National Pirogov Memorial Medical University, Vinnytsya

"APPROVE"
Vice -Rector of higher education institution
for Research, Education and Academic Affairs
_____ professor of HEI
Oksana SEREBRENNIKOVA
«02» September 2022 year

" AGREED "
Head of the Department
of Pharmaceutical Chemistry
_____ Assoc. prof. of HEI
Tetyana YUSHCHENKO
«02» September 2022 year

SYLLABUS
of academic discipline
General and inorganic chemistry

Specialty	226 Pharmacy, Industrial Pharmacy
Educational level	the second (master`s) level
Educational programme	EPP Pharmacy, Industrial Pharmacy, 2022
Academic year	2022-2023
Department	Pharmaceutical Chemistry
Lecturer	Assistant Olga Mazur
Contact information	*pharmchem@vmnu.edu.ua,* Vinnytsya, Pirogov str. 56; tel. 55-39-64
Syllabus compiler	PhD, Associate Professor of HEI Maria Evseeeva, Assistant Olga Mazur

1. Status and Structure of the Discipline

Discipline status	Obligatory
Discipline OPP code	OK 16/ discipline of general training
Year/Semester	1 year/I, II semesters
Scope of the discipline (total number of hours / number of credits ECTS)	180 hours /6,0 - credits ECTS
Number of content modules	9 modules
The structure of the discipline	Full-time study: Lectures – 28 hours Practical classes – 76 hours Self study classes - 76 hours
Language of study	English
Form of study	Full-time (or remote by order)

2. Description of the Discipline

Short annotation of the course, relevance. Discipline "General and Inorganic Chemistry" extends and deepens scientific knowledge about a matter, structure and properties of chemical elements and their transformations. Knowledge of "General and Inorganic Chemistry" will allow to the future specialist to lay hands on most important skills of quality and quantitative prognostication of probability of course of chemical reactions and establishment of mechanisms of interaction of inorganics, that is used in medical and pharmaceutical practice.

Semesters: I and II.

Module content: 180 hours, including lectures – 30 hours, practical – 80 hours, independent work – 70 hours; number of ECTS credits – 6,0.

Course purpose:

1) develop of a scientific world view, the development of theoretical forms of thought,ability to analyze, and competent using the chemical reactions and materials in pharmacy.

2) study the basics of Chemistry, the fundamental laws of Chemistry, during chemical reactions, theory of atomic structure, the teachings about the solutions specific tasks.

3) possession of competencies.

In accordance with the requirements of the standard, the discipline provides students with the following *competencies:*

- *general competences:*
  - − use the knowledge in practical situations;
  - − strive to protect the environment;
  - − ability to abstract thinking, analysis, synthesis;
  - − ability to conduct research at a high level;
  - − understanding of the subject and profession;
- *special competences:*

− ability to organize the activities of pharmacies, preparation of pharmaceuticals according prescription doctors;

− ability to organize and participate in the production of drugs in a pharmacological enterprises with a choice of manufacturing technology and equipment according to requirements GMP;

− ability to develop methodology for quality control of drugs, pharmaceutical substances, plant raw materials, physico-chemical and chemical control methods;

− ability to identify drugs and their metabolites in biological fluids and tissues; diagnosis of acute poisoning, drug and alcohol intoxication;

− ability to provide storage of drugs.

3. Learning outcomes :

As a result of studying the discipline "General and inorganic Chemistry" the student must:

- *know:*
  - − classification and nomenclature of inorganic compounds;
  - − the basic concepts and laws of chemistry and methods for their use;
  - − modern theory of the structure of atoms and molecules;
  - − basic patterns of different types of chemical reactions;
  - − characteristics and ways of expressing the composition of substances.
- *be able to:*
  - − classify and name of inorganic compounds;
  - − treat especially solutions of non-electrolytes and electrolytes;
  - − classify main types of ion, the acid-base balance;
  - − use of chemical glassware and weigh the matter;
  - − to prepare solutions with the given quantitative composition;
  - − hold no complex chemical experiment.

