



**NATIONAL PIROGOV MEMORIAL MEDICAL UNIVERSITY, VINNYTSIA**

**COURSE SYLLABUS**

**For the training of bachelor's / master's / doctor of philosophy (PHD) students**

**BIOLOGY WITH FUNDAMENTALS OF GENETICS**

| <b>Specialty</b>                      | <b>I 8 Pharmacy</b>                                                                                                              |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Educational Programme</b>          | “Pharmacy, Industrial Pharmacy” (2025, as amended in 2026)                                                                       |
| <b>Higher Education Level</b>         | Second (Master's)                                                                                                                |
| <b>Academic Year</b>                  | 2026–2027                                                                                                                        |
| <b>Status of the Discipline</b>       | Mandatory                                                                                                                        |
| <b>Language of Instruction</b>        | Ukrainian                                                                                                                        |
| <b>Total Workload</b>                 | 4 ECTS credits (120 hours)                                                                                                       |
| <b>Year of Study / Semester</b>       | First year of study / Semester 1                                                                                                 |
| <b>Developer(s)</b>                   | Professor<br>V.V. Rodinkova, Doctor of Biological Sciences, Professor                                                            |
| <b>Instructor(s), Guest Lecturers</b> | S.D. Kryklyva, Candidate of Biological Sciences, Associate Professor<br>V.V. Rodinkova, Doctor of Biological Sciences, Professor |
| <b>Venue and Contact Details</b>      | Department of Pharmacy, 56 Pyrohova Street, Vinnytsia<br>Telephone: 55–39–52; Email: pharmacy@vnmue.edu.ua                       |

## 1. DESCRIPTION OF THE ACADEMIC DISCIPLINE

### ABSTRACT

The programme of the discipline “Biology with Fundamentals of Genetics” has been drawn up in accordance with the procedure for training students of the second (Master’s) level of education in higher medical educational institutions of Ukraine, in line with the requirements of the ECTS credit-transfer system for organising the educational process and the curriculum for training specialists of the second (Master’s) level of higher education in the field of knowledge I “Healthcare and Social Security”, specialty I 8 “Pharmacy”.

The discipline is a mandatory component of the educational and professional programme “Pharmacy, Industrial Pharmacy” within the general training cycle of the Master of Pharmacy. It is worth 4 credits, which students complete during the first semester of the first year of study.

The main focus of the programme is the acquisition of knowledge in the discipline “Biology with Fundamentals of Genetics”, the study of which is necessary for the successful mastery of professional training disciplines. The subject area of the programme is the acquisition of knowledge about the patterns of the development of life, the structure and vital activity of the human organism at all levels of the organisation of living matter, and the influence of environmental factors on humans, as well as the development of skills and abilities in methods of analysing cells at the anatomical level.

As a fundamental discipline, biology with fundamentals of genetics is the theoretical basis of pharmacy and the foundation for training future pharmacists; it provides the theoretical knowledge and develops the practical skills that future pharmacists need in the following branches of biology: cytology, developmental biology, medical genetics and parasitology.

**Prerequisites for the Educational Component.** Biology with Fundamentals of Genetics builds on students’ study of biology with fundamentals of genetics, botany, zoology, general and inorganic chemistry, information technology in pharmacy, and Latin and Ukrainian, and is integrated with these disciplines.

### PURPOSE AND OBJECTIVES

**Purpose of the course and its significance for professional practice:** the purpose of the academic discipline “Biology with Fundamentals of Genetics” follows from the aims of the educational and professional programme for training graduates of a higher medical educational institution and is determined by the content of the systematic knowledge and skills that a specialist pharmacist must master. The knowledge that students obtain from the academic discipline “Biology with Fundamentals of Genetics” is fundamental for the block of disciplines that provide natural-science (NS block) and professional-practical (PP block) training.

**Post-requisites for the Educational Component.** In accordance with the requirements of the sectoral standard of higher education, this discipline serves as a basic biological discipline for certain professionally oriented and specialised disciplines and lays the foundations for students’ study of pharmacognosy, resource science of medicinal plants, training practice in pharmacognosy, medicinal toxicology, pharmaceutical botany, toxicological and forensic chemistry, pharmaceutical technology, technology of medicinal cosmetics, biological chemistry and pharmaceutical biotechnology. Integration with these disciplines and the development of skills in applying knowledge from the discipline are provided for.

**Competencies and learning outcomes promoted by the discipline** (relationship with the normative content of training of higher education students, formulated in terms of learning outcomes in the Standard). In accordance with the requirements of the standard, the discipline ensures that students acquire the following competencies:

**Integral:** the ability to solve complex problems and to critically understand and resolve practical problems in professional pharmaceutical and/or research and innovation activities, applying the provisions, theories and methods of the fundamental, chemical, technological, biomedical and socio-economic sciences; to integrate knowledge and address complex issues, and to formulate judgements on the basis of insufficient or limited information; to communicate one's own knowledge, conclusions and their rationale clearly and unambiguously to specialist and non-specialist audiences.

**General competencies (GC):**

GC 01. Commitment to preserving the environment.

