2) Have you heard Paul Simon's latest record? - Have you been hearing Paul Simon's latest record?
3) She's tired because she's shopped all day. - She's tired because she's been shopping all day.
4) Sorry. I've broken one of your glasses. - Sorry. I've been breaking one of your glasses.
5) How long have you had this book? - How long have you been having this book?
6) They have lived here for three years. - They've been living here for three years.

10. Read and translate the text. Circle any additional unknown words/phrases in the article. In pairs/groups, use your dictionaries to understand the meanings. Write their.

THREE BRANCHES OF BIOPHYSICS

Medical biophysics studies physics to describe or affect biological process for the purpose of medical application. Like many areas of study that have emerged in

recent times, it relies on broad interdisciplinary knowledge between the so-called traditional fields such as physics (i.e. medical physics, radiation physics or imaging physics) and advanced biology fields such as biochemistry, biophysics, physiology, neuroscience etc.

Some important areas of research in medical biophysics include medical imaging (e.g. MRI, computed tomography, and PET), oncology, vasculature and circulatory system function.

Molecular biophysics is an evolving interdisciplinary area of research that combines concepts in physics, chemistry, engineering, mathematics and biology. It studies biomolecular systems and explain biological function in terms of molecular structure, structural organization, and dynamic behaviour at various levels of complexity (from single molecules to supramolecular structures, viruses and small living systems). The discipline requires specialized equipment and procedures capable of imaging and manipulating minute living structures, as well as novel experimental approaches.

Biophysical chemistry is a relatively new branch of chemistry that covers a broad spectrum of research activities involving biological systems. The most common feature of the research in this subject is to seek explanation of the various phenomena in biological systems in terms of either the molecules that make up the system or the supra-molecular structure of these systems.

Biophysical chemists employ various techniques used in physical chemistry to probe the structure of biological systems. These techniques include spectroscopic methods like nuclear magnetic resonance (NMR) and X-ray diffraction. Also biophysical chemists study protein structure and the functional structure of cell membranes. For example, enzyme action can be explained in terms of the shape of a pocket in the protein molecule that matches the shape of the substrate molecule or its modification due to binding of a metal ion. Similarly the structure and function of the biomembranes may be understood through the study of model supramolecular structures as liposomes or phospholipid vesicles of different compositions and sizes.

11. Circle any additional unknown words/phrases in the article. In pairs/groups, use your dictionaries to understand the meanings. Write their definitions.

12. Remember how the fragments were used, and complete the sentence from the article above.

1) Medical Biophysics studies physics to …
2) Medical Biophysics relies on broad interdisciplinary knowledge between…
3) Some important areas of research in medical biophysics are…
4) Molecular biophysics is a rapidly evolving interdisciplinary area of research that …
5) Biophysical chemistry is a relatively new branch of chemistry that …
6) Biophysical chemists employ various techniques used in physical chemistry to …
7) Biophysical chemists study…
8) Enzyme action can be explained in terms of …
9) Similarly the structure and function of the biomembranes may be understood through …

13. Summarize the article in your own words.

14. Translate the text into English using the words you've learned.

Біологічні об'єкти, як правило, дуже складні і на процеси, що протікають в них впливають багато факторів, які часто залежать один від одного. Фізика дозволяє створити спрощені моделі об'єкта, які описуються законами термодинаміки, електродинаміки і т.д. У фізиці є безліч методів, які в своїй первісній формі не можуть бути використані для досліджень біологічних об'єктів. Тому ще одним завданням біофізики є пристосування цих методів і методик для вирішення завдань біології. Сьогодні для отримання інформації

в біологічних системах застосовують різні оптичні методи, рентгеноструктурний аналіз, різні електрометричні методи, методи хемілюмінесценції, лазерну спектроскопію, метод мічених атомів та ін. Це використовується, зокрема, для медичної діагностики і терапії.

15. Write an essay on the topic "Prospects of biophysics".

16. With the group of your colleagues make a presentation about the following selected topics in biophysics.

1) Biophysical mechanisms
2) Biophysical techniques
3) Molecular structure and behaviour.

Unit 8

PHYSIOCHEMICAL METHODS OF ANALYSIS

What are the physicochemical methods of analysis?
What kinds of physicochemical methods do you know?
What is the basis of physicochemical methods of analysis?

1. Read and translate the text.

PHYSIOCHEMICAL METHODS OF ANALYSIS: WHAT ARE THESE?

It seems that this term can be met only in Russian. In the English language literature, they usually speak and write about instrumental methods of analysis. The name instrumental is evidently not ideal; analytical balances or titrimeters used in classical chemical methods also belong to instruments.

Physicochemical methods of analysis have wider application. Without them it is hard to control and manage production processes and research. It should be noted that physicochemical methods of analysis solve the problems of chemical control and analysis; they constitute to one of the parts of analytical chemistry. The essence of the physical and chemical methods of analysis is to study relations between structure and properties of systems. For the analysis of substances chemical reactions are widely used. They are accompanied by changes in the physical properties of the analyzed system, for example, the color intensity of fluorescence, etc. So physicochemical methods of analysis is a field of analytical chemistry that investigates analyses using scientific instruments. There are several types of instrumental analyses.

Spectroscopy measures the interaction of the molecules with electromagnetic radiation. Spectroscopy consists of many different applications such as atomic absorption spectroscopy, atomic emission spectroscopy, ultraviolet-visible spectroscopy, x-ray fluorescence spectroscopy, infrared spectroscopy, Raman

spectroscopy, nuclear magnetic resonance spectroscopy, photoemission spectroscopy and so on.

Mass spectrometry measures mass-to-charge ratio of molecules using electric and magnetic fields. There are several ionization methods: electron ionization, chemical ionization, electrospray, fast atom bombardment, matrix-assisted laser desorption/ ionization, and others.

Crystallography is a technique that characterizes the chemical structure of materials at the atomic level by analyzing the diffraction patterns of electromagnetic radiation or particles that have been deflected by atoms in the material. X-rays are most commonly used. From the raw data the relative placement of atoms in space may be determined.

Electroanalytical methods measure the electric potential in volts and/or the electric current in amps in an electrochemical cell containing the analyte. These methods can be categorized according to which aspects of the cell are controlled and which are measured. The three main categories are potentiometry (the difference in electrode potentials is measured), coulometry (the cell's current is measured over time), and voltammetry (the cell's current is measured while actively altering the cell's potential).

Calorimetry and thermogravimetric analysis measure the interaction of a material and heat.

Separation processes are used to decrease the complexity of material mixtures. Chromatography and electrophoresis are representative of this field.

Microscopy. The visualization of single molecules, single biological cells, biological tissues and nanomaterials is very important and attractive approach in analytical science.

Also, hybridization with other traditional analytical tools is revolutionizing analytical science. Microscopy can be categorized into three different fields: optical microscopy, electron microscopy, and scanning probe microscopy. Recently, this field is rapidly progressing because of the rapid development of the computer and camera industries. Combinations of the above techniques produce a

"hybrid" or "hyphenated" technique. Several examples are in popular use today and new hybrid techniques are under development, for example, gas chromatography-mass spectrometry, gas chromatography-infrared spectroscopy, liquid chromatography- mass spectrometry and so on.

A general method for analysis of concentration involves the creation of a calibration curve. This allows for determination of the amount of a chemical in a material by comparing the results of unknown sample to those of a series known standards. If the concentration of element or compound in a sample is too high for the detection range of the technique, it can simply be diluted in a pure solvent. If the amount in the sample is below an instrument's range of measurement, the method of addition can be used. In this method a known quantity of the element or compound under study is added, and the difference between the concentration added, and the concentration observed is the amount actually in the sample.

2. Fill in the gaps in this sentences

1) Physicochemical methods of _____have wider application.
2) Spectroscopy measures the interaction of the molecules with _____.
3) From the raw data the relative placement of _____in space may be determined.
4) Separation processes are used to decrease the complexity of_____.
5) The visualization of single molecules, single biological cells, biological tissues and nanomaterials is very important and attractive approach in_____.
6) Microscopy can be categorized into three different fields: _____, _____, and scanning
7) probe microscopy.

3. Write out the sentences expressing the main ideas of each logical part of the text.

4. Write a summary of the text in your own words making use of plan and the sentences you've written out.

5. Choose the type of instrumental analysis and make a detailed presentation about it.

6. Past Perfect and Past Perfect Progressive. Choose the correct sentence from each pair.

1) I knew the facts of the case because I had read / had been reading the report.
2) My eyes ached because I had read / had been reading for three hours.
3) The children were filthy. They had played / had been playing in the garden, and they were covered in mud.
4) I was very nervous at the beginning of the match. I had never played/ had never been playing her before, and I didn't know how good she was.
5) Donald excelled himself as a cook. He had cooked / had been cooking a wonderful Spanish dish.
6) Donald was very cross. He had worked/ had been working in the kitchen all morning, and none had offered to help.

7. Define if the verb tenses in these sentences are correct.

1) He had been sitting here for 40 minutes when the telephone rang.
2) I had tried to get him on the phone all day.
3) When Sarah arrived at the party, Paul had been already going home.
4) When we got back the babysitter had gone home.
5) Tom had done his homework for an hour when his friend came to see him.
6) They had hoped to get the summit but Travers fell ill at base camp.

7) When we got home last night, we found that somebody had been breaking into the flat.
8) At eight in the morning we had been driving for six hours.

8. Read this text and translate it.

WHAT IS BIOCHEMISTRY LAB?

A biochemistry laboratory is an area in which a biochemist studies the chemical processes within living organisms. Traditional biochemistry examines the chemistry of reactions catalyzed by enzymes, but biochemical research has expanded to cover topics of signal transduction, transport within cells, and molecular interactions.

All biochemistry labs have the basic components of science research labs, such a pH meter, a balance for weighing out chemicals, a variety of buffers and other chemicals, and refrigerators and freezers for storing supplies. They also have a special freezer kept at -94° F (-70° C) for the long-term storage of proteins and tissues. Such facilities have centrifuges and access to an ultracentrifuge. An ice machine is generally essential for generating ice to keep enzymes and reagents chilled and stable. Virtually all biochemistry labs have gel electrophoresis supplies for examining proteins, along with the equipment for running Western blots.

For biochemistry research, a spectrophotometer is frequently necessary to measure protein concentrations or enzyme reactions. Usually, a UV-Vis spectrophotometer suffices, but some labs require a fluores.

Other biochemistry labs may have more specialized equipment, like particular chromatography equipment. This type of technology separates molecules.For instance, the lab may have a high-pressure liquid chromatography (HPLC) system to separate peptides or conduct enzyme assays on small molecules.

Another type of instrument one might have is a gas chromatography (GC) system. This unit separates volatile compounds. A protein biochemistry laboratory

may have a fast-pressure liquid chromatography (FPLC) system to purify large amounts of protein to study. It would have a variety of gel matrices, with differing chemical properties to use with the FPLC to separate the proteins.

There would be glass columns of varying proportions to hold the matrices. Protein biochemistry laboratories generally have a cold room, so that proteins can be isolated and purified at cold temperatures to keep them stable. The techniques of genetic engineering involve manipulating DNA or RNA in microorganisms, so sterile conditions are required. Such a lab would have a sterile hood that can be wiped down with ethanol its work surface. The lab would have agar, which forms a gel that the microorganisms grow on. There would be a variety of other of supplies for media, and antibiotics for growing up the genetically-altered microorganisms. It would have incubators and shakers that could be warmed up to grow bacteria or yeast.

Also necessary is access to an autoclave, to sterilize the supplies for growth and RNA manipulation, and to destroy the recombinant material after the experiments are finished. A medical biochemistry laboratory would have many of the items of other biochemistry labs, depending on its specialty. The difference would be in the source of the material for study.

9. Investigation work. Try to use your laboratory to carry out any of experiment with the help of these methods. Make photos and show them to your group. Make the presentation on the following topics.

1) Electrochemical methods
2) Chromatographic methods
3) Spectral methods
4) Radiometric methods

10. Write a story "Once I accidentally leaked the solution into the mass spectrometer…"

Unit 9

IMMUNOLOGY

Why do we need an immune system?

Nowadays we have many supplements on the market. Can all they replace our immune system?

In what context have you heard about immune system in your everyday life?

1. Read the text and translate it properly.

A MAGNIFICENT PROTECTOR

Inside your body there is an amazing protection mechanism called the immune system. It is designed to defend you against millions of bacteria, microbes, viruses, toxins and parasites that would love to invade your body. To understand the power of the immune system, all that you have to do is to have a look at one's death. That sounds gross, but it will show you important things about your immune system.

When something dies, its immune system (along with everything else) shuts down. In a matter of hours, the body is invaded by all sorts of bacteria, microbes, parasites... None of these things are able to get in when your immune system is working, but the moment your immune system stops the door is wide open. Once you die it only takes a few weeks for these organisms to completely dismantle your body and carry it away, until all that's left is a skeleton. Obviously your immune system is doing something amazing to keep all of that dismantling from happening when you are alive.

When a virus or bacteria (also known generically as a germ) invades your body and reproduces, it normally causes problems. Generally the germ's presence produces some side effect that makes you sick. For example, the strep throat bacteria (Streptococcus) releases a toxin that causes inflammation in your throat.

The polio virus releases toxins that destroy nerve cells (often leading to paralysis). Some bacteria are benign or beneficial (for example, we all have millions of bacteria in our intestines and they help digest food), but many are harmful ones; they get into the body or the bloodstream.

The job of your immune system is to protect your body from these infections. The immune system protects you in three different ways. First and foremost, it creates a barrier that prevents bacteria and viruses from entering your body. Then, if a bacteria or virus does get into the body, the immune system tries to detect and eliminate it before it can make itself at home and reproduce. Thirdly, when the virus or bacteria is able to reproduce and start causing problems, your immune system is in charge of eliminating it.

There are many diseases that, if you catch them once, you will never catch again. Measles is a good example, as is chicken pox. What happens with these diseases is that they make it into your body and start reproducing. The immune system gears up to eliminate them. Cells recognize the virus and produce antibodies for it. This process takes time, but the disease runs it course and is eventually eliminated.

A vaccine is a weakened form of a disease. It is either a killed form of the disease, or it is a similar but less virulent strain. Once inside your body your immune system mounts the same defense, but because the disease is different or weaker you get few or no symptoms of the disease. Now, when the real disease invades your body, your body is able to eliminate it immediately.

Many diseases cannot be cured by vaccines, however. The common cold and influenza are two good examples. These diseases either mutate so quickly or have so many different strains in the wild that it is impossible to inject all of them into your body. Each time you get the flu, for example, you are getting a different strain of the same disease. Thus, it’s only our immune system which helps us to be defended.

2. Give the definitions to at least three of the following terms.

Adenoids, bone marrow, large intestine, lymph nodes, lymphatic duct, payer's patches, small intestine, spleen, subclavian vein, thoracic duct, throat, thymus.

3. Fill in the gaps in these sentences

1) Inside your body there is an amazing_____ called the immune system.
2) Obviously your immune system is doing something amazing to keep all of that _____from happening when you are alive.
3) When _____or ____ invades your body and reproduces, it normally causes problems.
4) The strep throat bacteria releases a _____ that causes inflammation in your throat.
5) The job of your immune system is to protect your body from these_____.
6) If a bacteria or virus does get into the body, the immune system tries to _____ and _____it before it can make itself at home and reproduce.
7) _____recognize the virus and produce antibodies for it.
8) A vaccine is a weakened form of a_____.
9) Many diseases cannot be _____by vaccines.
10) These diseases either _____quickly or have so many different strains in the wild.

4. Answer the questions.

1) What is the immune system? What is the basic function of the immune system?
2) How can we understand the power of the immune system?
3) What happens when somebody dies?
4) What are the synonyms of the word "virus"?
5) What happens when the germ invades one's body?
6) What are benign bacteria?
7) How many ways of the immune system protection can you name?

8) Are there the diseases which you catch once and then never again?
9) What is a vaccine? How does it work?
10) Are there any vaccines unable to be cured by vaccines?
11) What happens each time you get flu?

5. Speak on the new facts you found in the text.

What wondered you or what information was new for you? Can you add any other information about the immune system?

6. Do you agree with the following statements? Choose one of them, explain and expand your idea and create a small report.

1) The strep throat bacteria (Streptococcus) releases a toxin that causes inflammation in your throat.
2) The Immune system doesn't work against viruses. It deals only with cells.
3) Bacteria have no nucleus.
4) Erythrocytes are not the part of immune system.
5) Bacteria and viruses work in the same way.
6) A vaccine is a form of a disease.

7. Make a plan of this text.Add key words in it if necessary.

8. Retell this text using your plan.

9. Open the brackets and put the verbs into the
Future Indefinite, the Future Perfect, the Present Indefinite or the Present Perfect Tense.

1) By 8 o'clock they (have) dinner.
2) By the end of the week he (finish) the translation.
3) Before you (come) I (do) all the work.

4) She (look) through the article by 12 o'clock.
5) They (receive) our letter by Monday.
6) By the time we (get) to the forest the rain (stop).
7) I think he (answer) the letter by this time.
8) We (begin) to work after we (read) all the instructions.
9) We (not do) anything until he (take) necessary steps.
10) The committee (prepare) the plan by tomorrow.
11) I suppose when my letter (reach) you I already (return) from your voyage.
12) He (pass) an exam after he (learn) all the material.
13) I am afraid they (not discuss) all the questions by the time they (come).
14) We (not be able) to start the experiment before we (obtain) the necessary data. The secretary already (look) through all the papers before the boss (come).
15) My train (leave) by the time you (come) to the station.

10. Open the brackets and use the Future Perfect Continuous Tense.

1) They already (rehearse) for an hour when we come.
2) I (work) in this company for 10 years next April.
3) By next year he (writing) the novel for three years.
4) The thieves are sure that they (drive) for 6 hours when the police discover the robbery in the morning.
5) They (study) for 3 hours when you come.

11. Read the text and translate.

IMMUNOLOGY

Immunology is a branch of biomedical science that covers the study of all aspects of the immune system in all organisms. It deals with the physiological functioning of the immune system in states of both health and disease; malfunctions of the immune system in immunological disorders; the physical,

chemical and physiological characteristics of the components of the immune system in vitro, in situ, and in vivo.

Even before the concept of immunity was developed, numerous early physicians characterized organs that would later prove to be part of the immune system.

When health conditions warrant, immune system organs including the thymus, spleen, portions of bone marrow, lymph nodes and secondary lymphatic tissues can be surgically excised for examination while patients are still alive. Classical immunology studies the relationship between the body systems, pathogens, and immunity. The earliest written mention of immunity can be traced back to the plague of Athens in 430 BCE. The study of the molecular and cellular components that comprise the immune system, including their function and interaction, is the central science of immunology.

In the 21st century, immunology has broadened its horizons with much research being performed in the more specialized niches of immunology. This includes the immunological function of cells, organs and system, as well as the function of the immune system outside classical models of immunity.

12. Give the definitions to at least three of the following words:

- immunology
- immune system
- in vitro
- in situ
- in vivo
- classical immunology

13. Write out the sentences expressing the main ideas of each logical part of the text.

14. Check your knowledge about the immune system? Do you know the answers to these questions?

1) Is a monocyte a red or white blood cell?
2) What is the largest lymphoid structure?
3) What common allergic disorder was named for the illness first described in those exposed to the farmlands of England?
4) What is a substance that can cause a person to become sensitive to, and produce antibodies against it?
5) What type of immunity is developed through exposure to a disease?
6) Which part of the body does NOT contain lymph nodes?
7) Which organ is NOT part of the immune system?
8) What is a specialist in immunology called?

15. Speak on the new facts you found. What wondered you or what information was new for you? Can you add some other information about the history of immunology or some interesting immunological facts?