Necessary educational components of the discipline: prerequisites, co-requisites and postrequisites.

Learning discipline “General and Inorganic Chemistry” requires knowledge of elementary Mathematics, Physics and the foundations base of Chemistry. Knowledge of the theoretical foundations of General and Inorganic Chemistry are necessary for the study of Analytical, Colloid and Biological Chemistry and Pharmacognosy.

that students take after completing the second module at the end of the fourth semester. Assessment of student achievement in the discipline is set on a multi-point scale and is determined by the ECTS system and scale.

Program Learning Outcomes (PLO):

PLO 2. Apply knowledge of general and professional disciplines in professional activities.

PLO 3. Adhere to the norms of sanitary and hygienic regime and safety requirements in carrying out professional activities.

PLO 4. Demonstrate the ability to independently search, analyze and synthesize information from various sources and use these results to solve typical and complex specialized tasks of professional activity.

PLO 11. Ability to conduct research at the appropriate level.

PLO 12. Analyze the information obtained as a result of scientific research, summarize, systematize and use it in professional activities.

4. Content and Logistics of the Discipline

Module 1. General chemistry	I semester – 90 hours /3 credits	Lestures № 1-9 (Full time study) Practical classes: Topics №1-18
Module 2. Inorganic chemistry	II semester – 90 hours/3 credits	Lestures № 10-14 (Full time study) Practical classes: Topics № 18-39

The course includes 43 topics, which are divided into two modules (6 content modules).

Content module 1. The structure of matter and the periodic law of D. I. Mendeleev.
Topic 1. The structure of the atom.
Topic 2. Periodic law of D. I. Mendeleev.
Topic 3. The nature of chemical bonding and the structure of chemical compounds.
Content module 2. Atomic-molecular theory and basic laws of chemistry.
Topic 4. Chemistry in the system of natural sciences. The history of the development of chemistry. Atomic molecular science.
Topic 5. Classification and nomenclature of inorganic compounds.
Topic 6. Basic laws of chemistry.
Topic 7. Concept of substance equivalent.
Content module 3. Elements of chemical thermodynamics and kinetics.
Topic 8. Basic concepts of chemical thermodynamics. The first law of thermodynamics. Thermochemistry.
Topic 9. The second law of thermodynamics. Directionality of chemical processes.
Topic 10. Speed and mechanisms of chemical reactions. Catalysis.
Content module 4. Solutions. Properties of solutions. Equilibrium in solutions tlectrolytes
Topic 12. The doctrine of solutions. Colligative properties of solutions.
Topic 13. Solubility. Methods of expressing the composition of solutions.
Topic 14. Theories of strong and weak electrolytes.
Topic 15. Equilibrium in solutions of sparingly soluble electrolytes.
Topic 16. Theories of acids and bases. Dissociation of water. pH
Topic 17. Protolytic processes.
Content module 5. Basic types of chemical reactions of electrolytes.
Topic 18. Reactions with electron transfer.
Topic 19. Coordination compounds. Complexation reactions.

Module 2. Inorganic chemistry

Content module 6. Organogenic and biogenic elements. Human and the biosphere.
Topic 1. Chemical elements, their classification.
Topic 2. Human and the biosphere.
Content module 7. s-Elements (typical metals).
Topic 3. s - Elements of group IA. Alkali metals.
Topic 4. Elements of the II_A group. Beryllium. Magnesium and alkaline earth metals.
Content module 8. Elements IIIA - VIIIA of groups of the periodic system of elements.
Topic 5. General characteristic of the p-elements. p-elementsof the III $_A$ group. Boron and Alluminum.
Topic 6. p-elementsof the IV_Agroup. Carbon and its compounds.
Topic 7. Silicon and its compounds.
Topic 8. p-elementsof the IV_Agroup.Germanium, Tin, Lead.
Topic 9. p-elementsof the $V_A$group.Nitrogen and its compounds.
Topic 10. Phosphorus and its compounds