GC 02. Ability for abstract thinking, analysis and synthesis.

GC 03. Knowledge and understanding of the subject area and understanding of professional activity.

GC 04. Ability to adapt and act in a new situation. Ability to show initiative.

GC 05. Ability to communicate in the state language both orally and in writing; ability to communicate in a foreign language (preferably English) at a level that ensures effective professional activity.

GC 06. Skills in the use of information and communication technologies.

GC 07. Ability to choose a communication strategy; ability to work in a team and with experts from other fields of knowledge/types of economic activity.

GC 08. Ability to assess and ensure the quality of work performed.

GC 09. Ability to conduct research at an appropriate level.

**Special (professional, subject-specific) competencies (SC):**

SC 01. Ability to collect, interpret and apply the data needed for professional activity, research and the implementation of innovation projects in the field of pharmacy.

SC 02. Ability to integrate knowledge and solve complex problems of pharmacy in broad or multidisciplinary contexts.

SC 06. Ability to communicate one's own knowledge, conclusions and arguments in the field of pharmacy clearly and unambiguously to specialists and non-specialists, including those who are studying.

SC 07. Ability to carry out sanitary and educational work among the population in order to prevent common diseases and dangerous infectious, viral and parasitic diseases, and to promote the timely detection of these diseases and adherence to their treatment in accordance with their medical and biological characteristics and microbiological features.

## 2. LEARNING OUTCOMES

Upon successful completion of the academic discipline, the student will be able to:

Integrative final programme learning outcomes (PLOs) promoted by the academic discipline:

PLO 01. To apply specialised knowledge and skills from general and professional disciplines in professional activity.

PLO 02. To critically consider scientific and applied problems in the field of pharmacy.

PLO 06. To communicate professionally in the state language; to use oral communication skills in a foreign language, analyse texts of a professional nature and translate foreign-language information sources.

PLO 12. To promote the preservation of health, including the prevention of disease and the rational prescription and use of medicinal products. To perform professional duties conscientiously and to comply with legislation on the promotion and advertising of medicinal products. To possess the psychological communication skills needed to achieve trust and mutual understanding with colleagues, doctors, patients and consumers.

### 3. FORMS OF ORGANISATION OF THE EDUCATIONAL PROCESS AND THEIR SCOPE

| Type of Learning Activity | Hours      |
|---------------------------|------------|
| Lectures:                 | 10         |
| Practical Classes:        | 50         |
| Independent Study (IS):   | 60         |
| <b>Total</b>              | <b>120</b> |

### 4. THEMATIC PLAN

| №                                                                                                            | Module and Topic Titles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <b>Module 1 “Biological Features of Life Organisation”</b>                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Content Module 1 “Cytological Foundations of Life Organisation and Biology of Individual Development”</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1                                                                                                            | <b>Levels of organisation of living matter. Optical systems in biological research.</b><br>The subject, purpose and objectives of biology as a science. Basic properties of living things. Forms of life: cellular and non-cellular. Levels of organisation of living matter. Methods of biological research. Microscopy and its varieties. Main concepts in the development of biology. The relationship between biology and other sciences. The significance of biology for medicine and pharmacy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2                                                                                                            | <b>Cell morphology. Structural components of the cytoplasm and nucleus, cell membranes.</b><br>The cell as the elementary structural and functional unit of living things. Chemical composition of the cell. Macro- and microelements. Inorganic and organic substances. Cell morphology. Biomembranes: structure and functions. Receptor structures of cells. Types of membrane transport: active and passive. The significance of membranology for pharmacy. Prokaryotic and eukaryotic cells. The main structural components of the cell: cytoplasm, organelles, nucleus. Structure and functions of double-membrane, single-membrane and non-membrane organelles. Cell inclusions. The main vital processes of the cell.                                                                                                                                                                                                                                                                           |
| 3                                                                                                            | <b>The hereditary apparatus of the cell. Chromosome morphology. The human karyotype.</b><br>The nucleus as the central information apparatus of the cell. Levels of organisation of hereditary material. Structural and functional characteristics of the interphase nucleus. Chromatin: structural organisation, euchromatin and heterochromatin. Sex chromatin. Morphofunctional characteristics and classification of human chromosomes. Chromosome analysis. The human karyotype.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 4                                                                                                            | <b>Characteristics of nucleic acids. Gene structure in prokaryotes and eukaryotes. Organisation of information flow in the cell. Regulation of gene expression.</b><br>The role of nucleic acids in the storage and realisation of hereditary information. The genetic code. Gene structure. DNA replication. Protein synthesis. Organisation of information flow in the cell. Regulation of gene expression.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 5                                                                                                            | <b>Gametogenesis. Biological features of human reproduction. Fertilisation. Natural types of ontogenesis.</b><br>Modes of reproduction: sexual and asexual. Modes of division of somatic cells. The cell cycle. Characteristics of interphase. Cell populations. Mitosis. Changes in cells and their structures during mitosis. Varieties of mitosis (amitosis, polytenia, endoreproduction). Regulation of mitosis. The concept of the mitotic activity of tissues. Disturbances of mitosis. Somatic mutations.<br>Gametogenesis: spermatogenesis and oogenesis. Structure of sex cells. Features of human reproduction. Artificial insemination. Life of cells outside the organism, cell cloning. Achievements of the cell and tissue culture method and its significance for biology and medicine. Ways of forming sex cells. Meiosis and its characteristics. Conjugation. Crossing over. Mechanisms leading to the genetic diversity of gametes. Regulation of meiosis. Disturbances of meiosis. |
| 6                                                                                                            | <b>Features of the prenatal period of human development. Prerequisites of congenital malformations. The postnatal period of ontogenesis.</b><br>The main stages of human ontogenesis: pre-embryonic, embryonic, postembryonic. Embryogenesis: zygote, cleavage, gastrulation, histogenesis and organogenesis. Mechanisms of growth and morphogenesis. Genetic control of development. Differentiation of cells, germ layers and tissues. Features of human prenatal development, critical periods. Teratogenic factors. Congenital malformations and their classification. Use of stem cells and fetoplacental preparations in medicine.<br>Main changes in the organism in the prereproductive, reproductive and postreproductive periods of ontogenesis. Regeneration and its types: physiological and reparative. Features of regenerative processes in humans. The significance of regeneration for the homeostasis system. Achievements of modern                                                 |