16. Read and translate the text.

A USEFUL VITAMIN

You'd have to eat a couple dozen oranges to get the same effect as one Vitamin C tablet that contains 500 mg of Vitamin C. Perhaps everyone knows that vitamin C and immune system of humans are interconnected principles. Ascorbic acid is a nutrient that has been shown to have a strong jolt on human health. Researchers originally intended that considerable doses of Vitamin C can reduce the severity and the rate of the common cold due to its using in oxidation-reduction in the human body.

Vitamin C is on the top of immune boosters list and there are many reasons for that. Perhaps, the greatest number of nutrient investigations was devoted to vitamin C and immune system. Ascorbic acid addendums are inexpensive to make, and it is very good that vitamin C is available naturally in many vegetables and

fruits. There is another possibility to get Ascorbic acid - you can buy at any chemist's shop vitamin-C-fortified version. Now let's take a brief review of vitamin C and immune system benefit of it.

Ascorbic acid increases the infection-fighting production antibodies and white blood cells and increases interferon levels, the antibody that covers surface of cells, which are favorable for the viruses` entry. Vitamin C diminished the cardiovascular disease risk with the help of raising HDL levels cholesterol while decreasing blood pressure and importunate with the proceeding during which fat is transformed to plaque in the human arteries. It is also interesting about vitamin C and immune system that people who have diets with higher vitamin C concentration have lower rates of prostate, colon and even breast cancer.

17. Make a conversation according to the following situation.

You are working out a new supplement for stimulating human's immune system. You have to assure your colleagues that your medicine is the most effective one.

Your partner's aim is to ask you as much as possible about the supplement`s effects on immune system.

18. Creative composition.

You are one of the white blood cells. Some antigen has infiltrated your master's body. What are your actions?

Unit 10

AIDS/HIV

What are viruses AID and HIV? Do you know if there is any difference?
Do these viruses influence on our immune system? Do you know how?
What are the main symptoms of AIDS?

1. Read the following text and translate.

BASIC THINGS ABOUT AIDS AND HIV

In 1985, scientists discovered the human immunodeficiency virus (HIV). HIV is a virus that is transmitted from person to person through the exchange of body fluids such as blood, semen, breast milk and vaginal secretions. Sexual contact is the most common way to spread HIV, but it can also be transmitted by sharing needles when injecting drugs, or during childbirth and breastfeeding. As HIV reproduces, it damages the body's immune system and the body becomes susceptible to illness and infection. There is no known cure for HIV infection nowadays.

Acquired immune deficiency syndrome, or AIDS, is a condition that describes an advanced state of HIV infection. With AIDS, the virus has progressed, causing significant loss of white blood cells or any of the cancers or infections that result from immune system damage.

Once inside the body the virus attacks specialized immune system cells known as CD4 cells. The virus attaches to these cells and infects them by injecting HIV nucleic acids (DNA and RNA) into the cell. New HIV virus then infects other CD4 cells as the cycle repeats itself.

Is HIV and AIDS the same thing? HIV is the virus which damages the body's immune system. While AIDS defining infections means a person is diagnosed with AIDS. A person can be infected for years without having AIDS.

Having HIV infection does not mean you have AIDS. Simply put, HIV and AIDS are not the same thing, but they are related to one another.

Before HIV infection became widespread in the human population, AIDS defining infections were rare, and almost exclusively in individuals with immune suppression, such as chemotherapy and certain types of cancers. AIDS was first recognized in the early 1980s in healthy homosexual men. Adding to the oddity, these men had no recognized cause for immune suppression. An infectious cause of AIDS was suggested by geographic clustering of cases, links among cases by sexual contact, mother-to-infant transmission, and transmission by blood transfusion. Later, isolation of HIV from patients with AIDS strongly suggested that this virus was the cause of AIDS. Medications can successfully treat many of the symptoms of early symptomatic HIV infection. Antiretroviral therapy slows the growth of the HIV virus in the body. It works very well in reducing the number of HIV particles in the bloodstream.

Although people have suppressed levels of HIV, they can still spread the virus to others through sex or sharing needles. Antiretroviral therapy is not a cure for HIV, but the treatment slows disease progression and may strengthen the immune system. People should never forget that HIV/AIDS is more than a physical ailment; it affects the whole person, emotional and physical. Often our treatments focus on the physical only but the emotional needs addressed as well.

2. Answer the following questions according to the sense of the text.

1) What is AIDS?
2) What is HIV?
3) Is there any difference between them? How are they similar?
4) What are the ways of transition of the virus from one human to another? Do you know any other variants?
5) How does the virus affect the immune system, the body?
6) Who was the first person with AIDS symptoms?

7) Are there any borders for the infection?
8) What are the ways of treatment? Can AIDS be cured?
9) How does antiretroviral therapy work?
10) Is this disease only physical?

3. Find the definitions to the following words.

1)	HIV	a)	detrimental colonization of a host organism by a foreign species;
2)	AIDS	b)	manifestation of a disease, indicating the nature of the disease, which is noticed by the patient;
3)	Immune system	c)	the virus that causes acquired immune deficiency syndrome;
4)	Infection	d)	medications for the treatment of infection by retroviruses, primarily HIV;
5)	Symptom	e)	the set of cells, and their activity against antigens, or infectious agents, that comprise the body's defense system against disease;
6)	Antiretroviral therapy	f)	a set of symptoms and infections resulting from the damage to the human immune system caused by the human immunodeficiency virus.

4. Read the text again and express the idea of each paragraph in questions.

5. Retell the texts from the point of view of:

- a man having acquired immune deficiency syndrome
- a doctor dealing with these diseases
- a girl whose boyfriend is ill.

6. Read the text and entitle it.

On November 24, 2004 the United Nations warned that the world was facing a "unique development challenge" with acceleration in the spread of AIDS. New data revealed there are nearly 40 million HIV sufferers worldwide. Of these 3 million will die of AIDS this year, a record toll in the 23-year history of the killer virus. The report says Sub-Saharan Africa remains by far the worst-affected region in the world. In South Africa 5.3 million people are infected, with "no sign yet of a decline in the epidemic." India has the second largest number of HIV sufferers in the world (5.1 million), while East Asia has seen a 56 percent increase in HIV cases, mainly attributable to an explosive rise in China. Women now constitute over half of all new cases contracting HIV/AIDS due to poor sexual education,
he sex trade, unprotected sexual intercourse, and a greater natural susceptibility to contract the virus than men.

However, if you are diagnosed with HIV, your physical health is not the only issue you have to deal with. Along with the physical illness are mental health conditions that may come up. Mental health refers to the overall well-being of a person, including a person's mood, emotions, and behavior. HIV/AIDS can have a major impact on many parts of human life. People with HIV and those close to them are subject to many things that may affect their mental health. Many people are surprised when they learn that they have been diagnosed with HIV. Some people feel overwhelmed by the changes that they will need to make in their lives. It is normal to have strong reactions when you find out you are HIV positive,

including feelings such as fear, anger, and a sense of being overwhelmed. Often people feel helpless, sad, and anxious about the illness. Although the society doesn't forget people affected with this devastating disease.

The red ribbon, a ribbon colored red, is the symbol of solidarity of people living with HIV/AIDS. The Red Ribbon Project was created by the New York artists in 1991. The artists wished to create a visual symbol to demonstrate compassion for people living with AIDS and their caregivers. The color red was chosen for it as the connection to blood and the idea of passion - not only anger, but love, like a valentine. First worn publicly by Jeremy Irons at the 1991 Tony Awards, the ribbon soon became renowned as an international symbol of AIDS awareness, becoming a politically correct fashion accessory on the lapels of celebrities. The Red Ribbon continues to be a powerful force in the fight to increase public awareness of HIV/AIDS and in the lobbying efforts to increase funding for AIDS services and research.

7. Write down questions based on the article. Ask them your partner.

8. Give a short talk on:

- The present-day situation in spreading of AIDS.
- Mental health conditions of an infected person.
- Red Ribbon project history.

9. Write a letter to the President explaining your concerns for AIDS victims and explaining what you feel the leader of the free world should do.

10. Role-play dialogue.

You came to the blood transfusion center. You are going to donate blood. Ask the doctor about the measures they take to prevent everybody to catch HIV. Your goal is to be as sure as possible in your safety.

The doctor’s aim is to make you sure that only in their center they take maximum care about donators.

11. Write a composition/ presentation.

You are the doctor sent to some high school to tell students about the measures to prevent catching of HIV. Prepare your speech to tell them as much as possible.

Unit 11

MICROBIOLOGY

Say in your words what microbiology is.

How many areas of microbiology do you know?

What is the main subject of microbiological research?

THE FANTASTIC WORLD

Microbiology is the study of microorganisms, which are microscopic and unicellular organisms. This includes eukaryotes such as fungi and protists, and prokaryotes. Viruses, though not classed as living organisms, are also studied. Microbiology typically includes the study of the immune system, or Immunology. And immune systems obviously interact with pathogenic microbes.

Microbiology includes virology, mycology, parasitology, bacteriology and other branches. Microbiological procedures usually must be aseptic, and use a variety of tools such as light microscopes with a combination of stains and dyes, agar plates in petri dishes, biochemical test and running tests against particular growth conditions.

Microbiology is researched actively. Many microbes are responsible for beneficial processes such as industrial fermentation, antibiotic production and others.

Bacteria can be used for the industrial production of amino acids. *Corynebacteriumglutamicum* is one of the most important bacterial species with an annual production of more than two million tons of amino acids.

A variety of biopolymers, such as polysaccharides, polyesters, and polyamides, are produced by microorganisms. Microorganisms are used for the

biotechnological production of biopolymers with tailored properties suitable for high-value medical application such as tissue engineering and drug delivery.

Microorganisms are beneficial for microbial biodegradation of domestic, agricultural and industrial wastes. The ability of each microorganism to degrade toxic waste depends on the nature of each contaminant.

There are also various claims concerning the contributions to human and animal health by consuming probiotics (bacteria potentially beneficial to the digestive system) and/or prebiotics (substances consumed to promote the growth of probiotic microorganisms). Recent research has suggested that microorganisms could be useful in the treatment of cancer.

3. Fill in the gaps in these sentences:

1) Microbiology is the study of_____, which are microscopic and unicellular organisms.
2) Viruses, though not classed as_____, are also studied.
3) Many microbes are responsible for _____such as industrial fermentation, antibiotic production and others.
4) _____are beneficial for microbial biodegradation of domestic, agricultural and industrial wastes.
5) Recent research has suggested that microorganisms could be useful in the _____of cancer.
6) Microorganisms are used for the _____of biopolymers with tailored properties suitable for high-value medical application.

4. Give the full answers to these questions:

1) What is microbiology?
2) Is microbiology connected with immunology? How?
3) Which branches of microbiology do you know?

4) Where are microbes used?

5) What do you know about *Corynebacteriumglutamicum*?

6) What is produced by microorganisms?

7) What is probiotic? What is prebiotic? What is the difference between them?

8) How can we biodegrade different wastes?

9) Could microorganisms be useful in the treatment of cancer?

5. Read the text attentively again and say which statements are true to the fact or false.

a) Microbiology is the study of microorganisms.

b) Microbiology typically includes the study of the immune system.

c) A virologist is a specialist in microbiology.

d) Microbiology is researched passively.

e) Bacteria can be used for the industrial production of all acids.

f) The ability of each microorganism to degrade toxic waste depends on the nature of each contaminant.

g) Probiotics are the substances consumed to promote the growth of probiotic microorganisms.

6. Write a summary of the text in your own words. Add key words in it if necessary.

7. Retell this text using your plan.

8. Find the appropriate definitions to the following words:

viruses	biological scientists who study organisms so small that, generally, they can only be seen with a microscope.

microbiologist	proteins that catalyze (i.e., increase or decrease the rates of) chemical reactions
antibiotics	organisms whose cells contain complex structures enclosed within membranes
prokaryotes	powerful medicines that fight bacterial infections
cancer	organisms that lack a cell nucleus or any other membrane-bound organelles
mycology	the branch of biology concerned with the study of fungi
eukaryotes	small infectious agents that can replicate only inside the living cells of organisms
enzymes	a class of diseases in which a group of cells display uncontrolled growth

Unit 12

VIROLOGY

What is a virus?

Are you afraid of viruses?

Can people living in the closed spaces without any contacts be protected from viruses?

What do you know about virology?

1. Read and translate the text.

VIROLOGY AND VIRUSES

Virology is the study of viruses and virus-like agents: their structure, classification and evolution, their ways to infect and exploit cells for virus reproduction, the diseases they cause, the techniques to isolate and culture them, and their use in research and therapy. Virology is often considered as a part of microbiology.

A major branch of virology is virus classification. Viruses can be classified according to the host cell they infect: animal viruses, plant viruses, fungal viruses, and bacteriophages (viruses infecting bacteria, which include the most complex viruses). Another classification uses the geometrical shape of their capsid (often a helix or an icosahedron) or the virus's structure (e.g. presence or absence of a lipid envelope).Viruses range in size from about 30 nm to about 450 nm, which means that most of them cannot be seen with light microscopes. The shape and structure of viruses has been studied by electron microscopy, NMR spectroscopy, and X-ray crystallography.

A virus is a small infectious agent that can replicate only inside the living cells of organisms. Viruses infect all types of organisms, from animals and plants to bacteria. Since the initial discovery of the tobacco mosaic virus in 1898, about

5,000 viruses have been described in detail, although there are millions of different types. Viruses are found in almost every ecosystem on Earth.

Virus particles (known as virions) consist of two or three parts: the genetic material made from either DNA or RNA, long molecules that carry genetic information; a protein coat that protects these genes; and in some cases an envelope of lipids that surrounds the protein coat when they are outside a cell. The average virus is about one one-hundredth the size of the average bacterium.

Viruses cause a number of diseases in eukaryotes. In humans, smallpox, the common cold, influenza, herpes, polio, rabies and AIDS are examples of viral diseases.

Viral infections in animals provoke an immune response that usually eliminates the infecting virus. Immune responses can also be produced by vaccines. However, some viruses including those causing AIDS and viral hepatitis evade these immune responses and result in chronic infections. Antibiotics have no effect on viruses, but several antiviral drugs have been developed.

The origins of viruses in the evolutionary history of life are unclear: some may have evolved from plasmids – pieces of DNA that can move between cells – while others may have evolved from bacteria.

The evolution of viruses, which often occurs in concert with the evolution of their hosts, is studied in the field of viral evolution. While viruses reproduce and evolve, they don't engage in metabolism and depend on a host cell for reproduction. The often-debated question of whether they are alive or not is a matter of definition that does not affect the biological reality of viruses.

ESSENTIAL VOCABULARY

AIDS *noun* – (acronym from *acquired immune deficiency syndrome*) a disease in which there is a severe loss of the body's cellular immunity, greatly lowering the resistance to infection and malignancy ● *AIDS was first identified in the early 1980s and now affects millions of people. The cause is a virus (called the human immunodeficiency virus or HIV) transmitted in blood and in sexual fluids,*

and although the incubation period may be long and treatment can slow the course of the disease there is currently no cure or vaccine. In the developed world the disease first spread among homosexuals, intravenous drug users, and recipients of infected blood transfusions, before reaching the wider population. This has tended to overshadow a greater epidemic in parts of Africa, where transmission is mainly through heterosexual contact.

antibiotic *noun* – a medicine (such as penicillin or its derivatives) that inhibits the growth of or destroys microorganisms.

antiviral *adjective* – (chiefly of a drug or treatment) effective against viruses.

bacterium (*plural* **bacteria**) *noun* – a member of a large group of unicellular microorganisms which have cell walls but lack organelles and an organized nucleus, including some which can cause disease ● *Bacteria are widely distributed in soil, water, and air, and on or in the tissues of plants and animals. Formerly included in the plant kingdom, they are now classified separately (as prokaryotes). They play a vital role in global ecology, as the chemical changes they bring about include those of organic decay and nitrogen fixation. Much modern biochemical knowledge has been gained from the study of bacteria, as they grow easily and reproduce rapidly in laboratory cultures.*

bacteriophage *noun* – a virus which parasitizes a bacterium by infecting it and reproducing inside it. Bacteriophages are much used in genetic research.

capsid *noun* – the protein coat or shell of a virus particle, surrounding the nucleic acid or nucleoprotein core.

classification *noun* – 1) the arrangement of animals and plants in taxonomic groups according to their observed similarities (including at least kingdom and phylum in animals, division in plants, and class, order, family, genus, and species) ● *The classification of the platypus was one of the critical issues of the 1830s.* 2) the action or process of classifying something ● *The classification of disease according to symptoms.*

common cold *noun* – the common cold is a mild illness. If you have it, your nose is blocked or runny and you have a sore throat or a cough.

electron microscope *noun* – a microscope with high magnification and resolution, employing electron beams in place of light and using electron lenses.

light microscope *noun* – (often referred to as optical microscope) is a type of microscope which uses visible light and a system of lenses to magnify images of small samples ● *Optical microscopes are the oldest design of microscope and were possibly invented in their present compound form in the 17th century. Basic optical microscopes can be very simple, although there are many complex designs which aim to improve resolution and sample contrast.*

eliminate *verb* – completely remove or get rid of (something).

engage *verb* – (engage in or be engaged in) participate or become involved in.

eukaryote *noun* – an organism consisting of a cell or cells in which the genetic material is DNA in the form of chromosomes contained within a distinct nucleus. Eukaryotes include all living organisms other than the eubacteria and archaea.

evolution *noun* – the process by which different kinds of living organism are believed to have developed from earlier forms during the history of the earth ● *The idea of organic evolution was proposed by some ancient Greek thinkers but was long rejected in Europe as contrary to the literal interpretation of the Bible. Lamarck proposed a theory that organisms became transformed by their efforts to respond to the demands of their environment. Lyell demonstrated that geological deposits were the cumulative product of slow processes over vast ages. This helped Darwin towards a theory of gradual evolution over a long period by the natural selection of those varieties of an organism slightly better adapted to the environment and hence more likely to produce descendants. Combined with the later discoveries of the cellular and molecular basis of genetics, Darwin's theory of evolution has, with some modification, become the dominant unifying concept of modern biology.*

evolve *verb* – develop over successive generations as a result of natural selection ● *The domestic dog is thought to have evolved from the wolf.*

exploit *verb* – make full use of and derive benefit from (a resource).

genetic material *noun* – the genetic material of a cell or an organism refers to those materials found in the nucleus, mitochondria and cytoplasm, which play a fundamental role in determining the structure and nature of cell substances, and capable of self-propagating and variation.

herpes *noun* – any of a group of virus diseases caused by herpesviruses, affecting the skin (often with blisters) or the nervous system.

host cell *noun* – a cell that harbors foreign molecules, viruses, or microorganisms ● *A cell being host to a virus.*

immune response *noun* – the reaction of the cells and fluids of the body to the presence of a substance which is not recognized as a constituent of the body itself.

infect *verb* – affect (a person, organism, cell, etc.) with a disease-causing organism ● *There is no evidence that the virus can infect humans.*

infectious agent *noun* – any factor whose excessive presence or relative absence is essential for the occurrence of a disease.

influenza *noun* – a highly contagious viral infection of the respiratory passages causing fever, severe aching, and catarrh, and often occurring in epidemics. Also called **flu**.

