**СИЛАБУС НАВЧАЛЬНОЇ ДИСЦИПЛІНИ**

**«Chemistry (Inorganic and Analytical)»**

**Ступінь вищої освіти - Бакалавр**
**Спеціальність «201 Агрономія »**
**Освітня програма «Агрономія»**
**Рік навчання 1, семестр 1**
**Форма здобуття вищої освіти денна** (денна, заочна)
**Кількість кредитів ЄКТС 6**
**Мова викладання Англійська** (українська, англійська, німецька)

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| **Лектор навчальної дисципліни** | **К.б.н., доцент Кравченко О.О.** |
| **Контактна інформація лектора (e-mail)** | **olha_kravchenko@nubip.edu.ua** |
| **URL ЕНК на навчальному порталі НУБіП України** | **https://elearn.nubip.edu.ua/course/view.php?id=2471** |

## ОПИС НАВЧАЛЬНОЇ ДИСЦИПЛІНИ

*(до 1000 друкованих знаків)*

*The discipline "Inorganic and Analytical Chemistry" belongs to the basic general education subjects and ensures the formation of the foundation of knowledge and skills of a specialist in the agronomic field, necessary for studying professionally oriented and special disciplines. Studying the course of the discipline is aimed at mastering knowledge about chemical laws and regularities of chemical transformations with an orientation to the processes occurring in the environment and the formation of the theoretical and practical level of students, the skills of performing a chemical experiment, necessary for mastering special subjects that use chemical analysis of natural and artificial objects. The student must be able to: use educational, methodical and reference literature on inorganic and analytical chemistry (including in elearn), carry out calculations based on the equations of chemical reactions and processes, solve calculation problems using computer technology, perform chemical reactions independently in practice, conduct laboratory research.* **Компетентності навчальної дисципліни:**

***інтегральна компетентність (ІК):*** *The ability to solve complex specialized tasks and practical problems in agronomy, which involves the application of theories and methods of the relevant science and is characterized by complexity and compliance with zonal conditions.*

***загальні компетентності (ЗК):***

*ЗК (GC) 7. Ability to apply knowledge in practical situations;*
*ЗК (GC) 8. Skills of performing safe activities;*
*ЗК (GC) 9. Ability to search, process and analyze information from various sources; ЗК (GC) 11. Efforts to preserve the environment.*

***спеціальні (фахові) компетентності (СК):***

*СК (SC) 7. The ability to scientifically use fertilizers and plant protection products, taking into account their chemical and physical properties and impact on the environment*

**Програмні результати навчання навчальної дисципліни:**

*ПРН (PLO) 4. To compare and evaluate modern scientific and technical achievements in the field of agronomy;*

*ПРН (PLO) 6. Demonstrate knowledge and understanding of fundamental disciplines to the extent necessary for mastery of relevant skills in the field of agronomy;*

*ПРН (PLO) 10. Analyze and integrate knowledge from general and special professional training to the extent necessary for specialized professional work in the field of agronomy;*

## СТРУКТУРА НАВЧАЛЬНОЇ ДИСЦИПЛІНИ

| Topic | Hours (lec/lab/Ind) | Learning outcomes | Tasks | Assessment |
|---|---|---|---|---|
| Module №1. **Theoretical foundations of inorganic chemistry. The Main Laws of chemical transformations** | | | | |
| Topic #1. Introduction. General notions, stoichiometrical laws and types of chemical reactions | 2/6/4 | To know: the place of chemistry among the main natural sciences, the main classes of inorganic compounds and the relationship between them To understand: the importance of studying chemistry in the system of training future technologists in agronomy | To do lab "The main classes of inorganic substances" To do "Control Test "Classification of Inorganic Substances"" | **5** **25** |
| Topic #2. Atomic structure of chemical elements. Electronic formulas | 2/4/6 | To know: chemical properties of elements and their most important compounds | To do lab "Atomic structure. Chemical bonding" To do Control Test "Atomic Structure. Electron configurations of atoms. Chemical bonding" | **5** **10** |
| Topic #3. The Periodic Law and Periodic Table of chemical elements | 2/-/4 | To be able to: predict the chemical properties of an element based on its position in the periodic table. | To do Independent Study for Module # 1 | **12** |
| Topic #4. Chemical bonding and structure of molecule. Chemical kinetics and equilibrium | 2/4/6 | To be able to: determine the relationship between the type of chemical bond existing in a compound and its chemical properties To know: factors affecting the rate of a chemical reaction, the state of chemical equilibrium and its displacement. | To do lab "Theory of electrolytic dissociation" To do Control Test "Theory of electrolytic dissociation" | **5** **18** |
| **Total hours (module 1)** | **8/14/20** | | | |
| Total points of lab work for the first module | | | | **80** |
| Module test | | | | **20** |
| Total points for module 1 | | | | **100** |
| **Module №2. Chemical transformations with change of oxidation number of elements or their valence** | | | | |