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|                                                                    | transplantology. Tumour growth. Old age as the final stage of ontogenesis. Signs of ageing at different levels of organisation. Theories of ageing. Life expectancy and problems of longevity. Gerontology and geriatrics. The concept of death as a natural biological phenomenon. Prolongation of human life. Fundamentals of human ecology. Healthy lifestyle.                                                                                                                                                                                                                                                                                                                                         |
| <b>Content Module 2 “Fundamentals of Medical Genetics”</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 7                                                                  | <b>Manifestation of the basic patterns of inheritance using the example of Mendelian human traits (mono-, di- and polyhybrid crosses).</b><br>The subject, purpose and objectives of medical genetics. Methods of genetic research: genealogical, cytogenetic, biochemical, molecular genetic, twin methods, etc. Basic concepts of genetics. The human genotype as an integral system. The human phenotype as a set of species-specific and individual traits and properties of the organism. Classification of the inheritance of traits. Monogenic and polygenic inheritance of human traits. Mendel’s laws and their cytological basis.                                                               |
| 8                                                                  | <b>Multiple alleles. Human blood group genetics. Interaction of allelic and non-allelic genes.</b><br>Main types of interaction of allelic and non-allelic genes: complementarity, polymery, epistasis. Expressivity and penetrance of genes.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 9                                                                  | <b>Linked inheritance of traits. Genetics of sex. T. Morgan’s chromosome theory of heredity.</b><br>The current state of human genome research. Genetic maps of chromosomes. Linkage groups. Crossing over. Sex as a set of characteristics that ensure sexual reproduction. Primary and secondary sexual characteristics. Theories of sex determination. Mechanisms of sex redetermination. Sex chromosomes. Features of the inheritance of sex-linked, sex-influenced and sex-limited traits.                                                                                                                                                                                                           |
| 10                                                                 | <b>Variability, its forms and manifestations. Molecular mechanisms of variability in humans.</b><br>Variability in humans as a result of sexual reproduction and an integral property and manifestation of life. Classification of variability and characteristics of its types. Phenotypic variability. Norm of reaction. Genocopies and phenocopies. Analysis of the mechanisms of mutation. Mutagenesis. Mutagens: physical, chemical, biological. Genetic monitoring. Ways of reducing the risk of mutations.                                                                                                                                                                                         |
| 11                                                                 | <b>Human genetics. Genealogical and twin methods.</b><br>The concept of hereditary human diseases and their classification. Gene, chromosomal, genomic and multifactorial human diseases: prevention, diagnosis and possible treatment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 12                                                                 | <b>Chromosomal diseases. The cytogenetic method of their diagnosis.</b><br>Chromosomal diseases and their classification. Diseases of autosomes and sex chromosomes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 13                                                                 | <b>Molecular diseases. The biochemical method and DNA diagnostics.</b><br>Gene diseases and their classification. Biochemical markers of human diseases.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 14                                                                 | <b>The population-statistical method. Medical genetic counselling.</b><br>The concept of populations. Population genetics. The ideal population. The Hardy–Weinberg law. Population dynamics. Different systems for determining blood groups and features of the inheritance of blood groups. Distribution of blood groups in populations. Medical genetic aspects and the need for family planning. Medical genetic counselling. Prenatal and postnatal diagnosis of hereditary diseases.                                                                                                                                                                                                                |
| <b>Module 2 “Medical and Biological Foundations of Parasitism”</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Content Module 3 “Fundamentals of Medical Parasitology”</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 15                                                                 | <b>Medical and biological foundations of parasitism. Protozoa as human parasites. Phylum Sarcostigophora, class Lobosea (true amoebae). Representatives of the class Zoomastigophorea (animal flagellates) – human parasites.</b><br>The subject, purpose and objectives of medical parasitology. The connection between medical parasitology and other disciplines. The concept of parasitism. Forms of association between parasite and host. Classification of parasites and hosts. Methods of prevention and pharmacotherapy of parasitic diseases. General characteristics and life cycles of the main representatives of protozoa that are human parasites. Means of preventing protozoal diseases. |
| 16                                                                 | <b>Class Zoomastigophora. Morphofunctional characteristics, laboratory diagnosis and prevention of giardiasis, trichomoniasis, leishmaniasis and trypanosomiasis.</b><br>General characteristics and life cycles of the main representatives of protozoa that are human parasites. Means of preventing protozoal diseases.                                                                                                                                                                                                                                                                                                                                                                                |
| 17                                                                 | <b>Phylum Apicomplexa, class Sporozoa. Morphofunctional characteristics, laboratory diagnosis and prevention of malaria and toxoplasmosis.</b><br>Methods of prevention and pharmacotherapy of parasitic diseases. General characteristics and life cycles of the main representatives of protozoa that are human parasites. Means of preventing protozoal diseases. Vector-borne (transmissible) human diseases.                                                                                                                                                                                                                                                                                         |
| 18                                                                 | <b>Medical helminthology. Phylum Plathelminthes, class Trematoda. Laboratory diagnosis and prevention of fascioliasis, dicrocoeliasis and paragonimiasis.</b><br>Classification of helminths. Basic concepts of medical helminthology. General characteristics and life cycles of representatives of helminths that are human parasites. Means of preventing trematodiasis.                                                                                                                                                                                                                                                                                                                               |
| 19                                                                 | <b>Phylum Plathelminthes, class Trematoda. Laboratory diagnosis and prevention of opisthorchiasis,</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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|    | <b>clonorchiasis and schistosomiasis.</b><br>Classification of helminths. Basic concepts of medical helminthology. General characteristics and life cycles of representatives of helminths that are human parasites. Means of preventing trematodiasis.                                                                                                                                                                                                                                                                                                           |
| 20 | <b>Phylum Plathelminthes, class Cestoda. Laboratory diagnosis and prevention of taeniasis, taeniarhynchiasis, cysticercosis and hymenolepiasis.</b><br>General characteristics and life cycles of representatives of flatworms that are human parasites. Means of preventing cestodiasis.                                                                                                                                                                                                                                                                         |
| 21 | <b>Phylum Plathelminthes, class Cestoda. Laboratory diagnosis and prevention of echinococcosis, diphyllbothriasis and alveococcosis.</b><br>General characteristics and life cycles of representatives of flatworms that are human parasites. Means of preventing cestodiasis.                                                                                                                                                                                                                                                                                    |
| 22 | <b>Phylum Nemathelminthes, class Nematoda. Laboratory diagnosis and prevention of ascariasis, enterobiasis, trichocephaliasis, ancylostomiasis and necatoriasis.</b><br>General characteristics and life cycles of representatives of roundworms that are human parasites. Means of preventing nematodiasis.                                                                                                                                                                                                                                                      |
| 23 | <b>Phylum Nemathelminthes, class Nematoda. Laboratory diagnosis and prevention of strongyloidiasis, dracunculiasis, trichinellosis and filariasis.</b><br>General characteristics and life cycles of representatives of roundworms that are human parasites. Means of preventing nematodiasis.                                                                                                                                                                                                                                                                    |
| 24 | <b>Medical arachnoentomology. Phylum Arthropoda. Class Crustacea. Class Arachnoidea. Morphology, development and medical significance of spiders, mites and the scabies mite.</b><br>Features of the morphology, feeding and reproduction of arachnids. Venomous arachnids (scorpions, spiders). The medical significance of mites as causative agents of diseases and vectors of human diseases. Mites that inhabit human dwellings and their medical significance.                                                                                              |
| 25 | <b>Phylum Arthropoda. Class Insecta. Morphology, ecology, development and medical significance of cockroaches, bugs, fleas, flies, mosquitoes, sandflies, biting midges and black flies. Control of blood-sucking insect swarms ("hnus").</b><br>Progressive and regressive changes in the organisation of the class Insecta depending on the habitat. Features of the morphology, feeding and reproduction of insects. The medical significance of lice, fleas, bugs and cockroaches as causative agents and vectors of causative agents of infectious diseases. |
| 26 | <b>Practical skills from Module 1 and Module 2.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 27 | <b>Final class in the academic discipline.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