NMR *abbreviation* – nuclear magnetic resonance.

spectroscopy *noun* – the branch of science concerned with the investigation and measurement of spectra produced when matter interacts with or emits electromagnetic radiation.

plasmid *noun* – a genetic structure in a cell that can replicate independently of the chromosomes, typically a small circular DNA strand in the cytoplasm of a bacterium or protozoan. Plasmids are much used in the laboratory manipulation of genes.

polio *noun* – (short for poliomyelitis) an infectious viral disease that affects the central nervous system and can cause temporary or permanent paralysis.

protein coat *noun* – the coiled or polyhedral structure, composed of proteins, that encloses the nucleic acid of a virus.

provoke *verb* – stimulate or give rise to (a reaction or emotion, typically a strong or unwelcome one).

rabies *noun* – a contagious and fatal viral disease of dogs and other mammals, transmissible through the saliva to humans and causing madness and convulsions.

replicate *verb* – (of genetic material or a living organism) reproduce or give rise to a copy of itself.

smallpox *noun* – an acute contagious viral disease, with fever and pustules that usually leave permanent scars. It was effectively eradicated through vaccination by 1979. Also called **variola**.

tobacco mosaic virus *noun* – a virus that causes mosaic disease in tobacco, much used in biochemical research.

vaccine *noun* – an antigenic substance prepared from the causative agent of a disease or a synthetic substitute, used to provide immunity against one or several diseases ● *There is no vaccine against HIV infection.*

viral evolution *noun* – a subfield of evolutionary biology and virology that is specifically concerned with the evolution of viruses.

virology *noun* – the branch of science that deals with the study of viruses.

virus

X-ray crystallography *noun* – the study of crystals and their structure by means of the diffraction of X-rays by the regularly spaced atoms of crystalline materials.

2. Give Ukrainian equivalents for the following words:

virus-like agents, is often considered as, a major branch, can be classified according to, range in size from about …. nm to about….nm, all types of organisms, describe in detail, consist of, carry genetic information, the average virus, can be produced by, have no effect on, the evolution of viruses, in the field of viral evolution, depend on.

3. Translate the following sentences into English.

1) СНІД - це стадія ВІЛ-інфекції, при якій розвиваються бактеріальні, грибкові, вірусні, протозойні інфекції (опортуністичні інфекції) і неінфекційні захворювання.
2) Запалення - одна з найбільш ранніх реакцій імунної системи на інфекцію.
3) Вчені створили вакцину від небезпечного менінгіту В.
4) Вже багато років не було епідемій віспи.
5) Поліомієліт - це гостре інфекційне захворювання, що вражає центральну нервову систему.
6) Людський рино-вірус відповідальний за 30 - 50% випадків загальної застуди.
7) Світлові мікроскопи можуть збільшувати об'єкт у 1500 разів, а електронні - в 20 000 разів.
8) Вірус тютюнової мозаїки передається механічним шляхом від хворої рослини до здорової або з насінням.
9) Традиційний метод ЯМР-спектроскопії (ядерної магнітно-резонансної) має багато недоліків.

4. Fill in the gaps.

1) Virology is often considered as a part of_____.
2) Viruses can be classified according to _____they infect.
3) Another classification uses the geometrical shape of their ____or the virus's structure.
4) A virus is a small _____that can replicate only inside the living cells of organisms.
5) Viruses are found in almost every _____on Earth.

6) Viruses cause a number of diseases in _____.
7) Viral infections in animals provoke _____that usually eliminates the infecting virus.
8) The evolution of viruses, which often occurs in concert with the evolution of their hosts, is studied in the field of_____.
9) While viruses _____and_____, they don't engage in metabolism and depend on a host cell for reproduction.
10) Virology is the study of viruses and virus-like agents: _____.
11) Viruses can be classified according to the host cell they infect: _____.
12) The shape and structure of viruses has been studied by_____.
13) Since the initial discovery of the tobacco mosaic virus in 1898, about 5,000 viruses have been described in detail, although_____.
14) Viral infections in animals provoke an immune response that_____.
15) Antibiotics have no effect on viruses, but _____.
16) The often-debated question of whether they are alive or not is a matter of definition that_____.

5. Find the appropriate definitions to the following words:

eukaryote	a living cell in which a virus reproduces
host cell	a small infectious agent that can replicate only inside the living cells of organisms
influenza	an organism whose cells contain complex structures enclosed within membranes
antibacterial	a disease of the human immune system caused by the human immunodeficiency virus (HIV)

virus	a compound or substance that kills or slows down the growth of bacteria
AIDS	an infectious disease caused by RNA viruses of the family Orthomyxoviridae, that affects birds and mammals

6. Remind sequence of tenses and indirect speech. Insert the necessary form of verbs.

1) They noticed they __ (fly) for three hours already.
2) Tom said that it __ (take) him an hour to get to the station.
3) She asked them if they___ (play) tennis in the afternoon.
4) Peter and John told me they ___ (go) to the Khreschatic the day before yesterday.
5) Mother said she ___ (have) a bad headache. Don't bother her.
6) Dorothy asked Margaret if she ___ (be) going to buy a new dress in the nearest future.
7) They told us they ___ (visit) the Kyiv Pechersk Lavra next Sunday.
8) Jack said that he already _____ (write) the letter.
9) They asked if the work _____ (finish) by tomorrow.

7. Translate into English.

1) Я знав, що він хворий.
2) Я думав, що ви у]хали з Англії.
3) Я думав, що ти його друг.
4) Саллі сказала, що не любить шоколад.
5) Він сказав, що вони дивляться телевізор.
6) Джек сказав, що сам відправить лист.
7) Вона сказала, що бувала в Лондоні.

8) Він сказав мені, що загубив книгу.
9) Диктор оголосила, що літак прибув в аеропорт.
10) Він знав, що метали проводять електричний струм.
11) Ми знали, що вони працювали в саду з самого ранку.
12) Я думав, що ти підеш в школу.
13) Я знав, що ви зрозумієте мене.
14) Анна сказала, що вона закінчить вправи до 7 години.
15) Я знав, що він говорив їй, що він пише п'єсу.
16) Галілей довів, що Земля обертається навколо Сонця.

8. Read and translate the text.

THE HISTORY OF VACCINATION

A very early form of vaccination known as variolation was developed several thousand years ago in China. It involved the application of materials from smallpox sufferers in order to immunize others. In 1796 Edward Jenner developed a safe method, using cowpox to successfully immunize a young boy against smallpox, and this practice was widely adopted. Vaccinations against other viral diseases followed, including the successful rabies vaccination by Louis Pasteur in 1886. The nature of viruses however was not clear to these researchers.

In 1892 Dimitri Ivanovski showed that a disease of tobacco plants, tobacco mosaic disease, could be transmitted by extracts that were passed through filters fine enough to exclude even the smallest known bacteria. In 1903 it was suggested for the first time that transduction by viruses might cause cancer. Such an oncovirus in chickens was described by Francis Peyton Rous in 1911; it was later called Rous sarcoma virus 1 and understood to be a retrovirus. Several other cancer-causing retroviruses have since been described.

While plant viruses and bacteriophages can be grown comparatively easily, animal viruses normally require a living host animal, which complicates their study immensely. In 1931 it was shown that influenza virus could be grown in fertilized

chicken eggs, a method that is still used today to produce vaccines. In 1937, Max Theiler managed to grow the yellow fever virus in chicken eggs and produced a vaccine from an attenuated virus strain; this vaccine saved millions of lives and is still being used today.

The first virus that could be crystalized and whose structure could therefore be elucidated in detail was tobacco mosaic virus (TMV), the virus that had been studied earlier by Ivanovski and Beijerink. In 1935, Wendell Stanley achieved its crystallization for electron microscopy and showed that it remains active even after crystallization. Clear X-ray diffraction pictures of the crystallized virus were obtained by Bernal and Fankuchen in 1941.

In 1975 the functioning of oncoviruses was clarified considerably. Until that time, it was thought that these viruses carried certain genes called oncogenes which, when inserted into the host's genome, would cause cancer.

A worldwide vaccination campaign led by the UN World Health Organization resulted in the eradication of smallpox in 1979.

9. Make 20 sentences covering the whole text.

10. Translate into English.

1) Людина протягом усього життя наражається на небезпеку заразитися і захворіти будь-якої вірусної інфекцією.
2) Розмножуючись, віруси виснажують клітинні ресурси, глибоко порушують обмін речовин, і, в кінцевому рахунку, є причиною загибелі клітин.
3) За своєю будовою і властивостями віруси займають проміжне місце між найскладнішими хімічними речовинами (полімерами, макромолекулами) і найпростішими організмами (бактеріями).
4) Довгий час вважали, що віруси викликають гострі масові захворювання. До теперішнього часу накопичено багато доказів того, що віруси є

причиною і різних хронічних хвороб, які тривають роками і навіть десятиліттями.

5) Молекула РНК вірусу тютюнової мозаїки міститься в білковому капсиді, що складається з 2130 ідентичних поліпептидних субодиниць.
6) Сучасна класифікація вірусів базується на основі виду та форми їх нуклеїнової кислоти.

11. Translate into English.

Хронічну втому викликає ретровірус. Скажений ритм сучасного життя легко може довести до ліжка, аптеки і «синдрому хронічної втоми». Але медики знайшли причину депресій, втоми і зниження імунітету офісних трудоголіків - це інфекція. Цей ретровірус XMRV, добре знайомий лікарям і біологам, викликає лейкемію у мишей і часто зустрічається в тканинах пухлин у чоловіків.

Причини синдрому хронічної втоми шукала група вчених під керівництвом доктора Джуді Міковіц з інституту Уіттмора Пітерсона (Невада, США). Кров випробовуваних тестувалася на наявність антитіл до різного роду вірусів. По аналізах визначили присутність вірусу в організмі восьми з 218 здорових людей, що склало всего 3,7%, в той час як серед «хронічно втомлюованих» ретровірус був виявлений у 68 чоловік, а це вже 67% вибірки. Синдром хронічної втоми вперше був виведений як окремий діагноз в кінці 1980 року, його початкова назва «грип яппі». Однак багато медиків і сьогодні сумніваються в реальності існування даного синдрому. Його симптоматика розпливчаста: від депресії до непритомності, від суглобових болів до анемії. Крім того невідомі і причини. Психологи звинувачують у всьому стреси і тиск цивілізаційної життя, клініцисти схиляються до вірусної етіології хронічної втоми, наприклад, до вірусу Епштейна-Барра, ентеровірусів, вірусу простого герпесу і, нарешті, ретровірус XMRV.

12. Write a creative composition "If viruses take over the world...".

13. Are you for or against vaccination? Make your argument and express your opinion in 'opinion essay'.

Unit 13

CANCER

Do you know what cancer is?

Is it up-to-date or out-of-date disease?

Do you know the statistics about cancer?

How can biotechnologists help to cure this disease?

When do you think the vaccine against this disease will be invented?

1. Read the text and translate it.

A DEVASTATING DISEASE

Cancer (medical term: malignant neoplasm) is a class of diseases in which a group of cells display uncontrolled growth (division beyond the normal limits), invasion (intrusion on and destruction of adjacent tissues), and sometimes metastasis (spread to other locations in the body via lymph or blood). These three properties of cancers differentiate them from benign tumors, which are selflimited, do not invade or metastasize. Most cancers form a tumor but some, like leukemia, do not. The branch of medicine concerned with the study, diagnosis, treatment, and prevention of cancer is oncology.

Cancer may affect people at all ages, even fetuses, but the risk increases with age. Cancer causes about 13% of all deaths. Cancers can affect all animals.

Nearly all cancers are caused by abnormalities in the genetic material of the transformed cells. These abnormalities may be due to the effects of carcinogens, such as tobacco smoke, radiation, chemicals, or infectious agents. Other cancer-promoting genetic abnormalities may be randomly acquired through errors in DNA replication, or are inherited, and thus present in all cells from birth. The heritability of cancers is usually affected by complex interactions between carcinogens and the host's genome.

Genetic abnormalities found in cancer typically affect two general classes of genes. Cancer-promoting oncogenes are typically activated in cancer cells, giving those cells new properties, such as hyperactive growth and division, protection against programmed cell death, loss of normal tissue boundaries, and the ability to enter in adjust tissue. Tumor suppressor genes are then inactivated in cancer cells, resulting in the loss of normal functions in those cells, such as accurate

DNA replication, control over the cell cycle, orientation and adhesion within tissues, and interaction with protective cells of the immune system.

Diagnosis usually requires the histological examination of a tissue biopsy made by a pathologist. Most cancers can be treated and some cured, depending on the specific type, location, and stage. Once diagnosed, cancer is usually treated with a combination of surgery, chemotherapy and radiotherapy.

In conclusion it should be said that cancer is one of the most complex and devastating diseases that claim the life of many humans. Today there are one in three people worldwide who are affected by cancer, and almost 60% of these people will almost certainly die.

ESSENTIAL VOCABULARY

abnormality *noun* – the quality or state of being abnormal

acquire *verb* – buy or obtain (an asset or object) for oneself ● *I managed to acquire all the books I needed.*

adhesion *noun* – the action or process of adhering to a surface or object.

adjacent *adjective* – if one thing is adjacent to another, the two things are next to each other ● *He sat in an adjacent room and waited. The schools were adjacent but there were separate doors.*

tissue *noun* – any of the distinct types of material of which animals or plants are made, consisting of specialized cells and their products ● *Inflammation is a reaction of living tissue to infection or injury.*

carcinogen *noun* – a substance capable of causing cancer in living tissue.

destruction *noun* – the action or process of causing so much damage to something that it no longer exists or cannot be repaired.

differentiate *verb* – identify differences between (two or more things or people) ● *He is unable to differentiate between fantasy and reality.*

division *noun* – the action of separating something into parts or the process of being separated ● *This gene helps to regulate cell division.*

DNA *noun* – deoxyribonucleic acid, a self-replicating material which is present in nearly all living organisms as the main constituent of chromosomes. It is the carrier of genetic information ● *Each molecule of DNA consists of two strands coiled round each other to form a double helix, a structure like a spiral ladder. Each rung of the ladder consists of a pair of chemical groups called bases (of which there are four types), which combine in specific pairs so that the sequence on one strand of the double helix is complementary to that on the other: it is the specific sequence of bases which constitutes the genetic information.*

replication *noun* – the process by which genetic material or a living organism gives rise to a copy of itself.

genome *noun* – the haploid set of chromosomes in a gamete or microorganism, or in each cell of a multicellular organism.

heritable *adjective* – transmissible from parent to offspring.

host *noun* – an animal or plant on or in which a parasite or commensal organism lives.

inherit *verb* – derive (a quality, characteristic, or predisposition) genetically from one's parents or ancestors (as *adjective* **inherited**) ● *Inherited diseases.*

intrusion *noun* – the action of intruding.

invade *verb* – (of a parasite or disease) spread into (an organism or bodily part)

invasion *noun* – an unwelcome intrusion into another's domain random drug testing of employees is an unwarranted invasion of privacy.

lymph *noun* – 1) a colourless fluid containing white blood cells, which bathes the tissues and drains through the lymphatic system into the bloodstream. 2) fluid exuding from a sore or inflamed tissue.

malignant *adjective* – 1) (of a disease) very virulent or infectious. 2) (of a tumour) tending to invade normal tissue or to recur after removal; cancerous.

neoplasm *noun* – a new and abnormal growth of tissue in a part of the body, especially as a characteristic of cancer.

metastasis (*pl.* **metastases** [-siːz]) *noun* – the development of secondary malignant growths at a distance from a primary site of cancer.

metastasize *verb* – (of a cancer) spread to other sites in the body by metastasis ● *Cancers that metastasize to the brain.*

prevention *noun* – the action of stopping something from happening or arising crime prevention ● *The treatment and prevention of AIDS.*

tumour *noun* – a swelling of a part of the body, generally without inflammation, caused by an abnormal growth of tissue, whether benign or malignant.

2. Complete the sentences using the words from the vocabulary list.

1) The medical term for ‘cancer’ is _____.
2) Uncontrolled growth, invasion and metastasis _____ cancer from benign tumor.
3) Cancer cells spread to other locations via _____ or _____.
4) Tobacco smoke, radiation, chemicals are _____.
5) Cancer-promoting oncogenes are ____ in cancer cells, while tumor suppressor genes are _____.
6) Pathologist makes _____.
7) With the help of a combination of surgery, chemotherapy and radiotherapy cancer can be _____.

3. Find Ukrainian equivalents to these English word combinations.

1)	Abnormalities	**a)**	Завдяки
2)	Benign tumour	**b)**	Втрата нормальних країв тканини
3)	Fetus	**c)**	Успадкований
4)	Tumor suppressor gene	**d)**	Онкологія
5)	Loss of normal tissue boundaries	**e)**	Трансформована клітина
6)	People at all ages	**f)**	Інфекційний агент
7)	Programmed cell death	**g)**	Неконтрольований ріст
8)	Inherited	**h)**	Доброякісна пухлина
9)	Histologic examination	**i)**	Аномалії
10)	Transformed cell	**j)**	Гіперактивний ріст та ділення
11)	Oncogenes	**k)**	Гістологічне обстеження
12)	Devastating	**l)**	Люди всіх вікових категорій
13)	Infectious agent	**m)**	Запрограмована смерть клітини
14)	Heritability	**n)**	Онкоген
15)	Oncology	**o)**	Плод
16)	Hyperactive growth and division	**p)**	Ген, що пригнічує пухлину
17)	Uncontrolled growth	**q)**	Можливість успадкування
18)	Due to	**r)**	Шкідливий для здоров’я

4. Give definitions of the following terms

1) Intrusion
2) Destruction
3) Division
4) Metastasis
5) Examination

5. Answer the questions according to the sense of the text

1) What is the definition of the term ‘cancer’?

2) What is the medical term for ‘cancer’?
3) Do all cancers form a tumor?
4) Whom can cancer affect?
5) What causes cancer?
6) How can abnormalities in the genetic material appear?
7) What do genetic abnormalities affect?
8) How do cancer-promoting oncogenes influence on cells?
9) What information did you read about tumor suppressor genes?
10) What does diagnosis usually require?
11) Can cancers be treated or cured and how?
12) What is the statistics of cancer affects?

6. Are the following sentences true or false? Correct the false statements if any.

1) When a person has cancer, he can control the growth of infected cells.
2) Leukemia is a form of cancer.
3) Mostly children have cancer.
4) Cancer cannot affect different animals.
5) Abnormalities in the genetic material can be the reason of cancer.
6) Cancer can never be inherited.
7) The host’s genome do not influence on the cancer heritability.
8) Cancer-promoting oncogenes do not endow cells with new properties.
9) Tumor suppressor genes are activated in cancer cells.
10) Pathologist makes the histological examination.
11) It is impossible even to treat cancer.
12) Cancer is of the mildest diseases and can be treated with aspirin.

7. Put the words in the correct order to make sentences or questions.

1) differentiate/ uncontrolled growth, invasion/benign tumor/ and metastasis/ cancer/ from.

2) of getting/ with age/ does/ the risk/ cancer/ increase?
3) can/ all/cancers/ affect/ animals.
4) due to/may be/ abnormalities/ in the genetic material/ of carcinogens/ of the transformed cells/ the effects
5) and/the heritability of cancers/ is/ by carcinogens/ the host's genome/affected?
6) diagnosis/ usually/ the histological examination/ requires/of a tissue biopsy/ of cancer.

8. Make your investigation and find out the origin and history of the term 'cancer'.

9. Study all types of the conditional sentences. Open the brackets in the conditional sentences making necessary changes. Translate them properly into Ukrainian.

Example: *If he (come) tomorrow, he will help us. — If he comes tomorrow, he will help us.*

1) If you (put) salt on ice, it will melt.
2) Provided that she (service) the car, we'll be able to drive to the country.
3) Unless he (do) his homework, he'll stay at home.
4) If you met the president, what you (do)?
5) If he (live) nearer, we would see each other more often.
6) Where you (go) if you were on leave?
7) She (notice) this mistake if she had been more attentive.
8) If we (know) that you were there, we would have called on you.
9) If I had known of his arrival, I (meet) him.
10) Nobody told me about your trouble. I would have helped you if I (know) about it.