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| Topic #5. Solutions, their nature and properties. Hydrolysis of salts | 2/6/4 | To understand: the essence and varieties of the process of dissociation and hydrolysis of salts, the influence of various factors on the completeness of its implementation. | To do Lab “Ionic product of water. Hydrolysis of salts” To do Control Test "Hydrolysis of Salts" | **5**<br><br>**20** |
| Topic #6. Red-Ox reactions | 2/8/6 | To know: the essence of oxidation-reduction processes. | To do lab Oxidationreduction reactions | **5**<br><br>**10** |
| | | | To do Control Test "RedOx reactions with products" | |
| Topic #7. General properties of non-metals | 2/2/4 | Analyze: theoretical information on the use of the main compounds of non-metals and learn in practice theoretical provisions that relate to the chemical properties of nonmetals | To do “Control Test "RedOx reactions without products" To do independent study for module 2 | **20**<br><br>**5** |
| Topic #8. General properties of metals | 2/2/4 | Analyze: theoretical information on the use of basic metal compounds and learn in practice theoretical provisions that relate to the chemical properties of metals | | |
| Topic #9. Coordination compounds | 2/6/2 | Be able to: determine and manage the processes that occur during complex formation | To do Lab Complex (coordination) compounds To do Control test "Complex (coordination) compounds" | **5**<br><br>**10** |
| **Total hours (module 2)** | **10/24/20** | | | |
| Total points of lab work for the second module | | | | **80** |
| Module test | | | | **20** |
| Total points for module 2 | | | | **100** |
| Module №3. **Principles and methods of Qualitative Analysis of Cations and Anions** | | | | |

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| Topic #10. Introduction to Analytical chemistry | 2/15/11 | to know: Possibilities of qualitative analysis and its application.<br><br>To be able to: perform the main stages of qualitative chemical analysis: | To do Lab "The first group of Cations" To do Lab "The second group of Cations" To do Lab "The third group of Cations" To do Lab "The fourth group of Cations" To do Lab "The first group of Anions" To do Lab "The second group of Anions" To do Lab "The third group of Anions" | **5**<br>**10**<br>**5**<br>**5**<br>**5**<br>**5**<br>**5** |
| Topic #11-12. Qualitative analysis. The main principle of qualitative analysis of unknown substances | 4/8/8 | To be able to: determine the qualitative composition of the simplest substance using the chemical analysis method | To do Control Test "Analysis of Unknown substance"<br>To do Independed study for Module #3 | **20**<br>**20** |
| **Total hours (module 3)** | **6/23/19** | | | |
| Total points of lab work for the third module | | | | **80** |
| Module test | | | | **20** |
| Total points for module 3 | | | | **100** |
| Module №4. **Theoretical and experimental foundations of Quantitative chemical analysis. Gravimetry and neutralization method. Red Ox methods and complexing methods.** | | | | |
| Topic #13. Theoretical and experimental foundanion of Quntitative analysis | 2/6/4 | To use: knowledge of methods of expressing the concentration of solutions for calculations in professional disciplines | To do Lab "Preparation of solution" To do Control test "Concentration of Solutions" | **10**<br>**40** |
| Topic #14. Titrimetry (volumetry, volumetric analysis). Neutralization method | 2/4/6 | To perform: standardization of titrated solutions, titration with obtaining reproducible results. | To do Lab Determination of alkali solution normality To do Lab "Determination of Water Hardness" | **10**<br>**10** |
| Topic #15. Oxidationreduction (Redox) Titration (Redoxmetry). Complexometric Titration | 2/4/6 | To analyze: advantages, disadvantages of individual physicochemical methods and the best choice for quantitative analysis of a specific research object. | To do Independent Study for Module 4 | **10** |
| **Total hours (module 4)** | **6/14/18** | | | |
| **Total course hours** | **30/75/75** | | | |
| Total points of lab work for the fourth module | | | | **80** |
| Module test | | | | **20** |