#### 5. FORMS AND METHODS OF ASSESSMENT OF LEARNING OUTCOMES

|                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ongoing Assessment during Practical Classes</b>                        | Methods: oral or written assessment and testing, computer-based assessment and testing, solving of situational tasks.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Final Assessment of the Academic Discipline – Pass/Fail Assessment</b> | It is conducted during the final practical class and is determined on the basis of the student's ongoing academic performance in accordance with the Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsia:<br><u>General Information / Key Documents</u><br><a href="https://www.vnmdu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf">https://www.vnmdu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf</a>                                             |
| <b>*Final Assessment of the Academic Discipline – Graded Pass</b>         | It is conducted during the final practical class and is assessed in accordance with the Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsia:<br><u>General Information / Key Documents</u><br><a href="https://www.vnmdu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf">https://www.vnmdu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf</a>                                                                                                          |
| <b>Final Assessment – Examination</b>                                     | It is conducted during the examination session according to the examination schedule and is assessed in accordance with the Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsia: <u>General Information / Key Documents</u> or<br><u>Regulations on the Organisation of the Educational Process</u><br><a href="https://www.vnmdu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf">https://www.vnmdu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf</a> |
| <b>Assessment Tools for Learning Achievement</b>                          | Theoretical questions, tests, situational tasks, practical assignments, demonstration of practical skills.                                                                                                                                                                                                                                                                                                                                                                                                                                 |

#### 6. ASSESSMENT CRITERIA

Assessment of students' knowledge is carried out in accordance with the current Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsia.