10. Translate into English.

1) Ти б засмутився (be upset), якби я не прийшов?
2) Будь він обережніше, він би не впав.
3) Якщо б він не приїхав на машині зустріти нас, нам би самим довелося нести свої речі.
4) Ти б пішла кудись увечері, якби він тебе запросив?
5) Ми б поїхали сьогодні в басейн, якби ви подзвонили вчора ввечері.
6) Якби він міг дати позитивний (positive) відповідь, він би давно це зробив.
7) Я б на твоєму місці не став би здіймати такий галас (raise a clamour).
8) Якщо б ти прийняв його пропозицію, ти б давно працював в хорошій фірмі.
9) Будь я на вашому місці, я б пішов раніше, щоб застати його.
10) Якби він вів машину обережніше, ніякої б аварії не сталося.

11. In pairs / groups, decide which of these opinions you agree with. Discuss how much truth there is in each one.

1) The sun is good for you.
2) You must wear sun block / sunscreen every time you go outside.
3) Being in the sun is bad because it causes wrinkles and makes you look older.
4) Sun tanned skin doesn't look good.
5) Buying vitamin D supplements is a waste of time. The sun is free.
6) People worry too much about UV rays.
7) Sunshine is dangerous in areas where there is a hole in the ozone layer.
8) People who sunbathe are crazy.
9) Feeling the warmth of the sun on your skin is one of life's greatest pleasures.
10) Our bodies need sunshine.

12. Look at the article's headline in the next exercise and guess whether these sentences are true or false.

1) Scientists have told us for many years that sunshine is healthy.
2) Researchers say there is a link between studying and cancer.
3) Doctors and scientists have changed their minds about UV rays.
4) Vitamin C is called the "sunshine vitamin".
5) Vitamin D may prevent 30 deaths for each one caused by skin cancer.
6) Sunscreen might not be so necessary now.
7) Our bodies need five hours a day in direct sunlight.
8) There is less cancer in sunnier parts of the world.

13. Read and translate the text. Pay attention to the underlined phrases and correct the word order.

SUNSHINE MAY PREVENT CANCER

Scientists have years for us told many that the sun can harm our health. Researchers have produced many studies that link exposure to the sun to cancer. Doctors about us warn continually the dangers of ultraviolet (UV) rays. Well, all of this might now change. Doctors and scientists may soon be telling us the opposite. New research suggests that sunshine bodies is for our necessary. Our skin absorbs the UV rays and produces vitamin D, also known as the 'sunshine vitamin'. Dr. Edward Giovannucci of Harvard University says that vitamin D contains many anti-cancer benefits. He believes vitamin D might help to prevent of 30% more deaths than caused by skin cancer. It might now put the time to be sunscreen away. Doctors may soon recommend us to spend fifteen minutes a day in direct sunlight. They say this will allow our skin to produce the vitamin D we need. Researchers highlight the fact that there are fewer people with cancer in the world parts of sunnier.

14. Read this conversation. Translate it, paying attention to the explained in the following vocabulary phrases.

A: Hey, you look great. Did you just get back from vacation?

B: No. Why?

A: What do you mean why? It's the middle of winter and everyone else is as white as a ghost. You look like you've been lying on a beach somewhere.

B: Alright, I'll tell you. But I don't want to hear any of your negativity. I've been hitting the tanning salon once a week.

A: I don't see anything wrong with that. I'd actually like to try it. What's it like?

B: The place I go you have to pay by the minute. It costs about 75 cents per minute and you really just need to go for one, twelve-minute session per week. You can get 20% off if you buy their $25 VIP card.

A: What do you think about the safety of them?

B: Many experts warn of the cancer causing risks of tanning. They say that overexposure to UVA and UVB rays cause genetic mutations that lead to skin cancer. I try to play it fairly safe and make sure I don't go too often. I also don't go in for longer than 12 minutes.

A: That's a good idea. How long do some people go?

B: Some people seem to get addicted to it. I've met several people who go 5 times a week and tan for 20 minutes per session. I'd personally be afraid to do that much, not only because of the cancer risk, but also because of the pre-mature aging of the skin.

A: Are there any health benefits associated with tanning indoors?

B: Your skin does absorb some vitamin D from the UVB rays, but many experts say that the risks outweigh the benefits.

Phrases and Vocabulary used:

What do you mean why?: This is a rhetorical question (which means a question you don't expect to be answered).

White as a ghost: During the winter when there isn't as much sunlight, we sometimes joke with each other as "looking white as a ghost". Many people believe that looking too white or pale skinned is not very attractive or healthy looking. It makes people want to get a suntan.

I don't want to hear any of your negativity: If you say this sentence to someone, it means that you don't want to hear any bad or negative opinion that they have.

Hitting the tanning salon: The tanning salon is a small business with indoor tanning beds. These tanning beds are made with special lights that simulate the sun's rays. You can go there to get an artificial suntan. "Hitting the tanning salon" means "going to the tanning salon".

Overexposure: If you are "overexposed" to something it means that you are in the presence of that thing too much and it is unhealthy.

Pre-mature aging: If something is "pre-mature" it means that it is happening before it is supposed to. If someone's skin has aged pre-maturely, it means that their skin looks older than it really is.

The risks outweigh the benefits: This means that there are more dangers or risks than there are potential benefits.

15. Make an information sheet about the benefits and dangers of UV rays. Write a for-and-against essay.

16. Explain how important you think the sun is and what part it plays in your everyday life.

Unit 14

BIOTECHNOLOGY GENERAL KNOWLEDGE

You study biotechnology.

Why did you choose this specialty?

What field of biotechnology are you going to study in future?

Say in your words what biotechnology is.

1. Read and translate the text.

WHAT IS BIOTECHNOLOGY?

The term "Biotechnology" (sometimes shortened to "biotech") consists of two parts. Bio is a Greek word for "life" and technology gives an indication of human intervention. Biotechnology can be based on the pure biological sciences (genetics, microbiology, animal cell culture, molecular biology, biochemistry, embryology, cell biology). Also its interests can be outside the sphere of biology (chemical engineering, bioprocess engineering, information technology, biorobotics). Biotechnology deals with brewing, manufacture of human insulin, interferon, and human growth hormone, medical diagnostics, cell cloning and reproductive cloning, the genetic modification of crops, bioconversion of organic waste and the use of genetically altered bacteria in the cleanup of oil spills, stem cell research and much more.

As a matter of fact, biotechnology is very ancient. Six thousand years ago, micro-organisms were used to brew beers and to produce wine, bread and cheese.Yeast makes dough rise and converts sugars into alcohol. Lactic acid bacteria in milk create cheese and yoghurt. This application of biotechnology is the directed use of organisms for the manufacture of organic products (examples include beer and milk products). In this way, classical biotechnology refers to the

traditional techniques used to breed animals and plants, as well as to the application of bacteria, yeasts and molds to make bread or cheese.

Modern biotechnology came into being during the nineteen seventies. Ithas often been divided into several categories; every field of this science is sometimes connected with the definite color.

Green biotechnology is biotechnology applied to agricultural processes. An example would be the selection and domestication of plants via micro propagation. Another example is the designing of transgenic plants to grow under specific environments in the presence (or absence) of chemicals. One hope is that green biotechnology might produce more environmentally friendly solutions than traditional industrial agriculture, although this is still a topic of considerable debate.

Red biotechnology is applied to medical processes. Some examples are the designing of organisms to produce antibiotics, and the engineering of genetic cures through genetic manipulation. White biotechnology, also known as industrial biotechnology, is biotechnology applied to industrial processes. An example is using naturally present bacteria by the mining industry in bioleaching; so it is the designing of an organism to produce a useful chemicalor destroy hazardous/polluting chemicals.

White biotechnology tends to consume less in resources than traditional processes used to produce industrial goods.

Blue biotechnology is a term that has been used to describe the marine and aquatic applications of biotechnology, but its use is relatively rare. Bioinformatics is an interdisciplinary field which addresses biological problems using computational techniques, and makes the rapid organization and analysis of biological data possible.

Bioinformatics plays a key role in various areas, such as functional genomics, structural genomics, and proteomics, and forms a key component in the biotechnology and pharmaceutical sector.

In conclusion biotechnology can berefered to any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

ESSENTIAL VOCABULARY

absence *noun* – the state of being away from a place or person.

antibiotic *noun* – a medicine (such as penicillin or its derivatives) that inhibits the growth of or destroys microorganisms.

bioconversion *noun* – the conversion of one chemical compound, or one form of energy, into another by living organisms

deal with *phrasal verb* – when you deal with something or someone that needs attention, you give your attention to them, and often solve a problem or make a decision concerning them.

genetic manipulation

hazardous *adjective* – risky; dangerous ● *We work in hazardous conditions. It is hazardous to personal safety.*

hormone *noun* – a regulatory substance produced in an organism and transported in tissue fluids such as blood or sap to stimulate specific cells or tissues into action

interferon *noun* – a protein released by animal cells, usually in response to the entry of a virus, which has the property of inhibiting virus replication.

marine *adjective* – relating to or found in the sea.

molecule *noun* – a group of atoms bonded together, representing the smallest fundamental unit of a chemical compound that can take part in a chemical reaction.

pharmaceutical *adjective* – relating to medicinal drugs, or their preparation, use, or sale.

rare *adjective* – (of an event, situation, or condition) not occurring very often ● *A rare genetic disorder.*

solution *noun* – 1) a means of solving a problem or dealing with a difficult situation. 2) a liquid mixture in which the minor component (the solute) is uniformly distributed within the major component (the solvent).

stem cell *noun* – an undifferentiated cell of a multicellular organism which is capable of giving rise to indefinitely more cells of the same type, and from which certain other kinds of cell arise by differentiation.

technique *noun* – a way of carrying out a particular task, especially the execution or performance of an artistic work or a scientific procedure.

transgenic *adjective* – relating to or denoting an organism that contains genetic material into which DNA from an unrelated organism has been artificially introduced.

2. Translate the sentences into English.

1) Усі живі організми або, як багатоклітинні тварини, рослини і гриби, складаються з безлічі клітин, або, як багато найпростіших і бактерій, є одноклітинними організмами.
2) Антибіотики пригнічують ріст бактерій.
3) Генетичний код – властивий всім живим організмам спосіб кодування амінокислотної послідовності білків за допомогою послідовності нуклеотидів.
4) Гормони є у всіх ссавців, включаючи людину.
5) Біотехнологи виробляють лікарські препарати з трупних отрут, які зазвичай вважаються небезпечними хімічними речовинами. Ключову роль в дослідженні трансгенних рослин грають останні відкриття.
6) Розвиток фармацевтичного сектора вказує на збільшення відкриттів в сфері фармацевтики.

3. Answer the questions.

1) What does the term ‘biotechnology’ consist of?

2) Can you count the areas of biotechnology?
3) Is biotechnology a new science or not? Give facts to prove it.
4) What is classical and modern biotechnology?
5) When did modern biotechnology begin?
6) What is bioinformatics? What is its role?
7) What biotechnology applies to agricultural
8) processes?
9) What can green biotechnology design?
10) What does red biotechnology deal with?
11) Give the examples of industrial biotechnology using?
12) What does blue biotechnology deal with?

4. Test your knowledge in biotechnology. Choose the correct answer.

1) The vector (DNA carrier) we used to put the glowing gene into the bacteria is called a…

a) Chromosome
b) Virus
c) Pipet
d) Plasmid

2) During a gel electrophoresis experiment, the small segment of DNA will move….

a) Backwards
b) Fast
c) Slow
d) Sideways

3) What tool do you use in lab to take very small samples of a liquid?

a) A beaker

b) A graduated cylinder
c) A micropipette
d) Safety glasses

4) In electrophoresis, where do the DNA samples go?

a) Straight up into the air
b) They move through the gel
c) Nowhere
d) Into a micropipette

5) What do you need to use so that you can estimate the size of the DNA bands?

a) A micropipette
b) A meter stick
c) An electronic balance
a) A DNA standard

6) When doing gel electrophoresis, how do you know that your gel is running and the electricity is on?

a) You see bubbles
b) You see sparks
c) You hear a noise
d) The light flashes

7) What makes the DNA move during gel electrophoresis?

a) Electricity
b) Gravity
c) Water
d) Wind

8) All the cells in your body have the same DNA, even though they do not look the same or have the same job.

a) True
b) False

9) Stem sells can be found in your heart.

a) True
b) False

10) DNA fingerprinting can be used to identify a criminal.

a) True
b) False

11) The DNA for the glowing gene came from:

a) Bacteria
b) Octopus
c) Fireflies
d) Jellyfish
e) Glow worms

12) A small piece of extra DNA found in bacteria is called…

a) Chromosome
b) Base pair
c) Double helix
d) Plasmid
e) Nucleus

13) The letter PCR stands for…

a) Pretty cool reaction
b) Polymerase chain reaction

c) Partly complete RNA
d) Partly complete reaction
e) Pure chain reaction

14) GEP (green fluorescent protein) makes jellyfish….
a) Reproduce
b) Glow
c) Shrink
d) Bigger
e) Sleepy

Answers: 1-d, 2-b, 3-c, 4-b, 5-d, 6-a, 7-a, 8-a, 9-b, 10-a, 11-d, 12-d, 13-b, 14-b.

5. Study the Gerund. Complete the following sentences using gerunds.

1) (Be) free and alone is a good thing if you are tired of big cities.
2) (Find) you here was a quite a surprise.
3) If this is what you intend (ask) me, stop (waste) your time.
4) They kept on (talk) though the band began (play).
5) Everyone enjoyed (swim) in the river.
6) My watch needs (repair).
7) He never mentioned (live) in Prague.
8) He does not seem to mind (air) the room.
9) Just imagine (go) there together!
10) Don't put of (do) it now. If you postpone (receive) a visa again, you will miss an excellent opportunity of (go) there.

6. Translate into English using gerunds where possible.

1) Я наполягаю, щоб ти показав нам свій новий автомобіль.

2) Маленький хлопчик пишався тим, що у нього такий благородний друг.
3) Цей фільм варто подивитися. Вам не зможе не сподобатися прекрасна гра акторів.
4) Було неможливо дістати квиток, і йому довелося відмовитися від думки послухати знаменитого піаніста.
5) Я пам'ятаю, що він голосно сміявся, коли розповідав цю історію.
6) Вона була впевнена, що хлопчики вже давно перестали працювати і втекли на річку.
7) Вона сиділа в вітальні, не кажучи ні слова і не звертаючи уваги на балаканину своєї сестри.
8) Чи не відповідаючи на привітання, він швидко пройшов в зал.
9) Він мав намір почати своє розслідування з огляду саду.
10) Він терпіти не може, коли його хвалять.

7. Study the Participle. Find the difference between Participles I and II. Open the brackets and fill in with the proper participle.

1) He fell asleep (exhaust) by the journey.
2) She entered the dining room (accompany) by her husband and her father.
3) A snake (sleep) in the grass will bite if anyone treads upon it.
4) (Fill) his pockets with apples the boy was about to run away when he saw the owner of the garden with a stick in his hand.
5) It was a bright Sunday morning of early summer (promise) heat.
6) When I came home, I found the table (lay).
7) (Judge) by the color of the sun it should be windy tomorrow.
8) (Arrive) at a big seaport, I started to look for a job.
9) He had received an urgent message (ask) him to telephone Sir Matthew.
10) He looked at groups of young girls (walk) arm in arm.
11) In the wood they sat down on a (fall) tree.
12) (See) from the hill the city looks magnificent.

13) (Not know) where to go he turned to a passer-by.
14) (Lock) in her room she threw a fit.
15) (Address) the parcel, I went out at once to post it.

8. Translate into English using participles where possible.

1) Будьте уважні, коли ведете машину.
2) На аркуші паперу було кілька рядків, написаних олівцем.
3) Отримавши телеграму, моя сестра негайно виїхала в Глазго.
4) Я не знаю чоловіка, що говорить по телефону.
5) Виїхавши ввечері, ми прибули в місто о 6 ранку.
6) Отримане звістка схвилювало всіх.
7) Я залишила їй записку, не заставши її вдома.
8) Відчуваючи втому, вони вирішили перепочити.
9) Я не запам'ятав ім'я чоловіка, яка телефонувала вам вчора.
10) Ми сиділи на терасі, насолоджуючись чудовим видом гір, що оточують наш готель.

9. Read this text and translate it.

MEDICAL BIOTECHNOLOGY

Medical biotechnology is the use of living cell materials to research and produce pharmaceutical and diagnostic products that help to treat and prevent humane diseases. Most medical biotechnologists work in academic of industrial settings.

Medical and pharmaceutical biotechnology can speed diagnosis, prevention, and certain therapies. Biotech medicine includes the creation of new vaccines, neutraceuticals, cosmetics with active biological ingredients, and medicines from transgenic animals and plants.

Due to the new basis, lack of experience and ignorance, the implementation of results of some areas of biotechnology (such as about stem cells, genetic enhancement, cell cloning, testing of new drugs in developing nations, controls of transgenic crops, and international regulation and enforcement) met severe resistance of society. Recombinant DNA and hybridoma technologies have been applied long time ago for manufacturing of rare and unique drugs (mainly protein) for human and veterinary medicine. Presently more than 150 recombinant proteins are approved or are in clinical trials for medical use.

Biotechnology met new challenges after the year 2000 when the human genome was sequenced. Although the function of 95% of the human 31 000 genes is still obscure, they all are of potential interest for the pharmaceutical biotechnology. The sequencing of human genome laid the foundations of a new branch of biotechnology called "genomic technologies". They include not only sequencing of new genes and genomes but also development of molecular (DNA and RNA) markers and microarray chips for detecting mutant genes and methods for specific gene silencing (suppression) and/or repair of defective genes for the purposes of gene therapy.

The fields of application of modern biotechnology techniques are medicines, vaccines, diagnostics, gene therapy, bioactive therapeutic, clinical and contract research and neutraceuticals.

10. Give Ukrainian equivalents for the following words and word combinations.

Powerful techniques, recombinant DNA, hybridoma technologies, fermentation technologies, natural materials, achievements of genetic and cell engineering, medical and pharmaceutical biotechnology, diagnosis, prevention, biotech medicine, creation of new vaccines, active biological ingredients, transgenic animals and plants, stem cells, genetic enhancement, cell cloning, veterinary medicine, recombinant proteins, human genome, pharmaceutical biotechnology,

genomic technologies, development of molecular markers and microarray chips, gene therapy, bioactive therapeutic.

11. Translate the sentences into English.

1) Трансгенний організм - живий організм, в геном якого штучно введено ген іншого організму.
2) Пацієнту була призначена хіміотерапія.
3) Йому поставили діагноз - менінгіт.
4) У клінічних дослідженнях беруть участь провідні медики країни.
5) Вчені повинні прискорити темп роботи, якщо вони хочуть закінчити до вказаного терміну.
6) Рекомбінантна ДНК складається з фрагментів різного походження.
7) Рекомбінантні білки – це білки, ДНК яких була створена штучно.

12. Answer the questions.

1) What does biotech medicine include?
2) Why did some areas of biotechnology meet severe resistance of society?
3) How were recombinant DNA and hybridoma technologies used?
4) How many recombinant proteins are approved in clinics?
5) When did biotechnology meet new challenges?
6) What is “genomic technologies”?

13. Speak on the new facts you found in the text. What wondered you or what information was new for you? Can you add some other information about the biotechnology?

14. Discover the difference in the sense of the following words. Make sentences showing the difference of these words.

Medicine, drug, tablets, medication, remedy, cure, medicament, preparation, physic, therapeutic, doctor's stuff.

15. Read the text again and make questions to each paragraph. Give a summary of this text. Check if all ideas from this text were used.