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| Total points for module 4 | **100** |
| **Total amount of point** | |
| **Educatiolnal work** | **70** |
| **Exam** | **30** |
| **Total** | **100** |

## ПОЛІТИКА ОЦІНЮВАННЯ

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| ***Політика щодо дедлайнів та перескладання:*** | Роботи, які здаються із порушенням термінів без поважних причин, оцінюються на нижчу оцінку. Перескладання модулів відбувається із дозволу лектора за наявності поважних причин (наприклад, лікарняний). |
| ***Політика щодо академічної доброчесності:*** | Списування під час контрольних робіт та екзаменів заборонені (в т.ч. із використанням мобільних девайсів). Курсові роботи, реферати повинні мати коректні текстові посилання на використану літературу |
| ***Політика щодо відвідування:*** | Відвідування занять є обов'язковим. За об'єктивних причин (наприклад, хвороба, міжнародне стажування) навчання може відбуватись індивідуально (в он-лайн формі за погодженням із деканом факультету) |

## ШКАЛА ОЦІНЮВАННЯ ЗНАНЬ ЗДОБУВАЧІВ ВИЩОЇ ОСВІТИ

| **Рейтинг здобувача вищої освіти, бали** | **Оцінка національна за результати складання екзаменів заліків** | |
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| | **екзаменів** | **заліків** |
| 90-100 | відмінно | зараховано |
| 74-89 | добре | |
| 60-73 | задовільно | |
| 0-59 | незадовільно | не зараховано |

## РЕКОМЕНДОВАНІ ДЖЕРЕЛА ІНФОРМАЦІЇ

### Technology and methodological requirements


1. Methodological guidelines "Inorganic and analytical chemistry for bachelor students specialty 201 – "Agronomy". Voitenko L.V., Kopilevich V.A., Prokopchuk N.M. Savchenko D.A., Kravchenko O.O. – Kyiv: Експо-Друк., 2022. - 219 p.
2. Laboratory manual on Inorganic and Analytical Chemistry. Savchenko D.A., Voytenko L.V., Prokopchuk N.M.- Kyiv: Експо-Друк., 2017. - 216 p.

## Required and recommended literature


1. General and Inorganic Chemistry : textbook / V.O. Kalibabchuk, V.V. Ohurtsov, V.I. Halynska et al. ; edited by V.O. Kalibabchuk. — Kyiv : AUS Medicine Publishing, 2019. — 456 p.
2. Introduction in General, Organic and Biochemistry, 7th Edition, by Morris Hein, Leo R. Best, Scott Pattison and Susan Arena, Brooks/Cole Publishing Co., 2021, 872 pp.
3. Inorganic Chemistry, second edition, D. F. Shriver, P. W. Atkins, and C.H. Langford; W. H. Freeman and Co., New York, 2004, 913 pp.


## Supplemental


1. Concepts and Models of Inorganic Chemistry, third edition, B. E. Douglas, D. H. McDaniel and J. J. Alexander; John Wiley & Sons, Inc., New York, 2014. 993 p.
2. Inorganic Chemistry, A Modern Introduction, T. Moeller; John Wiley & Sons, New York, 2008. 846 p.
3. Chemistry of the Elements, N. N. Greenwoo and A. Earnshaw; Pergamon Press, New York, 2004. 1542 pp.


## IT resources

1. Introduction to inorganic chemistry: https://bit.ly/3IAEddt ;
2. Khan Academy about Chemical Reactions: https://bit.ly/3IDtn6u
3. Analytical chemistry. Laboratory Manual: https://bit.ly/3KHh63A
4. Virtual lab for Chemistry https://chemcollective.org/vlabs
5. Periodic Videos by Tedex platform https://ed.ted.com/periodic-videos
6. Modern dynamic Periodic Table of Elements http://bit.ly/3Z56Bf5
7. Global Fertilizer impact monitor http://bit.ly/3Z50lDS