([https://www.vnmu.edu.ua/downloads/other/polog\\_organiz\\_ocv\\_proc\(2026\).pdf](https://www.vnmu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf))

| Type of Assessment                             | Assessment Criteria / Scale                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ongoing Assessment                             | According to the traditional grading scale: 5 – “Excellent”, 4 – “Good”, 3 – “Satisfactory”, 2 – “Unsatisfactory”                                                                                                                                                                                                                              |
| Interim Assessments                            | According to the traditional grading scale                                                                                                                                                                                                                                                                                                     |
| Assessment of Practical Skills                 | According to the traditional grading scale                                                                                                                                                                                                                                                                                                     |
| Pass/Fail Assessment                           | According to the 200-point scale (the arithmetic mean of the grades obtained during the semester is converted into points).<br>Passed: 122–200 points.<br>Failed: fewer than 122 points.                                                                                                                                                       |
| Final Grade of the Academic Discipline         | The sum of points for the examination test (12–20 points) and oral assessment (38–60 points).<br>Examination grade:<br>71–80 points – “Excellent”;<br>61–70 points – “Good”;<br>50–60 points – “Satisfactory”;<br>fewer than 50 points – “Unsatisfactory” / Failed.                                                                            |
| Overall Assessment for the Academic Discipline | Ongoing academic performance – 72–120 points (conversion of the average traditional grade for practical classes to the 120-point scale); 60% of the final grade for the academic discipline. Final Assessment – 50–80 points: 40% of the final grade for the academic discipline. Individual Assignments – 1–12 points. Total: 122–200 points. |

### GRADING SCALE: NATIONAL AND ECTS

| Total Score for All Learning Activities | ECTS Grade | National Grade: Examination, Course Project (Paper), Practical Training | National Grade: Pass                                |
|-----------------------------------------|------------|-------------------------------------------------------------------------|-----------------------------------------------------|
| 180–200                                 | A          | Excellent                                                               | Passed                                              |
| 170–179.99                              | B          | Good                                                                    | Passed                                              |
| 160–169.99                              | C          | Good                                                                    | Passed                                              |
| 141–159.99                              | D          | Satisfactory                                                            | Passed                                              |
| 122–140.99                              | E          | Satisfactory                                                            | Passed                                              |
| 60–121.99                               | FX         | Unsatisfactory, with the possibility of retaking                        | Failed, with the possibility of retaking            |
| 0–59.99                                 | F          | Unsatisfactory, with mandatory repetition of the discipline             | Failed, with mandatory repetition of the discipline |

### Criteria for Assessing Students' Knowledge

#### *Assessment of Oral/Written Responses during Ongoing Assessment*

**The grade “Excellent”** is awarded when a student demonstrates comprehensive knowledge of the topic, illustrating responses with a variety of relevant examples; provides complete, accurate, and clear answers without prompting or leading questions; presents the material without errors or inaccuracies; confidently solves problems and completes practical tasks of varying levels of complexity; and independently generates innovative ideas.

**The grade “Good”** is awarded when a student demonstrates good knowledge and understanding of the topic and provides correct, coherent, and well-structured answers, although they may not be fully comprehensive. The student answers additional questions correctly and

without significant errors; successfully solves problems and completes practical tasks, experiencing difficulties only with the most complex assignments.

**The grade “Satisfactory”** is awarded when a student demonstrates knowledge of the overall content of the topic and a satisfactory level of understanding. With the help of guiding questions, the student is able to solve modified (simplified) problems; solves problems and completes practical tasks, although experiencing difficulties even with relatively simple assignments; is unable to formulate a coherent and systematic response independently but provides correct answers to direct questions.

**The grade “Unsatisfactory”** is awarded when a student’s knowledge and skills do not meet the requirements for the grade “Satisfactory”.

The assessment criteria for all other types of students’ academic work are based on the requirements of the Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsya,

([https://www.vnmu.edu.ua/downloads/other/polog\\_organiz\\_ocv\\_proc\(2026\).pdf](https://www.vnmu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf)) and are specified in the programme of the academic discipline.

#### **Assessment of Students’ Independent Study**

Students’ independent study undertaken as part of a topic alongside contact hours is assessed as part of the ongoing assessment of that topic during the relevant practical class.

The maximum number of points a student may receive upon completion of the discipline is 200 points. The minimum passing score is 122 points.