16. Translate the text into Ukrainian.

Вперше термін «біотехнологія» використав угорський інженер Карл Ерек в 1917 році. Використання в промисловому виробництві мікроорганізмів або їх ферментів, що забезпечують технологічний процес відоміе з давніх-давен. На початку XX століття активно розвивалася бродильна і мікробіологічна промисловість. У ці ж роки були зроблені перші спроби налагодити виробництво антибіотиків, харчових концентратів, здійснити контроль ферментації продуктів рослинного і тваринного походження. Перший антибіотик – пеніцилін – вдалося виділити і очистити до прийнятного рівня в 1940 році. Це дало нові завдання: пошук і виробництво лікарських речовин, які продукуються мікроорганізмами, підвищення рівня біобезпеки нових лікарських препаратів.

17. Give a detailed answer or write an essay on the following questions.

- The future of biotechnology.
- What scientist will I be? And how will I help humanity?

Unit 15

GENETIC ENGINEERING

What areas of biotechnology do you know?

What does genetic engineering deal with?

Where can biotechnologists apply the products of genetic engineering?

1. Read and translate the text.

THE SCOPE OF GENETIC ENGINEERING

Genetic engineering is the area of biotechnology concerned with the directed alteration of genetic material. Biotechnology has already had countless applications in industry, agriculture, and medicine. It is a hotbed of research. The finishing of the human genome project – a "rough draft" of the entire human genome was published in the year 2000 – was a scientific milestone by anyone's standards. Research is now shifting to decoding the functions and interactions of all these different genes and to developing applications based on this information. The potential medical benefits are too many to list; researchers are working on every common disease, with varying degrees of success. Progress takes place not only in the development of drugs and diagnostics but also in the creation of better tools and research methodologies, which in turn accelerates progress.

When considering what developments are likely over the long term, such improvements in the research process itself must be factored in. The human genome project was completed ahead of schedule (it usually takes ten years to get from proof-of-concept to successful commercialization).

Genetic therapies are of two sorts: somatic and germ-line. In somatic gene therapy, a virus is typically used as a vector to insert genetic material into the cells of the recipient's body. The effects of such interventions do not carry over into the

next generation. Germ-line genetic therapy is performed on sperm or egg cells, or on the early zygote, and can be inheritable. Embryo screening, in which embryos are tested for genetic defects or other traits and then selectively implanted, can also count as a kind of germ-line intervention. Human gene therapy, except for some forms of embryo screening, is still experimental. Nonetheless, it holds promise for the prevention and treatment of many diseases, as well as for uses in enhancement medicine.

The potential scope of genetic medicine is vast: virtually all disease and all human traits – intelligence, extroversion, conscientiousness, physical appearance, etc. – involve genetic predispositions. Single-gene disorders, such as cystic fibrosis, sickle cell anemia, and Huntington's disease are likely to be among the first targets for genetic intervention. Polygenic traits and disorders, in which more than one gene is implicated, may follow later, although even polygenic conditions can sometimes be influenced in a beneficial direction by targeting a single gene.

ESSENTIAL VOCABULARY

accelerate *verb* – increase in rate, amount, or extent.

application *noun* – the action of putting something into operation.

benefit *noun* – an advantage or profit gained from something ● *Enjoy the benefits of being a member.*

carry *verb* – if something carries over or is carried over from one situation to another, it continues to exist or apply in the new situation.

concern with *verb* – regard it as important to do *something* ● *I was mainly concerned with making something that children could enjoy.*

consider *verb* – think carefully about (something), typically before making a decision ● *Each application is considered on its merits.*

decode *verb* – analyse and interpret (a communication or image) ● *A handbook to help parents decode street language.*

degree *noun* – 1) the amount, level, or extent to which something happens or is present ● *A degree of caution is probably wise*. 2) a unit of measurement of

angles, one ninetieth of a right angle or the angle subtended by one three-hundred-and-sixtieth of the circumference of a circle ● *Set at an angle of 45 degrees.* 3) a unit in any of various scales of temperature, intensity, or hardness ● *Water boils at 100 degrees Celsius.*

disorder *noun* – an illness that disrupts normal physical or mental functions skin disorders.

factor in *phrasal verb* – to include a particular thing in your calculations about how long something will take, how much it will cost etc.

generation *noun* – all of the people born and living at about the same time, regarded collectively.

genetic engineering *noun* – the deliberate modification of the characteristics of an organism by manipulating its genetic material.

germ-line *noun* – a series of germ cells each descended or developed from earlier cells in the series, regarded as continuing through successive generations of an organism

hotbed *noun* – an environment promoting the growth of something, especially something unwelcome ● *The country was a hotbed of revolt and dissension.*

inheritable *adjective* – capable of being inherited ● *These characteristics are inheritable.*

insert *verb* – place, fit, or push (something) into something else.

interaction

milestone *noun* – a very important event in the development of smth.

predisposition *noun* – a liability or tendency to suffer from a particular condition, hold a particular attitude, or act in a particular way ● *A child may inherit a predisposition to schizophreni.*

screening *noun* – the evaluation or investigation of something as part of a methodical survey, to assess suitability for a particular role or purpose. 2) the testing of a person or group of people for the presence of a disease or other condition ● *Prenatal screening for Down's syndrome.*

zygote *noun* – a diploid cell resulting from the fusion of two haploid gametes; a fertilized ovum.

2. Give Ukrainian equivalents for the following words.

genetic engineering, genetic material, human genome, potential medical benefits, research methodologies, proof-of-concept, somatic gene therapy, recipient's body, germ-line genetic therapy, egg cells, zygote, embryo screening, enhancement medicine, potential scope of genetic medicine, singlegene disorders.

3. Put the words in the right order and write down the sentences.

1) is /biotechnology /research /of /a hotbed
2) different genes /and /research /of /decodes/the functions /interactions
3) into /the effects /the next generation /do not carry over
4) are /genetic defects /embryos /tested for
5) human /still experimental/ therapy /is /gene
6) involve /and /predispositions /all disease /all human traits /genetic

4. Complete the sentences using the given words from the box in the correct form.

Concern germ-line embryo screening intervention common disease interactions inheritable somatic embryos

1) Genetic engineering ____ with the directed alteration of genetic material.
2) Germ-line genetic therapy can be_____.
3) Human gene therapy, except for some forms of _____, is still experimental.
4) Research wants to decode the functions and _____ of all these different genes.
5) Genetic therapies are of two sorts: _____ and _____.

6) Researchers are working on every _____ with varying degrees of success.
7) Embryo screening tests _____ for genetic defects or other traits.
8) Single-gene disorders are the first targets for genetic _____.

5. Translate the sentences into English.

1) Лікарі виявили у пацієнта спадкову схильність до серйозної хвороби.
2) Після огляду хворого була прописана фізіотерапія.
3) Є багато штамів вірусу грипу.
4) Після тривалого лікування у пацієнта спостерігалося значне поліпшення стану здоров'я.
5) У природі існує тісна взаємодія рослинного і тваринного світу.
6) Вони були на сімейній зустрічі, на якій були присутні три покоління; молодше з них було найчисленнішим.
7) Генна терапія людини, виключаючи деякі форми скринінгу ембріонів, досі знаходиться на експериментальному рівні.

7. Answer the questions.

1) What is genetic engineering?
2) Where does biotechnology have its applications?
3) What is human genome project?
4) Is there any sense of genetic engineering for medicine?
5) What about human genome project?
6) Genetic therapies are of two sorts, aren’t they? Can you name them?
7) What is somatic gene therapy?
8) What is the main idea, principle of germ-line genetic therapy?
9) What is the potential scope of genetic medicine?
10) How can polygenic conditions sometimes be influenced?

8. Translate the following one-rooted words.

1) Industry – industrial – industrialism – industrialist – industrialize – industrious;
2) Apply - applicant - application;
3) Gene – genealogy – genetics – genome – genetic;
4) Therapy – therapist – therapeutic – therapeutics;
5) Intervene – intervention – intervening – interventionism.

9. Read the text and translate it.

THE HUMAN GENOME PROJECT

Eyes of brown? or blue?… Curly hair? Or straight?… Dimples?…Freckles? …

It's in our genes. Heredity. Our mothers and fathers passed on all our traits when we were born. There are also many things in our genes that we would rather avoid, such as heart disease, diabetes, cancer, arthritis, muscular dystrophy, and other illnesses.

Many diseases come from alterations in our genes. To decipher our genetic code, a scientific journey has begun called The Human Genome Project. The genetic code is the complete instructions of all the genes that tell our body how to develop.

Over the years, some genes have been discovered for certain diseases. People who have a family history of these diseases can be tested for the specific gene. They will then know if they have this disease, even if no symptoms are present. But there are many more diseases with genetic components that have not yet been uncovered. Scientists are still unclear what or which genes affect those diseases. Francis Collins MD, PHD, is the Project Director at the National Center for Human Genome Research. He said that "by uncovering all 30,000 to 40,000 genes in the human genome, we should at the same time uncover the heredity basis of most diseases and that would put us in a position to diagnose them better, treat them better and practice better preventative medicine."

What are genes? They are found in the part of the cell called the nucleus. Human cells contain 23 pairs of chromosomes, 46 in all. One member of each pair comes from the mother and one from the father. Genes occur in pairs, like the chromosomes. A chromosome is a very long chemical molecule called DNA. Genes are segments of DNA molecules. DNA is shaped like a twisted ladder. Rungs of the ladder are chemicals called "base pairs". Chemical "A" is always paired up with "T" and "G" is always with "C". The complete human genome (all our DNA) contains three billion "base pairs". The Human Genome Project will find the sequence of all of them. This knowledge will revolutionize our understanding of the way genes influence disease, because the genes' "base pair" sequence is the code that determines what it does.

What do genes do? They give cells the instructions they need to make complex molecules called proteins. Each gene code is for a different protein. A cell first converts DNA to a similar molecule called RNA. RNA carries the gene's instructions to another part of the cell that acts like a protein factory. Most proteins that come out of the factory are enzymes. Other proteins form cell structures.

Occasionally, the gene that codes for a protein has an error in its based pair sequence. The cell then makes a protein that is not able to do what it should. This is called a mutated gene. Mutated genes play a major role in human diseases. Since genes are incredibly small, it is difficult for scientists to isolate them. Making it easier for scientists to find diseasecausing genes is the main goal of the Human Genome Project.

10. Answer the questions.

1) What is the main goal of The Human Genome Project?
2) How many genes are there in the human genome?
3) What is the name of the Project Director at the National Center for Human Genome Research?
4) How many chromosomes does A human cell contain?
5) What kind of a molecule is a protein?

6) What is the shape of DNA?
7) How many based pairs does a complete human genome contain?
8) How is an error gene called?
9) What similar molecule does a cell convert DNA to?
10) What do many diseases come from?

11. Find the appropriate definitions to the following words.

1) cells	**a)** specific segments of DNA that control cell structure and function; the functional units of inheritance.
2) chromosomes	**b)** structures in the nucleus of a cell.
3) DNA	**c)** these molecules contain the base pairs which hold genetic information.
4) genes	**d)** the unit of living matter of which all living things are made.
5) nucleus	**e)** the most prominent part in living cells.

12. Talk about what you have inherited from each parent. Do you favor one parent? Do you have sisters and brothers? What have they inherited from your parents?

13. Remember Modal verbs and its equivalents. Finish the second sentence with the same idea like in the first. Mind that sometimes you need the other modal verb!

1) She can ski really well.
   She _____ really well when she was five.

2) I can finish it by Friday but it won't be easy.
   I _____ it by Friday but it wasn't be easy.
3) I must check the oil before we leave.
   I _____ check the oil before we left.
4) It must be raining. Everyone has their umbrella up.
5) It _____. The ground is wet.
6) Thank you very much. You needn't give me a lift, but it's very kind.
   You _____ me a lift, but it was very kind.
7) He needn't collect me from the station. I'll walk.
   He _____ me from the station. I walked.
8) Why don't you take the exam? You might pass.
   Why didn't you take the exam? You _____.
9) He should stop smoking before it's too late.
   He _____ stop smoking before it was too late.
10) I could visit you next Sunday.
    I _____ you last Sunday. Why didn't you ask me?
11) There's the phone. It'll be Paul.
    Did he have a deep voice? It_____Paul.
12) He'll sit in the armchair for hours, staring into space.
    He_____ in the armchair for hours, staring into space.
13) Let's take the map. We may get lost.
    I wonder where they are. They _____.

14. Fill in the gaps with the verbs *could, may, must, have to, should* ***and the appropriate infinitive.***

1) Einstein's theory predicted that the universe was not static, but _____ (be) either expending or contracting.
2) Because the universe is expanding it _____ (cool), which means that it _____ (be) much hotter when it was young.

3) Therefore, a significant fraction of the universe ____ (consist) of non-baryonic matter.
4) There were no longer free electrons to absorb and scatter light, and photons _____ (travel) freely through the universe.
5) These fluctuations _____ (cause) by something that happened even earlier.
6) We _____, however, (be) careful about taking these models too seriously; they all _____ (be) wrong.

15. Translate into English using modal verbs.

1) Тобі слід було зателефонувати йому вчора.
2) Йому не слід було говорити з нею таким тоном. Його тон, мабуть, образив її.
3) Це повинно було статися. Всім відома його забудькуватість.
4) Вона повинна була віясніть все до того, як починати роботу. Тепер їй потрібно багато чого переробляти.
5) Їй слід було принести всі документи давним-давно. Тепер занадто пізно.
6) Дітям не можна дивитися фільми жахів.
7) Мені їх проводити? – Ні не потрібно. Мені доведеться зробити це самому.
8) У чужій країні не обходимо пристосовуватися до нових умов життя.
9) Даремно ти купив це пальто.
10) Ми, мабуть, не помітили його в цьому натовпі.
11) Нам не треба було поспішати, тому ми вирішили піти пішки.
12) Чому я повинен це робити?

16. Read and translate the text.

GM FOOD

One of the best-known and controversial applications of genetic engineering is the creation of genetically modified food. There are three generations of

genetically modified crops. First generation crops have been commercialized and most provide protection from insects and/or resistance to herbicides. There are also fungal and virus resistant crops developed or in development. They have been developed to make the insect and weed management of crops easier and can indirectly increase crop yield.

The second generation of genetically modified crops being developed aim to directly improve yield by improving salt, cold or drought tolerance and to increase the nutritional value of the crops. The third generation consists of pharmaceutical crops, crops that contain edible vaccines and other drugs. Some agriculturally important animals have been genetically modified with growth hormones to increase their size while others have been engineered to express drugs and other proteins in their milk.

The genetic engineering of agricultural crops can increase the growth rates and resistance to different diseases caused by pathogens and parasites. These modified crops would also reduce the usage of chemicals, such as fertilizers and pesticides, and therefore decrease the frequency of the damages produced by these chemical pollution.

Ethical and safety concerns have been raised around the use of genetically modified food. A major safety concern relates to the human health implications of eating genetically modified food, in particular whether toxic or allergic reactions could occur. Gene flow into related non-transgenic crops, off target effects on beneficial organisms and the impact on biodiversity are important environmental issues. Ethical concerns involve religious issues, corporate control of the food supply, intellectual property rights and the level of labeling needed on genetically modified products.

16. Search the Internet and find all new GM findings: foods and animals and so on. Present then to your class.

17. Read the text about GM food and translate it close to the text.

Генетично модифіковані організми створюються методами генної інженерії – науки, яка дозволяє вводити в геном рослини, тварини або мікроорганізму фрагмент ДНК з будь-якого іншого організму з метою надання йому певних властивостей. Наприклад, томати отримали ген морозостійкості від арктичної камбали, картопля отримала ген бактерії, чия отрута смертельна для колорадського жука, рис отримав ген людини, відповідальний за склад жіночого молока, який робить злак більш поживним.

Експериментальне створення генетично модифікованих організмів почалося ще в 70-і роки XX століття. З цього часу виробництво ГМП набирало обертів і зараз ми можемо зустріти ГМ сою, кукурудзу, рис, картопля, помідори, рапс, цукровий буряк, пшеницю, горох, соняшник, папайю, бавовну, тютюн, корів з підвищеною жирністю молока, лосося, який може жити як в солоній, так і в прісній воді і багатьох інших організмів. Неконтрольоване споживання генетично модифікованих продуктів може мати непередбачувані наслідки в майбутньому. Щоб повністю зрозуміти всі ризики вживання в їжу трансгенних продуктів, має пройти кілька десятків років і змінитися кілька поколінь, що харчувалися ГМ іжею.

Але не можна говорити зі стовідсотковою впевненістю про шкоду всіх трансгенних продуктів. І в природі існують організми, непридатні в їжу для людини (отруйні та мутагенні). Людина сама має право вибирати, як жити і чим харчуватися. Головне, щоб цей вибір був усвідомленим і ґрунтувався на науково доведених фактах, а не на чутках.

18. Create the project "Genetically modified food". Choose the product you want to create and qualities you can endow your GM product. What are they? Where can you take them from? Make a poster of your product and tell about the procedure you
made to create such unique GM product.

19. Write a 'pro-and-cons' essay about pluses and minuses of

- ***creating GM product.***
- ***using GM food.***

UNIT 16

STEM CELLS

What does a "stem cell" mean?

Do you know how stem cell is used in treatment of different diseases?

Are stem cells used nowadays? How?

1. Read and translate the text.

OUR FUTURE HOPE

Stem cells are cells found in most, if not all, multicellular organisms. They are characterized by the ability to renew themselves through mitotic cell division and differentiating into a range of specialized cell types. Research in the stem cell field grew out of findings by Canadian scientists Ernest McCulloch and James Till in the 1960s.

The two types of mammalian stem cells are: embryonic stem cells that are found in blastocysts, and adult stem cells that are found in adult tissues. In a developing embryo, stem cells can differentiate into all of the specialized embryonic tissues. In adult organisms, stem cells and progenitor cells act as a repair system for the body, replenishing specialized cells, but also maintain the normal turnover of regenerative organs, such as blood, skin or intestinal tissues.

To ensure self-renewal, stem cells undergo two types of cell division. Symmetric division gives rise to two identical daughter cells both endowed with stem cell properties. Asymmetric division, on the other hand, produces only one stem cell and a progenitor cell with limited self-renewal potential. Progenitors can go through several rounds of cell division before terminally differentiating into a mature cell. It is possible that the molecular distinction between symmetric and asymmetric divisions lies in differential segregation of cell membrane proteins (such as receptors) between the daughter cells.

Stem cells can now be grown and transformed into specialized cells with characteristics consistent with cells of various tissues such as muscles or nerves

through cell culture. However, their use in medical therapies has been proposed.

The classical definition of a stem cell requires that it possess two properties: self-renewal - the ability to go through numerous cycles of cell division while maintaining the undifferentiated state; potency - the capacity to differentiate into specialized cell types.

Properties of stem cells can be illustrated in vitro, using methods such as clonogenic assays, where single cells are characterized by their ability to differentiate and self-renew. As well, stem cells can be isolated based on a distinctive set of cell surface markers. However, in vitro culture conditions can alter the behavior of cells, making it unclear whether the cells will behave in a similar manner in vivo. Considerable debate exists whether some proposed adult cell populations are truly stem cells.

Medical researchers believe that stem cell therapy has the potential to dramatically change the treatment of human disease. A number of adult stem cell therapies already exist, particularly bone marrow transplants that are used to treat leukemia. In the future, medical researchers anticipate being able to use techtechnologies derived from stem cell research to treat a wider variety of diseases including cancer, Parkinson's disease, Alzheimer’s disease, spinal cord injuries, Amyotrophic lateral sclerosis and muscle damage, amongst a number of other impairments and conditions. However, there still exists a great deal of social and scientific uncertainty surrounding stem cell research, which could possibly be overcome through public debate and future research, and further education of the public.