Topic 11. p-elementsof the $V_A$group.Arsenic, Antimony, Bismuth.
Topic 12. p-elementsof the VI_Agroup.Oxygen and its compounds.
Topic 13. p-elementsof the VI_Agroup.Sulphur, Selenium, Tellurium.
Topic 14. p-elementsof the VII_Agroup.Halogens.
Topic 15. p-elementsof the VII_Agroup.Noble gases.
Topic 16. General characteristic of the d-elements. Types of chemical reactions with their participation.

Content module 9. d-Elements I-VIII groups of the periodic system of elements.

Topic 17. d-elementsof the I_B group.Copper, Silver, Aurum.
Topic 18. d-elementsof the II_B group.Zinc, Cadmium, Mercury.
Topic 19. d-elementsof the III - V_B groups.Titanium, Vanadium, Lanthanides.
Topic 20. d-elementsof the VI_B group.The subgroup of Chromium.
Topic 21. d-elementsof the VII_B group.The subgroup of Manganese.
Topic 22. d-elementsof the $VIII_B$ group.Iron and its compounds.
Topic 23. d-elementsof the $VIII_B$group.Cobalt and Nickel.
Topic 24. d-elements of the $VIII_B$ group. Platinum metals.

The topics of the lecture course reveal the problematic issues of the relevant sections of the discipline. Practical classes provide a theoretical justification of the main issues of the topic and the acquisition ofthe following practical skills:

to know:

- ✓ classification and nomenclature of inorganic compounds;
- ✓ basic concepts and laws of chemistry;
- ✓ modern theories of the structure of atoms and molecules and the dependence of the properties of a substance on its composition and structures;
- ✓ basic laws of chemical reactions of various types;
- ✓ properties and ways of expressing the composition of solutions;
- ✓ properties of chemical elements, their most important compounds and their possible ways transformation;
- ✓ teaching of V. I. Vernadsky about the biosphere

be able to:

- ✓ classify and name inorganic compounds;
- ✓ to interprete the general regularities underlying the structure of substances;
- ✓ classify the properties of solutions of non-electrolytes and electrolytes, calculate the composition solutions;
- ✓ to interprete and classify the main types of ionic, acid-base and redox equilibrium and chemical processes to form a holistic approach to the study chemical and biological processes;
- ✓ to use chemical utensils and weigh substances;
- ✓ to calculate the relative error of the experiment;
- ✓ to prepare solutions with a given quantitative composition;
- ✓ to conduct a simple chemical experiment;
- ✓ classify chemical properties and transformations of inorganic substances;
- ✓ carry out qualitative determination of some cations and anions;
- ✓ to interpret the general patterns underlying the application of inorganic

substances in pharmacy and medicine;

- ✓ apply the theoretical foundations of general and inorganic chemistry and acquired
- ✓ experimental skills when studying specialized disciplines.

The student's independent work involves preparation for practical classes and intermediate tests, study of topics for independent extracurricular work, writing essays, preparation of presentations, tables. The control of mastering the topics of independent extracurricular work is carried out at the intermediate control classes and the final control of the discipline.

Individual work includes the study of scientific literature, preparation of reviews on the topics provided for presentation at meetings of the student scientific group, the implementation of scientific and practical research, participation in specialized competitions, scientific and practical conferences, competitions of student research papers.

Thematic plans of lectures, calendar plans of practical classes, thematic plan of independentextracurricular work, volume and directions of individual work are published on the site of the department.

Route of obtaining materials: Department of Pharmaceutical Chemistry / To the student / Full-time or part-time form of education / "Pharmacy, industrial pharmacy" / 1st year / Educational and methodological materials of General and Inorganic Chemistry / or by link https://www.vnmu.edu.ua/ pharmaceutical chemistry department #. Access to materials is carried out from the student's corporate account s000XXX@vnmu.edu.ua.