### **7. METHODOLOGICAL SUPPORT**

Teaching and learning materials (lecture notes or extended lecture outlines), thematic plans for lectures, practical classes and independent study, assignments for ongoing assessment, methodological guidelines, and teaching manuals.

### **8. ACADEMIC DISCIPLINE POLICIES**

The completion of learning activities and all academic work within the discipline must comply with the requirements of the Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsya; ([https://www.vnmu.edu.ua/downloads/other/polog\\_organiz\\_ocv\\_proc\(2026\).pdf](https://www.vnmu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf)), the Regulations on the Organisation of the Educational Process for Higher Education Students Pursuing the Degree of Doctor of Philosophy at National Pirogov Memorial Medical University, Vinnytsya ([https://www.vnmu.edu.ua/downloads/other/pologPhD\\_org.pdf](https://www.vnmu.edu.ua/downloads/other/pologPhD_org.pdf)); the Law of Ukraine “On Education” (Article 42); the Law of Ukraine “On Academic Integrity”; and the Code of Academic Integrity of National Pirogov Memorial Medical University, Vinnytsya ([https://www.vnmu.edu.ua/downloads/other/kodex\\_akad\\_dobr\\_edit%202026.pdf](https://www.vnmu.edu.ua/downloads/other/kodex_akad_dobr_edit%202026.pdf))

Students are entitled to high-quality educational services and a safe learning environment under martial law, emergency situations and states of emergency; access to up-to-date scientific and educational information; and qualified academic guidance and support in studying the discipline and acquiring practical skills.

The Department’s policy on the provision of educational services is student-centred and is based on the regulatory documents of the Ministry of Education and Science of Ukraine and the Ministry of Health of Ukraine, the University Statute, the procedures governing the provision of educational services, including in emergency situations, as stipulated by the principal regulations and administrative directives governing the organisation of the educational process at National Pirogov Memorial Medical University, Vinnytsya, as well as on the principles of academic integrity.

**Academic Integrity.** When studying the discipline and completing all types of learning assignments and/or research activities, students must comply with the Law of Ukraine “On Education” (Article 42), the Law of Ukraine “On Academic Integrity”, and the Code of Academic Integrity of National Pirogov Memorial Medical University, Vinnytsya ([University website →](#)

General Information → Key Documents → Code of Academic Integrity). In the event of a violation of academic integrity principles, appropriate measures shall be taken in accordance with the applicable regulatory documents.

**Compliance with VNMU Internal Regulations and Safety Requirements during Practical Classes.** At the first practical class, the instructor provides a safety briefing on appropriate conduct on the Department premises, informs students of the location of the shelter and the evacuation route to the shelter in accordance with the approved evacuation plan, explains the rules of conduct while proceeding to and remaining in the shelter, and provides instructions on all actions stipulated by the Emergency Response Plan (pursuant to Order No. 505 dated 30 August 2023). In the event of an air raid alert or any other emergency warning signal, the instructor suspends the class. The instructor and students proceed together to the shelter and remain there until the warning signal is cancelled. Once the alert has been lifted, the instructor and students either resume the class in the Department's classrooms or students independently complete the remaining learning material, which is subsequently assessed at the next class.

#### **Requirements for Preparation for Practical Classes**

Students are required to participate actively in the educational process: attend classes and come adequately prepared; complete the test tasks related to the current topic in their workbooks and fill in the required diagrams and tables; actively participate in discussions of the class topic; complete all assignments specified in the programme; search for additional information relevant to the topic and present it to their peers.

Students are expected to arrive at classes on time. Late arrival is not permitted in accordance with the Internal Regulations for Students of VNMU. A student who arrives more than 10 minutes late is not admitted to the class and is required to make up the missed class in accordance with the established procedure.

*For specialties within Field of Study I "Healthcare and Social Security", students are required to wear a medical coat during practical classes. Students who fail to comply with this requirement are not admitted to the class.*

Students are expected to be polite, courteous, and respectful in their interactions with teaching staff, other University employees, fellow students, and other persons studying at VNMU. Students must maintain a quiet and orderly environment and demonstrate appropriate conduct on the Department premises.

In its activities, the Department adheres to the principles of mutual respect and tolerance. Students are expected to uphold the same principles.

Students must comply with safety regulations while on the Department premises.

When working in teaching and research laboratories, students must comply with the applicable safety regulations (published on the website of the **Department of Pharmacy**). When completing practical assignments, students must keep their workstations clean and orderly and leave them tidy upon completion of the practical work.

While at clinical training sites, students are required to comply with the established therapeutic and protective regime and sanitary and hygiene requirements. Where quarantine restrictions are introduced at a healthcare institution, strict compliance with all applicable requirements is mandatory.

When entering inpatient departments, students must wear a medical coat, cap, and change of footwear. Students must also have a medical mask, gloves, and hand sanitiser with them. Bringing outdoor clothing, outdoor footwear, or bulky personal belongings into inpatient departments is not permitted. Students are strictly prohibited from handling any medical devices, equipment, or instruments without the instructor's permission.