ESSENTIAL VOCABULARY

adult *adjective* – fully grown or developed.

Alzheimer's (disease) *noun* – a disease that results in the gradual loss of memory, speech, movement, and the ability to think clearly, and that is common espesially among older people.

amyotrophic lateral sclerosis *noun* – a progressive, usually fatal, neurodegenerative disease caused by the degeneration of motor neurons, the nerve cells in the central nervous system that control voluntary muscle movement.

assay *noun* – a procedure for measuring the biochemical or immunological activity of a sample.

cancer *noun* – a disease in which cells in the body grow without control, or a serious medical condition caused by this disease.

capacity *noun* – the ability or power to do or understand something ● *I was impressed by her capacity for hard work.*

distinction *noun* – a difference or contrast between similar things or people there is a sharp distinction between domestic politics and international politics ● *I was completely unaware of class distinctions.*

endow *verb* – provide with a quality, ability, or asset ● *He was endowed with tremendous physical strength.*

impair *verb* – weaken or damage (something, especially a faculty or function) ● *A noisy job could permanently impair their hearing.*

impairment *noun* – the state or fact of being impaired, especially in a specified faculty ● *A degree of physical or mental impairment.*

in vitro *adjective* – (of processes or reactions) taking place in a test tube, culture dish, or elsewhere outside a living organism.

in vivo *adjective* – (of processes) taking place in a living organism.

injury *noun* – an instance of being injured ● *She suffered an injury to her back*; the fact of being injured; harm or damage ● *All escaped without serious injury.*

mammalian *adjective* – relating to mammals ● *The disease can spread from one mammalian species to another.*

marrow *noun* – a soft fatty substance in the cavities of bones, in which blood cells are produced.

mature *adjective* – fully developed physically; full-grown ● *She was now a mature woman. Owls are sexually mature at one year.*

Parkinson's disease *noun* – is a degenerative disorder of the central nervous system that often impairs the sufferer's motor skills, speech, and other functions.

potency *noun* – the power of something to affect the mind or body; the extent of the contribution of an allele towards the production of a phenotypic characteristic; a capacity in embryonic tissue for developing into a particular specialized tissue or organ.

progenitor *noun* – an originator or founder of a future development; precursor.

spinal cord *noun* – the cylindrical bundle of nerve fibres and associated tissue which is enclosed in the spine and connects nearly all parts of the body to the brain, with which it forms the central nervous system.

2. Translate into English.

1) Терапія дорослими стовбуровими клітинами активно використовується для лікування лейкемії.
2) Здібності стовбурових клітин часто демонструють в пробірці, використовуючи методи клітинного аналізу.
3) Учені спостерігали за стовбуровими клітинами в пробірці і зробили висновок, що знайдені пошкоджені стовбурові клітини переходять в ракові клітини.
4) Багато вчених обіцяють, що через кілька десятків років стовбуровими клітинами можна буде вилікувати майже всі хвороби людини.
5) Існують відмінності в життєвих циклах різних клітин.
6) Ембріональні стовбурові клітини здатні до ділення, тим самим вони відновлюють ті стовбурові клітини, які загинули або були використані.

7) У дорослих організмів стовбурові клітини і клітини попередники виступають в якості ремонту системи для тіла, поповнення спеціалізованих клітин і підтримання нормальної регенеративної органів, наприклад, крові, шкіри або кишкової тканини.
8) У природних умовах стовбурові клітини, можливо, ведуть себе не так як в пробірці.
9) У майбутньому лікарі зможуть лікувати ушкодження спинного мозку.
10) Стовбурові клітини ссавців бувають двох типів.
11) Щоб забезпечити самовідновлення стовбурові клітини піддаються поділу.
12) У даний час стовбурові клітини використовуються в терапії.
13) Трансплантація спинного мозку використовується в лікуванні лейкемії.
14) Сальні залози виділяють свій секрет на поверхню шкіри.
15) М'язова тканина забезпечує рухову активність тваринного організму.
16) Стовбурові клітини мають властивості самовідновлення.
17) Кожна клітина має певний набір генів.
18) У результаті симетричного поділу утворюються дві схожі клітини.
19) Кістковий мозок виробляє формені елементи крові.
20) Стовбурові клітини в процесі клітинного ділення диференціюються в зрілі клітини.
21) Потенціал - здатність диференціюватися в різні типи клітин.
22) Клітки попередники можуть пройти кілька етапів клітинного ділення.
23) Властивості стовбурових клітин можна проілюструвати методом клоногенних аналізу.

3. Answer the questions.

1) What ability do stem sells have?
2) Who was the first investigator of stem cells?
3) What are the types of mammalian stem cells?
4) How do stem cells and progenitor cells act in adult organisms?

5) What types of cell division do you know?
6) What is the difference between them?
7) How can stem cells be grown and transformed?
8) What are the properties of stem cells?
9) What is the method of clonogenic assay?
10) Will stem cell therapy cure many diseases or not?
11) Are there any existing adult stem cell therapies?
12) Are all people sure about the necessity of stem sells research?

4. Remember the use and forms of the Infinitive. Open the brackets and choose the Infinitive in the Active or Passive Voice.

1) They are glad (invite/be invited) to the party.
2) I don't like (interrupt/be interrupted).
3) He will be happy (see/be seen) you.
4) I was glad (meet/be met) at the station.
5) Children like (tell/be told) tales and always (listen/be listened) to them with interest.
6) I did not think (interrupt/be interrupted) you.
7) He is glad (send/be sent) abroad.
8) He likes (ask/be asked) his professor questions.
9) He does not like (ask/be asked) questions because he does not know how to answer them.
10) Be careful with him. He is a very resentful person. He can't bear (joke/be joked at).
11) He does not like (laugh/be laughed) at other people.
12) Look, a ship can (see/be seen) in the distance. Can you (see/be seen) it?

5. Study the Complex Object. Open the brackets and use the Complex Object.

Example: *He expected (they, arrive) at 5. — He expected them to arrive at 5.*

1) Do you want (they, stay) at the hotel or with us?
2) I'd like (the professor, look through) my report.
3) Do you want (I, show) you the sights of the city?
4) We expect (he, arrange) everything by the time we come.
5) I want (she, tell) me the news in brief.
6) He expected (the meeting, hold) in the Red Room.
7) I would like (they, fix) an appointment for me for Tuesday.
8) We want (she, introduce) us to the president.
9) I don't want (they, be late) for dinner.
10) He expected (she, invite) to the party by the Smiths.
11) I'd like (the dress, buy) by Saturday.
12) I don't want (she, treat) like Alice.
13) We considered (he, be) an honest person.
14) I don't like (she, prevent) me from doing it.
15) I suspect (he, help) by her.

6. Translate into English using the Complex Object.

1) Я не очікував, що цей поліцейський буде таким неввічливим.
2) Ми б хотіли, щоб ви доставили товари до кінця червня.
3) Я очікував, що її запросять туди.
4) Вони не очікували, що його запитають про це.
5) Я чув, як його ім'я кілька разів згадувалося на зборах.
6) Він не помітив, як ми підійшли до нього.
7) Ви бачили, як вони над чимось сміялися?
8) Ми не очікували, що про це оголосять по радіо.
9) Мені б хотілося, щоб вона сказала нам, що вона буде робити сьогодні ввечері.
10) Я думаю, що сьогодні ви почуєте, як вона співає.
11) Коли він почув, що його син плаче, він встав і пішов в дитячу кімнату.

12) Я б хотів, щоб ніхто не брав мої речі.

7. Read and translate the text.

EMBRYO-SAFE STEM CELL RESEARCH

Researchers at Advanced Cell Technology, Inc. have found a new technique to gather stem cells. They took a single cell from an eight-cell human embryo, claiming that the process does no harm. The removal of a single cell isn't new, and has been employed in fertility clinics to test for diseases. Doctors and fertility specialists do this before the embryo is implanted in the womb.

Human embryonic stem cell research is controversial because, with the present state of technology, starting a stem cell line requires the destruction of a human embryo and/or therapeutic cloning. Such reproductive cloning can fundamentally devalue human life. Those in the pro-life movement argue that a human embryo is a human life and is therefore entitled to protection.

Contrarily, supporters of embryonic stem cell research argue thatsuch research should be pursued because the resultant treatments could have significant medical potential. It is also noted that excess embryos created for in vitro fertilization could be donated with consent and used for the research.

Although critics quickly pointed out that all sixteen embryos used in the experiment were destroyed. ACT, Inc. later admitted that scientists removed more than a single cell, and hence their destruction. In addition, scientists developed stem cell lines from only two of the ninety-one cells removed. An official of the United States Conference of Catholic Bishops disapproved of the experiment, saying "it left no embryos alive, and solves no ethical problem."

8. Answer the questions.

1) What did Advanced Cell Technique, Inc. do?
2) What do fertility clinics usually do?
3) What is the position of the supporters?
4) And what are the critics doing because of the research?

5) What ethical reasons do critics disapprove stem cell research?

9. Translate the text about stem cells.

Стовбурові клітини є тією основою ("стовбуром"), з якої розвивається "древо" всього організму. На самих ранніх стадіях свого розвитку зародок повністю складається зі стовбурових недиференційованих клітин, потім починаються етапи диференціювання і з них утворюються органи і тканини організму. У дорослому організмі стовбурові клітини містяться в невеликих кількостях в крові та кістковому мозку і в ще менших кількостях у всіх органах і тканинах.

Оскільки ці клітини можуть перетворюватися в клітки будь-яких органів і тканин, вони грають роль свого роду екстреної допомоги: якщо десь в організмі неполадка, стовбурові клітини спрямовуються туди і, перетворюючись в клітини пошкодженого органу, сприяють відновленню його функції. З віком кількість стовбурових клітин стає все менше, і, відповідно, відновлювальні можливості організму знижуються.

Так, коли ми народжуємося, у нас в кістковому мозку на 10 тис. Кровотворних клітин припадає одна стовбурова клітина. У зростаючих підлітків стовбурових клітин вже в 10 раз менше. До 50-ти років на 0,5 млн звичайних клітин припадає 1 стовбурова, в 70 років - 1 стовбурова клітина на мільйон. Через це можливості людини по регенерації сильно обмежені. В результаті страждає здатність тканини до фізіологічної регенерації і до відновлення після хвороби або травми.

10. Talk about the following questions in pairs/groups. Make a report or write an essay on these questions.

1) Is it unethical to collect stem cells if it means that an embryo will be destroyed? Why/ not?
2) Do you think these kinds of experiments are like scientists playing God? Why/ not?

3) What would happen if scientists could cure all diseases some day?
4) If your husband/wife had Alzheimer's, would you want science to find a cure as soon as possible? What if it meant conducting stem cell research?
5) Who is right, those who follow religion or those who follow science? Why?
6) What will happen if stem cell treatment becomes a reality? What about population, the rich and poor, etc.?

Unit 17

CLONING

Do you agree or disagreewith the following statements? Why?

- *People will someday be cloned for spareparts.*
- *Cloning is a dangerous technology that should be illegal.*
- *The cloning of endangered animals will someday be an important science.*
- *If my pet died, I would want to clone him.*
- *When I die, I want to be cloned.*

1. Read and translate the text.

CLONING AND CONCERNS ABOUT IT

Cloning in biology is the process of producing similar populations of genetically identical individuals that occurs in nature when organisms such as bacteria, insects or plants reproduce asexually. Cloning in biotechnology refers to processes used to create copies of DNA fragments (molecular cloning), cells (cell cloning), or organisms.

Molecular cloning refers to the process of making multiple molecules. It is used in a wide array of biological experiments and practical applications ranging from genetic fingerprinting to large scale protein production.

Cloning of any DNA fragment essentially involves four steps. First is fragmentation – breaking apart a strand of DNA; second is ligation - gluing together pieces of DNA in a desired sequence; third is transfection - inserting the newly formed pieces of DNA into cells and the last is screening or selection - selecting out the cells that were successfully transfected with the new DNA. Cloning a cell means to derive a population of cells from a single cell. In the case of unicellular organisms such as bacteria and yeast, this process is remarkably

simple and essentially only requires the inoculation of the appropriate medium. However, in the case of cell cultures from multicellular organisms, cell cloning is an arduous task as these cells will not readily grow in standard media.

Organism cloning (also called reproductive cloning) refers to the procedure of creating a new multicellular organism, genetically identical to another. In essence this form of cloning is an asexual method of reproduction, where fertilization or inter-gamete contact does not take place. Asexual reproduction is a naturally occurring phenomenon in many species, including most plants (vegetative reproduction) and some insects. Scientists have made some major achievements with cloning, including the asexual reproduction of sheep and cows.

There is a lot of ethical debate over whether or not cloning should be used. However, in the United States, the human consumption of meat and other products from cloned animals was approved by the FDA (The Food and Drug Administration) on December 28, 2006, with no special labeling required. Cloned beef and other products have since been regularly consumed in the US without distinction.

Because of recent technological advancements, the cloning of animals (and potentially humans) has been an issue. The Catholic Church and many religious organizations oppose all forms of cloning, on the grounds that life begins at conception. They concern about the protection of the identity of the individual and the right to protect one's genetic identity.

Another concern is that the biotechnologies used on animals may someday be used on humans. Researchers have found several abnormalities in cloned organisms, particularly in mice. The cloned organism may be born normal and resemble its non-cloned counterpart, but majority of the time will express changes in its genome later on in life. The concern with cloning humans is that the changes in genomes may not only result in changes in appearance, but in psychological and personality changes as well. The theory behind this is that the biological blueprint of the genes is the same in cloned animals as it is in normal ones, but they are read

and expressed incorrectly. Results of these abnormally expressed genes in the cloned mice were premature death, pneumonia, liver failure and obesity.

ESSENTIAL VOCABULARY

asexual *adjective* – (of reproduction) not involving the fusion of gametes.

blueprint *noun* – a design plan or other technical drawing.

consumption *noun* – 1) the action of using up a resource ● *Industrialized countries should reduce their energy consumption;* 2) the action of eating or drinking something.

counterpart *noun* – a person or thing that corresponds to or has the same function as another person or thing in a different place or situation.

fertilization *noun* – the action or process of fertilizing an egg or a female animal or plant, involving the fusion of male and female gametes to form a zygote.

genetic fingerprinting *noun* – the analysis of DNA from samples of body tissues or fluids in order to identify individuals.

inoculation *noun* – the action of inoculating or of being inoculated; vaccination ● *Inoculation against flu was readily available.*

ligation *noun* – the joining of two DNA strands or other molecules by a phosphate ester linkage.

multicellular *adjective* – (of an organism or part) having or consisting of many cell

non-coding sequence

premature *adjective* – occurring or done before the usual or proper time; too early.

resemble *verb* – have a similar appearance to or qualities in common with (someone or something); look or seem like.

strand *noun* – a single thin length of something such as thread, fibre, or wire, especially as twisted together with others.

transfect *verb* – infect (a cell) with free nucleic acid.

unicellular *adjective* – (of protozoans, certain algae, spores, etc.) consisting of a single cell.

2. Translate into English.

1) Значний прогрес у вивченні клонування людини буде досягнутий в майбутньому.
2) Молекулярне клонування займається молекулами ДНК, їх частинами та навіть окремими генами.
3) Приймай ці ліки регулярно, вони захистить тебе від рецидиву хвороби.
4) По мірі того, як молекулярна ланцюг подовжується, змінюються і властивості речовин, що складаються з цих молекул.
5) Фрагменти ДНК будуть розрізані в випадкових місцях.
6) ДНК являє собою кілька ланцюжків, що складаються з нуклеотидів.
7) Під час трансфекції генетична інформація переноситься в еукаріотичні клітини за допомогою очищеної ДНК.
8) Нитка ДНК складається з фрагментів і розривається на частини в процесі розмноження.
9) Безстатеве розмноження захищає організм від введення іншої біологічної програми.

3. Fill in the gaps in the sentences according to the text.

1) Cloning in biotechnology refers to processes used to create copies of _____, _____, or _____.
2) Cloning is commonly used to amplify DNA fragments containing whole_____.
3) In the case of unicellular organisms such as bacteria and yeast, this process is remarkably simple and essentially only requires _____of the appropriate medium.

4) Organism cloning refers to the procedure of creating a new_____, genetically identical to another.
5) _____is a naturally occurring phenomenon in many species, including most plants and some insects.
6) Researchers have found several abnormalities in_____, particularly in mice.

4. Put thefollowing ideas in the order as they were given in the text.

- Religious organizations oppose cloning
- There are 3 types of cloning
- Diseases caused by cloning
- Cloning produces similar populations or identical individuals
- Organism cloning creates new multicellular organism asexually
- Multiple molecules can be made by molecular cloning
- Cloned meat have been consumed in the US without distinction
- Cell cloning derives a population of cells from a single cell

5. Read and translate interesting facts about cloning.

DID YOU KNOW…?

- ✓ Dolly the cloned sheep was named after country singer Dolly Parton, because she started life as a mammary cell.
- ✓ We leave our DNA around all the time, everywhere: on the door, on the table, on the keyboard… For the moment we couldn't clone from it, but hey, perhaps later we may be able to clone you from the tiny bits of DNA you leave about!
- ✓ Humans have far fewer genes than expected at 35,000 to 42,000, compared to the nematode worm with 18,000 and the fruit fly with 13,000. However,

scientists say we may still have more – we don’t know the whole genome set yet and we may have missed some genes.

- ✓ The difference between humans and fruit flies or worms is that human genes work differently, are capable of multitasking, and we have more control genes.
- ✓ Most mutations occur in males.
- ✓ In each of our cells, there are six feet of DNA packed into a chromosome only 0.0004 inches across.
- ✓ Lining up all of the DNA in the human body, it would reach to the sun and back more than 600 times.
- ✓ The information would fill 200 500-page telephone directories.
- ✓ Our DNA is 99.9% identical to all other members of the human race.

6. Study the Complex Subject. Open the brackets and use the Complex Subject.

Example: *He is thought (study) now. — He is thought to be studying now.*

1) He is considered (be) a good musician.
2) They are thought (go away) some days ago.
3) James is expected (make) a report next Wednesday.
4) Steve is known (help) them to solve a problem when they were in trouble.
5) Mozart is known (compose) a lot of wonderful pieces of music.
6) The film is considered (be) the worst of the year.
7) She is supposed (work) in the laboratory from 2 to 6 p.m. tomorrow.
8) They are known (make) a new discovery a month ago.
9) He is expected (manage) the business himself.
10) He is said (be) at the customs office now.

7. Translate into English using the Complex Subject.

1) Стівен обов'язково виграє цю гру.

2) Відомо, що Пітер поїхав в Осло.
3) Припускають, що президент виступить на конференції.
4) Цю п'єсу вважають найцікавішою в театрі.
5) Здається, вона готує яблучний пиріг. Пахне дуже смачно.
6) Боб, напевно, нам допоможе. – Він напевно нам допоможе.
7) Вважають, що вони поїхали вчора.
8) Очевидно, переговори закінчаться завтра.
9) Вважають, що ця робота була виконана успішно.
10) Навряд чи цей факт має велике значення.
11) Це, ймовірно, станеться, якщо вітер не зміниться.
12) Кажуть, що делегати на конференцію вже приїхали.
13) Відомо, що цей комітет був створений кілька років тому.
14) Він, мабуть, пише нову книгу.
15) Припускають, що вони зможуть вирішити це питання відразу.
16) Відомо, що Джек Лондон написав багато прекрасних книг.

8. Read the following text and translate it.

HUMAN CLONING

Human cloning is the creation of a genetically identical copy of an existing or previously existing human. There are two commonly discussed types of human cloning: therapeutic cloning and reproductive cloning. Therapeutic cloning involves cloning cellsfrom an adult for use in medicine and is an active area of research. Reproductive cloning would involve making cloned human beings. Such reproductive cloning has not been performed and is illegal in many countries. A third type of cloning called replacement cloning. It is a theoretical possibility, and would be a combination of therapeutic and reproductive cloning. Replacement cloning would entail the replacement of an extensively damaged, failed, or failing body through cloning followed by whole or partial brain transplant.