5. Forms and methods of monitoring learning success

Current control in practical classes	Methods: *oral or written survey, testing, electronic survey, solving situational problems, conducting laboratory tests, their interpretation and evaluation of their results (registration of the protocol in the workbook)*
Control of mastering the thematic section of the discipline at intermediate control classes	Methods: *oral or written questioning, electronic testing, solving situational problems, control of practical skills*
Final semester control - credit at the end of the third semester (full-time study)	Methods: *pre-examination testing, oral examination (according to the provisions on the organization of the educational process in* Pirogov memorial VNMU (link https://www.vnmu.edu.ua/Загальна information / Basic documents)
Final control of the discipline - exam)	Methods: *pre-examination testing, oral examination (according to the provisions on the organization of the educational process in* Pirogov memorial VNMU (link https://www.vnmu.edu.ua/Загальнаinformation / Basic documents)
Tools for diagnosing learning success	Theoretical questions, tests, clinically-oriented situational tasks, practical tasks, demonstration of practical skills

6. Assessment criteria

Knowledge assessment is carried out in accordance with the Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link https://www.vnmu.edu.ua/en/general-regulations)

Current control	According to the five-point system of traditional assessments: 5 "excellent", 4 "good", 3 "satisfactory", 2"unsatisfactory"
Intermediate separation controls	According to the five-point system of traditional assessments
Control of practical skills	According to the five-point system of traditional assessments
Final control of the discipline	*Sum of points for pre-examination testing (12-20 points) andoral examination (38-60 points)* *Exam grade:* *71-80 points - "excellent" 61-70 points - "good"50-60 points - "satisfactory"* *Less than 50 points - "unsatisfactory" / did not pass*
Discipline assessment:	Current performance - from 72 to 120 points (conversion of the average traditional grade for practical classes on a 120- point scale): 60% of the grade for the discipline Final control - from 50 to 80 points: 40% of the grade for the discipline Individual work - from 6 to 12 points Total from 122 to 200 points.

Discipline Assessment Scale: National and ECTS

The sum of points for all types of training activities	Mark ECTS	Score on a national scale	
		for exam, course project(works), practices	for credit
180-200	**A**	excellent	credited
170-179,99	**B**	good	
160-169,99	**C**		
141-159,99	**D**	satisfactory	
122-140,99	**E**	satisfactory	
0-121,99	**FX**	unsatisfactory with the possibility of reassembly	is not credited with the possibility of re-assembly
	F	unsatisfactory with mandatory re-study of the discipline	is not credited with compulsory re-study of the discipline

7. Policy of discipline / course

The student has the right to receive high-quality educational services, access to contemporary scientific and educational information, qualified advisory assistance during the study of discipline and mastering practical skills. The policy of the department during the providing ofeducational services is a student-centered, based on normative documents of the Ministry of Education and the Ministry of Health of Ukraine, the Statute of the University and the Procedure for the Providing of Educational Services regulated by the main principles of the organization of the educational process in National Pirogov Memorial Medical University, Vinnytsya and the principles of academic integrity (linkhttps://www.vnmu.edu.ua/en/general-regulations).

Adherence to the rules of VNMU, safety techniques in practical classes.

Requirements for preparation for practical classes. Student should be present at the practical lesson on time, theoretically prepared according to the topic topic, adhere to the necessary for work in the laboratory form of clothing (medical gown, if necessary - hat, gloves, etc.). When performing a laboratory work, it is necessary to strictly follow the rules and safety precautions, experiments are possible only in the presence of a teacher or laboratory assistant in the classroom. Show tolerance, courtesy, tact and respect to other participants during the discussion.