When communicating with patients and their relatives, as well as outside the healthcare institution, students are required to observe ethical and deontological principles and comply with applicable legislation concerning the confidentiality and protection of information. The disclosure or dissemination of patients' medical or personal information by any means, including through social media, verbal communication, or otherwise, is strictly prohibited.

In interactions with healthcare personnel and during discussions as part of the educational process, students are expected to adhere to the principles of tolerance, courtesy, and mutual respect. Inappropriate, disrespectful, or provocative behaviour is not permitted.

**Use of Mobile Phones and Other Electronic Devices.** The use of mobile phones and other electronic devices during classes is not permitted, except for emergency calls or when such devices are used to present supplementary materials relevant to the topic of the class.

**Absence from Classes.** Missed classes must be made up in accordance with the procedure established by the current Regulations on the Organization of the Educational Process at National Pirogov Memorial Medical University, Vinnytsya ([https://www.vnmu.edu.ua/downloads/other/polog\\_organiz\\_ocv\\_proc\(2026\).pdf](https://www.vnmu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf)), at the times specified in the make-up schedule published on the website of the **Department of Pharmacy (VNMU website)**, either with the instructor on duty or with the student's regular instructor. Making up a missed class involves completing the assignments related to the topic of the missed class in accordance with the specific requirements of the discipline.

Mastery of lecture topics is assessed during practical classes, seminars (including the assessment of practical skills), and final assessment, in accordance with the Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsya ([https://www.vnmu.edu.ua/downloads/other/polog\\_organiz\\_ocv\\_proc\(2026\).pdf](https://www.vnmu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf))

**Admission to Final Assessment.** The procedure for admission to final assessment in the discipline is set out in the current Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsya ([https://www.vnmu.edu.ua/downloads/other/polog\\_organiz\\_ocv\\_proc\(2026\).pdf](https://www.vnmu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf)).

Students are admitted to final assessment provided that they have no outstanding academic requirements: the average grade for ongoing assessment must be at least 3.0 (72 points on the 120-point scale); all final sessions for the content modules must have been completed with a passing grade ("3" or higher); and all missed practical classes must have been made up with a passing grade ("3" or higher). Otherwise, the student must improve their average grade by making up unsatisfactory grades and must make up all missed classes.

**Additional Points for Individual Assignments.** Students may receive additional points in the discipline for the successful completion of individual assignments, the content of which is published on the Department's website as part of the teaching and learning materials for the discipline. The number of points awarded is determined based on the results of the individual assignment in accordance with the current Regulations on the Organisation of the Educational Process at National Pirogov Memorial Medical University, Vinnytsya. ([https://www.vnmu.edu.ua/downloads/other/polog\\_organiz\\_ocv\\_proc\(2026\).pdf](https://www.vnmu.edu.ua/downloads/other/polog_organiz_ocv_proc(2026).pdf)).

#### **Resolution of Conflict Situations**

In the event of misunderstandings or concerns regarding the quality of educational services, assessment of academic performance, or other conflict situations involving an instructor, students should first raise their concerns directly with the instructor. If the issue remains unresolved, the student has the right to submit an appeal to the Head of the Department in accordance with the Regulations on the Consideration of Appeals from Higher Education Students at National Pirogov Memorial Medical University, Vinnytsya ([VNMU website → General Information → Key Documents](#)).

Students also have the right to contact the student self-government bodies, the administration of the Faculty (Institute), or the University administration, either directly or through the designated feedback channels ("trust boxes"), links and addresses for which are available on the official VNMU website.

The Department recognises that a student-centred approach entails students' responsibility for the conscious and active acquisition of knowledge and for proper compliance with the rules and requirements established by applicable legislation and VNMU regulatory documents. The Department reserves the right to inform the relevant University bodies of any violations committed by students.

### Policy on Blended Learning

The organisation of blended learning is governed by the Regulations on the Introduction of Elements of Distance Learning at National Pirogov Memorial Medical University, Vinnytsya ([VNMU website](#) → [General Information](#) → [Key Documents](#)). The main online learning platforms used for classes are Microsoft Teams and Google Meet.

The procedures for conducting practical classes, lectures, make-up classes, and consultations in the distance learning format are published on the Department's webpage ([VNMU website](#) → Department of Pharmacy → For Students/Postgraduate Students → Mode of Study → Year of Study → Teaching and Learning Materials).

**Communication with the Instructor.** Students may contact the instructor via Microsoft Teams chat, messaging applications (Viber, Telegram, WhatsApp), or email, as determined by the instructor, during working hours.

## 9. LEARNING RESOURCES

Teaching and learning materials for the discipline are available on the Department's website. The materials can be accessed via: [VNMU website](#) → Department of Pharmacy → For Students/Postgraduate Students.

### LITERATURE

#### Core Literature for Biology with Fundamentals of Genetics

1. Urry, L. A., Minorsky, P. V., Hull, K. L., & Orr, R. B. (2026). *Campbell Biology* (13th ed.). Pearson.

Covers levels of life organisation, cell structure, reproduction, inheritance, population genetics, development, and ecology. Relevant throughout Module 1.