Some people and groups oppose therapeutic cloning, but most scientific, governmental and religious organizations oppose reproductive cloning. Many scientific organizations have made public statements suggesting that human reproductive cloning be banned until safety issues are resolved. Serious ethical concerns have been raised by the idea that it might be possible in the future to harvest organs from clones. Some people have considered the idea of growing organs separately from a human organism - in doing this, a new organ supply could be established without the moral implications of harvesting them from humans.

The first human hybrid human clone was created in November 1998, by American Cell Technologies. It was created from a man's leg cell, and a cow's egg whose DNA was removed. It was destroyed after 12 days.

On January, 2008, Wood and Andrew French, Stemagen's chief scientific officer in California, announced that they successfully created the first 5 mature human embryos using DNA from adult skin cells, aiming to provide a source of viable embryonic stem cells. It is not clear if the embryos produced would have been capable of further development, but Dr. Wood stated that if that were possible, using the technology for reproductive cloning would be both unethical and illegal. Thus, the 5 cloned embryos were destroyed.

9. Talk about the following questions in pairs/groups. Remember to support your answers!

1) In your opinion will reproductive cloning be legal in future?
2) Grandpa just died. Would you consider cloning him? Why/ not?
3) What do you think will happen in 10 years regarding cloning? 25 years? 100 years?
4) What do you think about the whole business of cloning? Will it be possible and profitable in future?
5) Would you like to have a cloned version of yourself? For spare part of just to have a brother/ friend?

10. Translate int English.

Проблема клонування пов'язана з потенційними ризиками для здоров'я майбутнього клону, зокрема, можливість його передчасного старіння. Вчені ще в 1971 році звернув увагу на проблему вкорочення хромосом в клітинах в результаті поділів. Вчений припустив, що укорочення хромосом не може йти вічно - в якийсь момент клітина постаріє і втратить здатність ділитися. Але чому наші хромосоми не коротші хромосом наших предків? Виявилося, що на кінцях хромосом є спеціальні ділянки - теломери. При подвоєнні хромосом ці ділянки дійсно коротшають, проте спеціальний фермент - теломераза, активний в деяких клітинах (наприклад, в стовбурових), може добудовувати теломери до вихідного розміру. Виходить, що при наявності ферменту теломерази клітини здатні ділитися без особливих обмежень, не "старіти». Відсутність теломерази в більшості клітин є одним із захисних механізмів від неконтрольованого ділення, тобто раку.

11. Write a letter to a scientist involved in cloning. Give him/her three pieces of advice on what (s) he should do to make sure cloning is safe. Ask him/her three questions about cloning. Read your letter to your partner(s). Your partner(s) will answer your questions.

12. Do we have a right to clone dead people? What if they didn’t want to be cloned? Make a report/essay on this topic.

Unit 18

BIOTECHNOLOGICAL ETHICS

What do you know about ethical issues?

Why are some people against biotechnological research?

1. Read and translate the text.

ETHICAL ISSUES IN BIOTECH

From the time when the earliest pioneers of medicine took the Hippocratic Oath, the importance of ethical considerations about actions affecting living entities has been recognized by professionals. The general principles are still of fundamental importance: respect for life and the need for a balance of benefit over harm resulting from any intervention.

There are three particular contemporary features that account for the public concern on the threshold of the 21st century. First, much of the current development in biotechnology results from an advanced understanding of the nature of genetics and the ability to perform manipulations in the genomes of plants and animals. Some feel that 'respect for life' implies that there should be no interference with it in this basic way. Obviously, heart transplants are as radically unnatural as gene transplants, but most people consider them to be ethically acceptable.

Second, the pace of discovery in genetics-based biotechnology is very rapid and there is anxiety thattechnology will drive developments ahead of proper ethical considerations. The moratorium on human germ-line therapy is an example that there must be ethical restraints on the use of what is technically feasible. Part of the reason for this restriction is uncertainty about the long-term effects of such interventions. There is also uncertainty about the environmental consequences of the genetic manipulation of plants. These issues are scientific questions that need to be answered before we have an adequate basis of knowledge for final ethical decisions.

Third, advanced technology involves processes that are only well understood by the experts who develop and use them. This places considerable power in the hands of the companies that employ these experts. Currently, there is much public suspicion about the reliability and independence of this 'expert' advice. Although some of this suspicion comes from a difficulty in understanding that certain answers cannot be given to complex questions.

There is also much suspicion of transnational corporations, which want to maximize their profits by making users dependent on their products and then controlling availability. But the ethical use of biotechnology should clearly include it being provided only on a fair and just basis.

ESSENTIAL VOCABULARY

anxiety *noun* – a feeling of worry, nervousness, or unease about something with an uncertain outcome.

acceptable *adjective* – able to be agreed on; suitable.

consequence *noun* – a result or effect, typically one that is unwelcome or unpleasant ● *Abrupt withdrawal of drug treatment can have serious consequences.*

contemporary *adjective* – belonging to or occurring in the present ● *The tension and complexities of our contemporary society.*

harm *noun* – 1) physical injury, especially that which is deliberately inflicted ● *I didn't mean to cause him any harm*. 2) actual or potential ill effects or danger ● *There's no harm in asking her.*

entity *noun* – a thing with distinct and independent existence.

long-term *adjective* – occurring over or relating to a long period of time ● *The long-term effects of smoking.*

moratorium *noun* – a temporary prohibition of an activity.

suspicion *noun* – a feeling or thought that something is possible, likely, or true ● *She had a sneaking suspicion that he was laughing at her.*

rapid *adjective* – happening in a short time or at a great rate.

restraint *noun* – (often **restraints**) a measure or condition that keeps someone or something under control ● *Decisions are made within the financial restraints of the budget.*

restriction *noun* – (often restrictions) a limiting condition or measure, especially a legal one planning restrictions on commercial development.

transplant *noun* – an operation in which an organ or tissue is transplanted ● *A heart transplant.*

2. Give Ukrainian equivalents for the following words.

earliest pioneers, ethical considerations, in relation to, living entities, general principles, respect for life, contemporary features, account for, nature of genetics, manipulations in the genomes of plants and animals, heart transplants, gene transplants, to be ethically acceptable, genetics-based biotechnology, pace of discovery, drive developments, human germ-line therapy, ethical restraints, long-term effects, environmental consequences, scientific question, adequate basis of knowledge, ethical decision, advanced technology, public suspicion, 'expert' advice, transnational corporations.

3. Translate the sentences into English.

1) Цей дослідник був головним в цьому проекті, і він ніс всю відповідальність за наслідки.
2) Геном – це сукупність хромосомних спадкових чинників.
3) Пацієнту була призначена операція з пересадки органу.
4) Світ живих істот налічує кілька мільйонів видів.
5) Хворому був призначений довгостроковий догляд.
6) Феномен генетичної рестрикції лежить також в основі розвитку ряду иммунопатологий.
7) Дослідник отримав позитивні відгуки колег про свої досягнення.

4. Put the words in the right order and write down the sentences.

1) genetics-based / The / of / very / discovery / rapid / is / pace / in / biotechnology.
2) is / about / uncertainty / the / of / There / environmental / genetic / the / of / plants / consequences / manipulation.
3) as / transplants / Heart / radically / are / gene / unnatural / as / transplants.
4) There / much / about /reliability /and / of / is /'expert' / the / independence / suspicion / public / advice.
5) a /suspicions / from / Some / difficulty/ derive / in / understanding.

5. Answer the questions.

1) When did ethical considerations start to be recognized?
2) What are the general ethics principles?
3) What do some people think about interference in life in its basic way?
4) What anxiety appears in connection with the rapid development of genetic-based biotechnology?
5) What example does the moratorium on human germ-line therapy shows?
6) What anxiety does public have about the experts?
7) Is there any suspicion about the transnational corporations` activity?
8) What basis should ethics of biotechnology have?

6. Read and translate the text.

GENETICALLY MODIFIED FOODS ETHICS

Selective breeding has been used since agriculture began, with the development of cultivated crops from wild species and of domestic herds from wild animals. However, it is now possible to carry out gene transfers that could not occur in nature, even gene transfers from the animal kingdom to the plant kingdom.

Some people have characterized this as 'playing God', with the implication that it is ethically unacceptable to interfere with nature. However, human beings

are themselves part of nature and many religious people would see the responsible exercise of scientific skills as being the employment of Godgiven abilities.

One of the major concerns about GM crops is their possible environmental effects. Insect-resistant strains may reduce the use of insecticides, but will genes spread from herbicide-resistant strains to produce 'superweeds'? All interventions in nature run the risk of unanticipated upsets to its balance and, from the time that humans with stone axes began felling trees, agriculture has had significant environmental consequences. Because consequences are difficult to predict accurately, it is important that carefully controlled and monitored trials are used to gain the detailed knowledge on which ethically responsible decisions can be based.

It is predicted that the world population, currently approximately six billion, will rise to approximately eight billion by the year 2020. Present agricultural resources, if their produce was fairly distributed, could sustain approximately 6.4 billion people. Biotechnology offers considerable possibilities to help eliminate the anticipated shortfall. However, there is also considerable concern that small-scale farmers should not be exploited by large international companies.

To these considerations must be added the universal ethical obligation to respect the duty of safety. With regard to food safety, GM products do not seem to raise issues or demand the monitoring of techniques, different to those employed to assess the effects of ordinary foods.

7. Give the definitions to the following words.

Genetically modified foods, selective breeding, cultivated crops, gene transfers, environmental effects, insecticides, superweeds, herbicide-resistant strains, insect-resistant strains, agricultural resources, small-scale farmers, food safety.

8. Read and translate the text.

HUMAN GENETICS ETHICS

The use of biotechnology in relation to human beings is governed by the Hippocratic principle that interventions must be for the benefit of the individual person concerned. Controversy in this area is not generated by dissent from this principle but by disagreement about what constitutes a human person, with all the moral rights appertaining to that status.

Some believe that this status is established at the moment of conception. If that is the case then no manipulation of the early embryo, other than for its own direct benefit, could be ethically justified. Others, however, take a more developmental view of the way in which a human fetus grows into a person, with the dawning of sentience and eventually of mentality. Currently, that research is also limited to projects investigating aspects of human fertility.

Although the repair of damaged tissues in the ill or injured is seen as being highly desirable, the creation of a 'replacement person' is not so acceptable. Respect for the human person forbids this – not because there is an intrinsic human right to possess a unique genome but because a human being is to be valued for their self and not used as a surrogate for another. The same moral intuition leads to an abhorrence

of the idea of using genetic manipulation to produce 'designer babies' with qualities according to parental specification. Persons are never to be commodified: ethically, they are never means but always ends.

Science, by gaining knowledge, confers power; if that power is to be used to choose the good and refuse the bad then wisdom must be added to knowledge. This quest for judicious decisions will involve the participation of at least three parties: the experts, the community of possible beneficiaries and the general public.

If this prospect of a rational debate about biotechnology is to be realized, a considerable educational program will be required. It is clear that many people still lack the rudimentary degree of scientific understanding that is indispensable as the basis for reaching informed, ethical conclusions on these issues.

9. Answer the questions.

1) What is the Hippocratic principle?
2) Is there a controversy in this area?
3) Who is a 'replacement person'?
4) What do people think about the creation of a ‘replacement person’?
5) What will involve the participation of at least three parties: the experts, the community of possible beneficiaries and the general public?

10. Write down questions to each paragraph.

11. Create a code of ethics regulations for biotechnologists. Write what they should do and what they must not do.

Unit 19

NANOTECHNOLOGY

What does the word "nanotechnology" mean?

What does nanotechnology research?

How many proteins do you know?

1. Read and translate the text.

WHAT IS NANOTECHNOLOGY?

Nanotechnology (sometimes shortened to "nanotech") is the study of manipulating matter on an atomic and molecular scale.

Nanotechnology may be able to create many new materials and devices with a vast range of applications, such as in medicine, electronics, biomaterials and energy production. But also nanotechnology raises many concerns about the toxicity and environmental impact of nanomaterials, and their potential effects on global economics.

Nanotechnology is the engineering of functional systems at the molecular scale. In its original sense, nanotechnology refers to the projected ability to construct items from the bottom up, using techniques and tools being developed today to make complete, high performance products.

One nanometer (nm) is one billionth of a meter. By comparison, a DNA double-helix has a diameter around 2 nm. On the other hand, the smallest cellular life-forms, the bacteria of the genus Mycoplasma, are around 200 nm in length. By convention, nanotechnology is taken as the scale range 1 to 100 nm. The lower limit is set by the size of atoms (hydrogen has the smallest atoms, which are approximately a quarter of 1 nm diameter) since nanotechnology must build its devices from atoms and molecules. The upper limit is more or less arbitrary but is around the size that phenomena not observed in larger structures start to become apparent and can be made use of in the nano device.

Two main approaches are used in nanotechnology. In the "bottom-up" approach, materials and devices are built from molecular components which assemble themselves chemically by principles of molecular recognition. In the "top-down" approach, nano-objects are constructed from larger entities without atomic-level control.

Areas of physics such as nanoelectronics, nanomechanics, nanophotonics and nanoionics have evolved during the last few decades to provide a basic scientific foundation of nanotechnology.

ESSENTIAL VOCABULARY

advanced *adjective* – far on or ahead in development or progress.

approach *noun* – a way of dealing with a situation or problem ● *We need a whole new approach to the job.*

approximately *adverb* – used to show that something is almost, but not completely, accurate or exact; roughly ● *A journey of approximately two hours.*

arbitrary *adjective* – If you describe an action, rule, or decision as arbitrary, you think that it is not based on any principle, plan, or system. It often seems unfair because of this ● *Arbitrary arrests and detention without trial were common.*

evolve *verb* – develop gradually ● *The company has evolved into a major chemical manufacturer.*

impact *noun* – a marked effect or influence.

nanomaterial *noun* – a material having particles or constituents of nanoscale dimensions, or one that is produced by nanotechnology.

observe *verb* – take note of or detect (something) in the course of a scientific study ● *The behaviour observed in groups of chimpanzees.*

phenomenon (pl. **phenomena**) *noun* – a fact or situation that is observed to exist or happen ● *Ball lightning is very interesting natural phenomena.*

toxicity *noun* – 1) the degree of strength of a poison; 2) the state or quality of being poisonous.

2. Translate into English.

1) Журнал "Нано Дайджест" зібрав найцікавіші досягнення вчених у сфері нанотехнологій.
2) Нанометр – одиниця вимірювання довжини в метричній системі, що дорівнює однієї мільярдної частини метра.
3) Токсичність діє шкідливо на організм людини, тварин і рослин.
4) Величезний внесок науки в духовне життя суспільства є беззаперечним.
5) В наш час розвивається така область хімії, як молекулярний дизайн.
6) Спостерігати за нанооб'єктами можна різними способами.
7) Щоб підтвердити цю теорію необхідно наукове обгрунтування.

3. Are the following statements true or false? Correct the false ones.

1) Nanotechnology is the study of manipulating matter on only molecular scale.
2) Generally, nanotechnology deals with structures sized between 10 to 100 nanometre.
3) Nanotechnology may be able to create many new materials and devices with a vast range of applications.
4) Nanoelectronics is the engineering of functional systems at the molecular scale.
5) Nanotechnology refers to the projected ability to construct items from the bottom up.
6) One nanometer (nm) is one billionth, or 10^{-9}, of a meter.
7) Nanotechnology is taken as the scale range 1 to 100 nm.
8) The upper limit is set by the size of atoms.
9) Four main approaches are used in nanotechnology.
10) Only nanoelectronics have evolved during the last few decades to provide a basic scientific foundation of nanotechnology.

4. Using dictionary give definitions of the following word combinations.

- silver nanoparticles

- stress response
- nano-titanium dioxide
- carbon nanotubes
- organic food

5. Revision. Choose the correct variant.

1) My mother _____in a very big hospital in London.
   a) work
   b) is working
   c) works
   d) are working
2) What _____this evening?
   a) do you do
   b) are you doing
   c) you do
   d) were you doing
3) Have you ever _____ the portrait ofm Mona Lisa?
   a) seen
   b) see
   c) seeing
   d) saw
4) The children will call you if they _____ anything.
   a) need
   b) will need
   c) needed
   d) have needed
5) “Your mother was here a minute ago”. “Oh, _____?”
   a) did she
   b) has she
   c)was she

d) is she

6) Alice is_____than her sister.

a) taller

b) more taller

c) tallest

d) more taller

7) 6254 _____

a) six thousand and two hundred fifty-four

b) six hundred two thousand and fifty-four

c) six thousand two hundred fifty-four

d) six thousand two hundred and fifty-four

8) There isn`t_____butter in the fridge.

a) some

b) no

c) any

d) a

9) How_____ water is there in the cup?

a) little

b) much

c) many

d) big

10) This house was built_____ the 18th century.

a) in

b) on

c) at

d) by

11) Talk_____me, please!

a) with

b) to

c) for

d) on

12) Christmas is_____popular holiday in Great Britain.

a) most

b) the most

c) most of all

d) very

13) _____ I come in?

a) can

b) should

c) may

d) am

14) I’m sorry, I_____go.

a) ought to

b) must

c) need to

d) have to

15) You_____come to school in time.

a) ought to

b) should

c) need

d) may

16) She is likely to help them. _____

a) їй подобається допомагати їм

b) вона, напевене, допоможе їм

c) вона навряд чи допоможе їм

d) їй подобається, коли вони допомагають їй

17) She was born_____19 May, 1950.

a) in

b) on

c) at

d) by

18) You are angry with me, _____you?

a) aren’t

b) shall

c) won’t

d) will

19) Let me give you_____.

a) an advice

b) the advice

c) some advice

d) some advices

20) We would like_____ you a present.

a) give

b) giving

c) to give

d) to giving

21) We have very_____money left.

a) few

b) little

c) a few

d) a little

22) The_____ pens and pencils are on the desk.

a) children

b) childrens

c) children’s

d) childrens’

23) The mice_____the cheese.

a) have eaten

b) have been eaten

c) has eaten

d) has been eaten

24) I wonder where _____.

a) he did go

b) he went

c) did he go

d) went he

25) Don`t touch this ball! It’s_____!

a) her

b) mine

c) my

d) your

26) _____the more you get fat.

a) when you eat more

b) eating more

c) the more you eat

d) more eaten

27) Can you look_____the baby for 10 minutes?

a) out

b) to

c) for

d) after

28) It was _____yesterday!

a) such nice weather

b) too nice weather

c) so nice weather

d) such a nice weather

29) I want one and_____of pears, please.

a) half kilo

b) a half kilo

c) half kilos

d) a half kilos

6. Read and translate the text.

PROTEINS

Structure and size: proteins are linear, unbranched polymers constructed from 20 different α- amino acids that are encoded in the DNA of the genome. All living organisms use the same 20 amino acids and the same genetic code. Proteins are large molecules with molecular weight ranging from 10 to 50 kdal for single-chain proteins. Multichain proteins of 150 to 200 kdal are frequently encountered.

Proteins serve a wide range of functions in living organisms. They are involved in the following:

- enzymatic catalysis (all known enzymes are proteins);
- transport and storage of small molecules and ions;
- systematic movements (both striated and smooth muscle are composed chiefly of protein, as are structures involved in the motility of certain freeliving cells;
- the structure of skin and bone (collagen, the most abundant protein in body, gives these structures high tensile strength);
- the immune defense system (antibodies are specialized proteins recognizing self and nonself);
- hormonal regulation (some hormones are proteins; the cellular receptors that recognize hormones and neutrotransmitters are proteins);
- control of genetic expression (repressor molecules in bacteria are proteins that suppress certain DNA sequences; protein initiation and termination
- factors serve in the transcription phases of gene function).