Usage of mobile phones and other electronic devices. The use of electronic devices is allowed, but limited to individual cases. It is allowed to use these devices for testing on the Microsoft Teams platform, for mathematical calculations ("Calculator" function), for processing literary sources in electronic form (agreement with teacher is required). It is forbidden to use electronic devices during classes for photo, audio and video recordingwithout the consent of all participants of the educational process, for entertainment purposes, as well as during an oral survey.

Academic integrity. When studying the discipline, the student must be guided by the Code of Academic Integrity and Corporate Ethics of National Pirogov Memorial Medical University, Vinnytsya (link: https://www.vnmu.edu.ua/en/general-regulations)/ Code of Academic Integrity). In case of violation of the norms of academic integrity during the current and final controls student receives a grade of "2" and must work it out to his teacher in the prescribed manner within two weeks after receiving an unsatisfactory assessment).

Missed classes. Missed classes are working out in the manner prescribed by Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link https://www.vnmu.edu.ua/en/general-regulations) at the time of work out schedule (published on the website of the department https://www.vnmu.edu.ua/ department of Pharmaceutical Chemistry #) to the teacher on duty. To work out missed lesson student must provide permission from the dean's office, pass multiple choice questions (MCQ) on a missed topic and recitation, work out laboratory work (if the latter is in a particular topic), draw up a laboratory report and defend it to the teacher on duty.

Note. To ensure the completion of the laboratory works, it is necessary to apply in advance to the laboratory assistant of pharmaceutical chemistry department and indicate the topic and specific date of rework to prepare the necessary reagents, laboratory utensils, etc.

The reworks of missed lectures are carried out to the lecturer of the subject, with the permission of the dean, the abstract of the lecture, a short recitation on the topic of the lecture is possible.

The procedure for admission to the discipline final control is given in the Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link https://www.vnmu.edu.ua/en/general-regulations). To the final control allowed students who do not have missed practical classes and lectures and received an average traditional grade of at least "3".

Additional points. Individual points in the discipline (from 6 to 12) that student can receive for

individual work, the amount of which is published on the website of the department in the educational methodical materials of the discipline, the number of points is determined by the results of IRS according to Regulation of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link https://www.vnmu.edu.ua/en/general- regulations).

Conflict resolution. In case of misunderstandings and complaints to the teacher because of the quality of educational services, knowledge assessment and other conflict situations, student should submit his / her claims to the teacher. If the issue is not resolved, the student has the right to apply to the head of the department according to Complaints Consideration Procedure in VNMU named after M.I. Pirogov (link https://www.vnmu.edu.ua/en/general- regulations)

Politics in terms of remote learning. Distance learning regulated by the Regulations of the elements of remote learning in National Pirogov Memorial Medical University, Vinnytsya (https://www.vnmu.edu.ua/ General information). The main training platforms for studying are Microsoft Team and Google Meets. Practical classes and lectures, exercises and consultations during distance learning is published on the website of the department (https://www.vnmu.edu.ua/ en/ Department of Pharmaceutical Chemistry / to Students or https://www.vnmu.edu.ua/en/Department of Pharmaceutical Chemistry / News).

Feedback from teachers is via messengers (Viber, Telegram, WhatsApp) or e-mail (at the teacher's choice) during working hours.

Educational resources.

1. Educational and methodological support of the discipline is published on the website of the department (https://www.vnmu.edu.ua/ en/ department of Pharmaceutical Chemistry / for students). Consultations are held twice a week according to theschedule.
2. **The time-table and distribution of groups** with assigned teachers are published on the web page of the department (https://www.vnmu.edu.ua /en/ department of Pharmaceutical Chemistry / for students).Questions to the intermediate and final semester control (credit) of the discipline are published on the web page of the department (https://www.vnmu.edu.ua / en/ department of Pharmaceutical Chemistry / for students).

Responsible for the Course  Teacher Olha Mazur

Head of the Pharmaceutical Chemistry Department — Assoc. prof. of HEI Tetyana YUSHCHENKO