[Official publisher link.](#) [pearson.com](https://www.pearson.com)

2. Alberts, B., Heald, R., Hopkin, K., Johnson, A., Morgan, D., Roberts, K., & Walter, P. (2023). *Essential Cell Biology* (6th ed.). W. W. Norton & Company.

Supports topics on microscopy, membranes, organelles, chromosomes, DNA replication, gene expression, and cell division. Particularly suitable for Topics 1–5.

[Official publisher link.](#) [Description](#)

3. Pierce, B. A. (2024). *Genetics: A Conceptual Approach, Update* (7th ed.). Macmillan Learning.

Recommended for Mendelian inheritance, gene interactions, linkage, sex-linked inheritance, mutations, pedigree analysis, and population genetics—Topics 7–14. Use the **2024 updated edition**.

[Official publisher link.](#) [www.macmillanlearning.com](https://www.macmillanlearning.com)

4. Cohn, R., Scherer, S., & Hamosh, A. (Eds.). (2024). *Thompson & Thompson Genetics and Genomics in Medicine* (9th ed.). Elsevier.

Covers human chromosomes, inherited diseases, molecular diagnostics, genetic counselling, prenatal screening, and personalised healthcare. Especially relevant to Topics 11–14.

[Official publisher link.](#) [www.uk.elsevierhealth.com](https://www.uk.elsevierhealth.com)

5. Gunn, A., & Pitt, S. J. (2022). *Parasitology: An Integrated Approach* (2nd ed.). Wiley.

Covers parasite–host relationships, parasite biology, life cycles, and diagnostic approaches. Provides the biological foundation for Module 2, with photographs, practical exercises, and self-assessment materials.

[Official publisher link.](#) [Parasitology](#)

#### Supplementary Literature for Biology with Fundamentals of Genetics

1. Sadler, T. W. (2023). *Langman's Medical Embryology* (15th ed.). Wolters Kluwer.

Recommended for gametogenesis, fertilisation, embryogenesis, critical developmental periods, and

congenital malformations— Topics 5–6.

Official publisher link: [shop.lww.com](http://shop.lww.com)

2. **Garcia, L. S. (2021). *Practical Guide to Diagnostic Parasitology* (3rd ed.). ASM Press.**

A practical reference for specimen collection, microscopy, parasite identification, and laboratory diagnosis. Particularly useful for Topics 15–23 and practical skills assessment.

Official publisher link: [wiley.com](http://wiley.com)

3. **Mullen, G. R., & Durden, L. A. (Eds.). (2019). *Medical and Veterinary Entomology* (3rd ed.). Academic Press.**

Covers medically important insects and arachnids, including mosquitoes, flies, fleas, lice, bugs, mites, ticks, spiders, and scorpions. Directly supports Topics 24–25.

Official publisher link: [sciencedirect.com](http://sciencedirect.com)

4. **Centers for Disease Control and Prevention. (n.d.). *DPDx—Laboratory Identification of Parasitic Diseases of Public Health Concern*.**

A freely accessible educational resource containing parasite life cycles, diagnostic images, and laboratory procedures. Suitable for practical classes across Module 2. Accessed 13 October 2026.  
DPDx resource · Diagnostic procedures. [DPDx Homepage](http://dpdx.cdc.gov/)

### ELECTRONIC RESOURCES

University website: [National Pirogov Memorial Medical University, Vinnytsya](http://www.vnmuh.gov.ua/)

Department website: [VNMU Departments](http://www.vnmuh.gov.ua/) — **Department of Pharmacy**

University Library website: [VNMU Library](http://www.vnmuh.gov.ua/)

National Scientific Medical Library of Ukraine: [National Scientific Medical Library of Ukraine](http://www.nslm.gov.ua/)

World Health Organization: [World Health Organization \(WHO\)](http://www.who.int/)

Ministry of Health of Ukraine: [Ministry of Health of Ukraine](http://www.moh.gov.ua/)

Public Health Center of the Ministry of Health of Ukraine: [Public Health Center of Ukraine](http://www.pch.gov.ua/)

English-language database of medical and biomedical literature: [PubMed](http://pubmed.ncbi.nlm.nih.gov/)

English-language online resource for physicians and other healthcare professionals: [Medscape](http://www.medscape.com/)

Testing Centre: <https://www.testcentr.org.ua/uk/>

Wikipedia, “Plant cell”: [http://en.wikipedia.org/wiki/Plant\\_cell](http://en.wikipedia.org/wiki/Plant_cell)

*Other electronic resources should be added as appropriate to the content of the discipline and the subject area of the relevant academic discipline programme.*

The course syllabus for the academic discipline “Biology with Fundamentals of Genetics” was discussed and approved at the meeting of the Department of Pharmacy (Minutes No. 1 dated 26 August 2026).

Course Coordinator:

Doctor of Biological Sciences, Professor

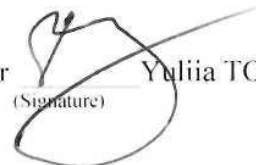


(Signature)

Viktoriia RODINKOVA

Acting Head of the Department of Pharmacy:

Candidate of Pharmaceutical Sciences, Associate Professor



(Signature)

Yuliia TOMASHEVSKA