Proteins show an exquisite specificity of biologic function – a consequence of the uniqueness of the three-dimensional structural shape, or conformation, of each protein. In humans, disease states are often related to the altered function of a

protein. This is due to an anomaly in the structure of the protein, which in turn may be due to a deficiency in its synthesis.

Amino acids. The fundamental units of protein polymers are α-amino acids. They are composed of an amino group, a carboxyl group, a hydrogen atom, and a distinctive side chain, all boned to a carbon atom. One of the 20 amino acids, proline, is an imino acid, not an α-amino acids as are the other 19. A few other amino acids are found in a number of proteins but are not coded for in DNA; they are derived from one or another of the 20 fundamental amino acids after these have been incorporated into the protein chain (posttranslational modification).

Peptides and polypeptides. The peptide bond is the bond formed between the α-carboxyl group of one amino acid and the α-amino group of another. It is formed by removal of the elements of water. The process is highly endergonic and requires the concomitant hydrolysis of high-energy prosphate bonds. The peptide bond is a planar structure with the two adjacent α-carbons, a carbonyl oxygen, and α-amino-N and its associated H atom, and the carbonyl carbon all lying in the same plane. The – CN – bond has a partial double-bond character that prevents rotation about the bond axis.

The linking together of many amino acids by peptide bonds produces polypeptide chains. Amino acids, when in polypeptide chains, are customarily referred to as residues. Protein polypeptide chains are typically more than 100 amino acid residues long. Smaller peptides, however, are common and often have important biologic roles. By convention, peptide structures are written from left to right, starting with the amino acid residue having a free α- amino group (the so-called N-terminal amino acid) and ending with the residue having a free α-carboxyl group (the C-terminal). Either the three-letter abbreviations of the single-letter abbreviations are used.

7. Game. Sentence Race

1) Prepare a list of review vocabulary words.

2) Write each word on two small pieces of paper. That means writing the word twice, once on each paper.
3) Organize the pieces like bundles, 2 bundles, 2 sets of identical words.
4) Divide the class into 2 teams. Get them to make creative team names.
5) Distribute each list of words to both teams. Every student on each team should have a paper. Both teams have the same words.
6) When you call a word, 2 students should stand up, one from each team. The students must then run to the blackboard and race to write a sentence using their
7) word. The winner is the one with a correct and clearly written sentence.

8. Translate the text into English.

Сучасна тенденція до мініатюризації показала, що речовина може мати абсолютно нові властивості, якщо взяти дуже маленьку частинку цієї речовини. Частинки розмірами від 1 до 100 нанометрів зазвичай називають «наночастинками». Так, наприклад, виявилося, що наночастинки деяких матеріалів мають дуже хороші каталітичні та адсорбційні властивості. Інші матеріали показують дивовижні оптичні властивості. Вдається домогтися взаємодії штучних наночасток з природними об'єктами з нанорозмірами − білками, нуклеїновими кислотами і ін. Ретельно очищені наночастинки можуть самовбудовуватися в певні структури. Така структура містить чітко впорядковані наночастинки і також часто проявляє незвичайні властивості.

ADDITIONAL TEXTS

HIV's history traced

New evidence has emerged that HIV was racing through the US population long before doctors woke up to a new killer disease called AIDS. The study might also help the hunt for an HIV vaccine. Researchers have reconstructed the virus' past using the few remaining blood samples taken during the 1980s from AIDS patients in New York, California and Georgia. They fed the HIV genetic sequences into a new type of statistical analysis that compares them with more contemporary ones, to estimate how fast the virus has changed and spread. The technique "looks back in time", says researcher Kenneth form Georgia.

The results support the idea that HIV arrived in the United States around 1968, long before the first AIDS cases appeared. AIDS was first reported in 1981 and was retrospectively recognized as having struck in the late 1970s. This is compatible with HIV's roughly ten-year incubation period. From the start, the virus probably spread like wildfire. The rapid spread of the virus might help to explain why the disease finally came to light. It could have been because spiraling numbers passed a critical point.

HIV is thought to have jumped from African chimpanzees into humans, perhaps when they ate infected meat. Then one strain, called HIV-1, spread all over the world. Researchers are still unclear exactly how HIV arrived in the United States. One hypothesis suggests that Canadian air steward GaetanDugas – dubbed Patient Zero - brought in the disease and spread it to many homosexual partners.
The latest study, which includes Patient Zero's genetic sequence, fits a different scenario: that the disease entered many different times independently. Even early in the epidemic, the group found, the viruses in different cities were distinct from one another.

This supports another popular theory: that HIV may have hitched a ride with tourists arriving from Haiti. The historical reconstruction also contains a lesson for today's vaccine researchers. Contemporary strains are more closely related to their ancestral ones than they are to each other. This suggests that future vaccines, which researchers hope will prime the immune system to attack any HIV strain that they encounter, would be best based on an ancestral sequence. Early work on such vaccines is already under way, says Kenneth.

Bad news for HIV-vaccines?

A patient with some immunity to one strain of HIV virus has become infected with another strain. This could spell trouble for urgently needed HIV vaccines, warn researchers. Others think the case has little bearing on immunizing healthy people.

This alarming controversy has emerged on the eve of World AIDS day, as the United Nations announces that more than 40 million people worldwide are now infected with the virus. The patient had been on 'stop-start' HIV therapy. Under this regimen, a patient takes anti-HIV drugs until the virus is suppressed, and then they stop. When the virus rebounds, undamaged parts of their immune system that had recovered during treatment keep the virus in check, often for months. As the virus gradually beats the immune system, they start taking the drugs again. Several cycles into his treatment, the patient had "an extremely vigorous response to his virus", says Bruce Walker of Harvard Medical School in Boston, Massachusetts, who led the study. The patient then caught a second, different strain of HIV – probably from sex with another HIV-infected person - and his immune system collapsed rapidly. This is the first case of so-called 'super infection' in someone who had immunity to their initial infection. "We thought for a long time that if you get infected with one strain of HIV that you are well protected from another," says Walker.

There are countless strains of HIV. The hope has been that a vaccination against one would lead to immunity to the rest. The patient's second infection was caused by a closely related strain that is common in North America. "But it clearly was not something his immune system could deal with," says Walker. Hopes for an effective HIV vaccine are far from dashed, however. It's probably not good news, but vaccinated healthy people are likely to be very different. Even at its best, the immune response of someone with HIV is never going to function normally.

Indeed, the patient lacked cells that produce neutralizing antibodies to help destroy pathogens. Half his immune system was missing. It is also possible that Walker's patient was a very rare case. It is not known how many HIV-positive people are exposed to other strains of the virus and fight them off. There is one concrete conclusion from the study: it is imperative that safer sex be practiced during each encounter, even when both partners are HIV-infected.

Parasite that makes cat-lovers neurotic

Cat-lovers may be more neurotic than other people as a result of a feline parasite that could ultimately also be responsible for international cultural differences, according to a radical theory published today. More than a quarter of the world's population - ranging from about seven per cent of the UK population to almost 70 per cent in Brazil - is infected with Toxoplasma -gondii, a relative of the malaria bug, which also infects rats, giving them a suicidal attraction to cats.

"Some of us have a parasite in our brains that does its best to change our personalities," writes Dr. Kevin Lafferty, of the University of California at Santa Barbara in the Proceedings of the Royal Society, Biology. "In populations where this parasite is very common, mass personality modification could result in cultural change."

He suggests that attitudes to ego, money, material wealth, work and rules may be affected by the parasite. Those infected by T. gondii are prone to guilt. It has been shown that, in rats at least, this helps the parasite to complete its life-

cycle. An infected rat's behavior alters so that it becomes more active, less cautious and therefore more likely to be eaten by a cat.

Dr. Lafferty suggested that climate affects the persistence of Toxoplasma and therefore that there are cultural ramifications. The parasite's eggs live longer in humid, low-altitude regions that have infrequent freezing and thawing. Earlier research at Imperial College London suggested that the parasite may also trigger schizophrenia. It showed that anti- psychotic drugs used to treat the illness prevented changes in the behavior of rats that were infected with the parasite.

Yum, amino acids

Researchers have pinpointed the receptor that allows us to taste proteins' building blocks. The amino acid receptor triggers the lip-smacking umami taste that flavor enhancers exploit. Its discovery might help the design of new additives.
Mice's version of the receptor responds to nearly all of the 20 amino acids found in proteins, Charles Zuker of the University of California, San Diego, and colleagues have found. The human version of the receptor is most sensitive to the chemical glutamate.

Glutamate is one of the most common amino acids in our diets. It gives high-protein food its meaty, umami flavor. About 1.5 million tons of monosodium glutamate is used to make food tasty each year. Humans' more specialized receptor need not be a disadvantage, or reflect differing diets, says Zuker. It could just be a quirk of evolution. "Food rich in amino acids probably contains all 20." The ability to taste amino acids "guides us to proteins", which themselves have no taste. Two years ago, a different research group announced the discovery of an umami receptor. Whether this is the real thing has been controversial. Mice lacking that receptor can still taste umami, for example, and its shape raises questions about its possible function.

The new receptor comprises two molecules, T1R1 and T1R3. Related molecules sense bitter and sweet flavors: T1R3 is also part of a recently discovered sweet-taste receptor, in tandem with another molecule T1R2. Taste receptors are

big business. The US market for artificial sweeteners exceeds $600 million each year. As well as making snacks moreish, flavor enhancers could make food more appetizing to the elderly, who have less sensitive taste buds, or could help ill people suffering from loss of appetite.

Different species and individuals inhabit different taste worlds. Variation in the receptor gene between human and mouse, and between individual humans, reflects this. "I'd bet that human taste preferences - whether you have a sweet tooth or not, say - are down to nothing but differences in receptor repertoire. We are starting to translate behavior into simple genetic differences," says Zuker. His team experimented on isolated receptorbearing taste bud cells.

Next the group hopes to work out what messages these cells send to the brain, and what the brain does with this information. "We don't know how the brain determines the final taste of an amino acid," says Zuker. "I've tasted every single amino acid. Not all of them taste umami." Knowing the molecular lock should help us design keys to fit it, he says. "We could design tastes on a computer."

GM could hold back the tears

A new finding could lead to genetically modified onions that don't make us cry as we chop them. Researchers in Japan have identified the enzyme that releases a tear-duct-tickling chemical when an onion is cut. Onion's tear-jerker is a compound called propanthial S-oxide. It is made by an enzyme known as lachrymatory- factor synthase, Shinsuke Imai, Japan, and his colleagues have discovered. Their investigations involved a mix of genetic sleuthing and old-fashioned biochemistry.

Previous studies had suggested that onions' flavor compounds were behind the effect. Chopping was thought to make them react with a common onion enzyme, allinase, producing propanthial S-oxide. This suggested that in order to breed or genetically engineer a non-irritant onion, scientists would have to tamper with its flavor. Indeed, onions bred to be tear free, like the Veri Sweet vegetable

recently marketed in Washington State, have a characteristically different taste. The latest study puts paid to this idea. "The chemistry is not new," says Imai. "But the way it occurs in the plant is not as was first thought." Now that a single, flavor independent enzyme has been identified, it would be simple to create an onion in which the enzyme was absent, or suppressed, Imai's team suggests. "Anyone skilled in the art" should be able to produce such a modified onion, says the researcher.

It's not exactly what the world has been crying out for, but S. Imai argues that it could be one of the first GM organisms acceptable to consumers. It won't require the addition of a foreign gene, simply the silencing of an existing one. Onion's irritant is thought to have evolved to protect the nutritious bulbs from being eaten. For cooks the world over, this onion would have direct benefits that most existing genetically modified crops lack. "A non-lachrymatory onion would perhaps be one of the first examples where the consumer was the main beneficiary," Imai says.

Atkins-style diets can be life-threatening, doctors warn

Low carbohydrate diets, such as the Atkins plan, can lead to life-threatening conditions, a medical journal warned yesterday. The Lancet described the case of an obese woman who had adhered strictly to the high-protein diet for a month before being admitted to hospital as an emergency. The 40-year-old, who had taken vitamin supplements recommended by the Atkins plan, needed treatment in the intensive care unit of a New York hospital. She had ketoacidosis, a condition triggered by the liver's production of ketones, the acids which appear during periods of starvation or when there is a lack of insulin in the body due to diabetes.
When first admitted the patient felt nauseous and was dehydrated after vomiting for several days. She was short of breath and in "moderate distress". Four days later, after a dextrose drip, she was well enough to be discharged. The doctors said the Atkins diet was largely to blame.

Professor Klaus-Dieter Lessnau, who led the team from the New York School of Medicine, wrote: "Our patient had an underlying ketosis caused by the Atkins diet ... this problem may become more recognized because this diet is becoming increasingly popular worldwide." The Atkins diet maintains that you can lose weight rapidly by cutting carbohydrates entirely from meals.

For a month before she fell ill the woman admitted to the US hospital had lived on meat, cheese and salads. She had also taken vitamins recommended by the diet. As instructed in the original Atkins diet book, she monitored her urine twice daily. During this month-long period, she lost about 9kg. Commenting on the case elsewhere in the Lancet, Lyn Steffen, a doctor, and Jennifer Nettleton, from the University of Minnesota School of Public Health delivered a further warning about Atkins and other carbcutting diets. The pair wrote: "While the rapid weight loss seems to be an obvious benefit of the Atkins diet, bigger questions remain.”

First, is the diet safe? ... low carbohydrate diets for weight management are far from healthy, given their association with ketosis, constipation or diarrhea, halitosis, headache, and general fatigue to name a few side effects. These diets also increase the protein load to the kidneys and alter the acid balance in the body, which can result in loss of minerals from bone stores, thus compromising bone integrity.

Combinational adenovirus-mediated gene therapy and dendritic cell vaccine in combating well-established tumors

Recent developments in tumor immunology and biotechnology have made cancer gene therapy and immunotherapy feasible. The current efforts for cancer gene therapy mainly focus on using immunogenes, chemogenes and tumor suppressor genes. Central to all these therapies is the development of efficient vectors for gene therapy. By far, adenovirus (AdV)- mediated gene therapy is one of the most promising approaches, as has confirmed by studies relating to animal tumor models and clinical trials. Dendritic cells (DCs) are highly efficient,

specialized antigenpresenting cells, and DC-based tumor vaccines are regarded as having much potential in cancer immunotherapy.

Vaccination with DCs pulsed with tumor peptides, lysates, or RNA, or loaded with apoptotic/ necrotic tumor cells, or engineered to express certain cytokines or chemokines could induce significant antitumor cytotoxic T lymphocyte (CTL) responses and antitumor immunity. Although both AdVmediated gene therapy and DC vaccine can both stimulate antitumor immune responses, their therapeutic efficiency has been limited to generation of prophylactic antitumor immunity against re-challenge with the parental tumor cells or to growth inhibition of small tumors.

However, this approach has been unsuccessful in combating well-established tumors in animal models. Therefore, a major strategic goal of current cancer immunotherapy has become the development of novel therapeutic strategies that can combat well-established tumors, thus resembling real clinical practice since a good proportion of cancer patients generally present with significant disease. In this paper, we review the recent progress in AdV-mediated cancer gene therapy and DC-based cancer vaccines, and discuss combined immunotherapy including gene therapy and DC vaccines.

We underscore the fact that combined therapy may have some advantages in combating well-established tumors vis-a-vis either modality administered as a monotherapy.

Light smokers escape heart risk three years after quitting

Light smokers who quit are no more likely to suffer heart attacks than non-smokers after about three years of abstinence, according to new research.

An international study of more than 27,000 people found that those who smoked fewer than 10 cigarettes per day had no increased risk of having a heart attack three to five years after quitting. There are about 1.3 billion smokers in the world. However heavy smokers, who had smoked 20 or more cigarettes per day, were still 22 per cent more likely than non-smokers to have an attack two decades after

giving up. While the link between smoking and the increased danger from heart attacks has been shown in previous research, the new study published today in The Lancet, shows all forms of tobacco exposure multiply the risks. In addition to smoking cigarettes, chewing tobacco, passive smoking and puffing on sheeshas which are popular in the Middle East, were found to be harmful to the heart. Prof Salim Yusuf from McMaster University in Ontario, Canada, who led the study, said: "Since the risks of heart attack associated with smoking dissipate substantially after smoking cessation, public health efforts to prevent people from starting the habit and promote quitting, will have a large impact in the prevention of heart attacks worldwide. Chewing tobacco, which is increasingly being promoted as a safe alternative to smoking, is also harmful." The researchers studied 27,089 individuals from 52 countries, and assessed the relationship between their risk of suffering a heart attack and whether they were a smoker or former smoker, how they consumed tobacco, amount smoked and exposure to second-hand smoke. Current smokers were on average three times more likely to have a heart attack. Chewing tobacco doubled the chances of having a heart attack, as did smoking eight to 10 cigarettes a day. Heart attack risk was found to be linked directly to the number of cigarettes a person smoked, increasing, compared with non-smokers, by 63 per cent for people smoking one to nine cigarettes a day, 159 per cent for 10 to 19 cigarettes, 359 per cent for 20 or more cigarettes, and 816 per cent for 40 or more.

Non-smokers who were exposed to second-hand smoke for 22 hours or more per week were 62 per cent more likely to have a heart attack. The researchers estimate that about 100 million people died from tobacco-related diseases worldwide during the 20th century. Across the world there are estimated to be 1.3 billion smokers, four-fifths of whom live in developing countries.

Ruairi O'Connor, from the British Heart Foundation, said: "This study provides further evidence that tobacco exposure - whether it be smoking, chewing or inhaling - is seriously bad news for your heart health. The good news for smokers is that much of the added risk of a heart attack recedes after quitting - a

great reason to kick the tobacco habit for good." Amanda Sandford, the research manager of the anti-smoking group Ash said: "Millions of people are suffering heart attacks because they have smoked or chewed tobacco or have been exposed to other people's smoke. If current trends persist about one billion people will die of tobacco-related conditions in this century. Most of these deaths will be in poorer nations where there are few resources to combat the tobacco epidemic," she said. «This study highlights the need for the rapid implementation of the global treaty on tobacco control."

HOW TO READ CHEMICAL FORMULAS AND EQUATIONS

H+- hydrogen ion / univalent positive hydrogen ion

Cu++- divalent positive cuprum ion

Al++ - trivalent positive aluminium ion

Cl- - negative chlorine ion / negative univalent chlorine ion

The list of chemical elements with transcription

Ag	argentum	срібло	Ga	gallium	галій
Al	aluminum	алюміній	Ge	germanium	германій
Ar	argon	аргон	H	hydrogen	водень
As	arsenic	миш'як	He	helium	гелій
Au	aurum	золото	Hg	hydrargyrum	ртуть
B	boron	бор	I	iodine	йод
Ba	barium	барій	Ir	iridium	іридій
Be	beryllium	берилій	K	potassium	калій
Bi	bismuth	вісмут	Li	lithium	літій
Br	boromine	бром	Mg	magnesium	магній
C	carbone	вуглець	Mn	manganese	марганець
Ca	calcium	кальцій	Mo	molybdenum	молібден
Cd	cadmium	кадмій	N	nitrogen	азот
Cl	chlorine	хлор	Na	natrium	натрій
Co	cobalt	кобальт	Ne	neon	неон
Cr	chromium	хром	Ni	nickel	нікель
Cs	caesium	цезій	O	oxygen	кисень
Cu	copper	мідь	P	phosphorus	фосфор
F	fluorine	фтор	Pb	plumbum	свинець
Fe	ferrum	залізо	Pt	platinum	платина

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