

National Pirogov Memorial Medical University, Vinnytsya

«APPROVE»

Vice-Rector of higher education institution

for Research, Education and Teaching

 prof. of HEI Oksana SEREBRENNIKOVA

«2» September 2022

“ AGREED ”

Head of the Department of Pharmacy

 professor of HEI Olena KRYVOVIAZ.

«1» September 2022

SYLLABUS
of Subject
BIOLOGY WITH THE FUNDAMENTALS OF GENETICS

Specialty	226 Pharmacy, Industrial Pharmacy
Educational level	the second (master's) level in Pharmacy, Industrial Pharmacy
Educational programme	EPP Pharmacy, 2022
Academic year	2022-2023
Department	Pharmacy
Lecturer (if lectures are given)	Rodinkova Victoria, Prof, Dr. of Biological Science Palamarchuk Olga, Associate Prof., PhD in Biology,
Contact information	https:// www.vnmu.edu.ua/
Syllabus compiler	Rodinkova Victoria, Prof, Dr. of Biological Science

1. Status and structure of the discipline

Discipline status	Mandatory
Discipline code in EPP/ discipline place in EPP	EC // discipline of general training
Course / semester	1st year (I semester)
The amount of discipline (the total number of hours / number of credits ECTS)	120 hours / 4 credits ECTS
Number of content modules	1 module
The structure of the discipline	Lectures - 10 hours Practical classes 30 hours Independent work 50 hours
Language of study	English
Form of study	Full - time , part-time, (<i>or remote by order</i>)

Description of the discipline:

Biology with the basics of genetics is the science of the basics of human life, studying the laws of heredity, variability, individual development and morphophysiological adaptation of a person to environmental conditions in connection with his biosocial essence. It is also the science of the influence of molecular genetic, cellular, ontogenetic, population factors on human health. That is why biological knowledge is necessary for pharmacists of any specialty to understand the essence of diseases, to establish the mechanisms of action of drugs on the human body, taking into account its individual characteristics, to protect people's health, and to have a scientifically sound attitude to nature and its protection. The modern level of knowledge in biology with the basics of genetics is necessary in the system of pharmaceutical education. The organization of the educational process is carried out according to the credit-transfer system. The amount of study load of applicants for higher education is described in ECTS credits - credits that are credited to applicants for higher education upon successful mastering of a discipline section.

Prerequisites:

Biology with the fundamentals of genetics is based on the study by students of general biology, genetics, botany, zoology, general and inorganic chemistry as part of the school course, as well as information technology in pharmacy, Latin and Ukrainian languages as the University course, and is integrated with these disciplines.

The purpose of the course and its significance for professional activities:

Purpose of the course: the academic discipline «Biology with the basics of genetics» stems from the goals of the educational and professional training program for graduates of a higher medical educational institution and is determined by the content of those systemic knowledge and skills that a pharmacist-specialist must master. The knowledge acquired by a student from the academic discipline «Biology with the basics of genetics» is basic for the block of disciplines that provide natural science (NS block) and professional and practical (PP block) training.

Postrequisites:

According to the requirements of the industry standard of higher education, Biology with the fundamentals of genetics plays the role of a basic biological discipline for certain professionally oriented and special disciplines. It lays the foundation for the study by applicants of higher education of pharmacognosy, resource science of medicinal plants, educational practices in

pharmaceutical botany and pharmacognosy, chemistry, drug technology, cosmetics technology, biological chemistry, pharmaceutical biotechnology.

Learning outcomes.

Competences and learning outcomes that the discipline contributes to:

Integral (IC): the ability to solve complex problems and critically comprehend and solve practical problems in professional pharmaceutical and / or research and innovation activities using the provisions, theories and methods of fundamental, chemical, technological, biomedical and socio-economic sciences. Discipline helps to integrate knowledge and solve complex issues, formulate judgments with insufficient or limited information; clearly and unambiguously communicate their own knowledge, conclusions and justify them for professional and non-professional audiences.

1. Content and logistic of the discipline

The discipline study program is structured into 2 modules, which include 3 blocks of content modules.

<p>Module 1 . Biological features of the organization of life Content module 1. Cytological foundations of life organization and biology of personal development Content module 2. Fundamentals of medical genetics, anthropogenetics.</p> <p>Module 2. Medical and biological basis of parasitism Content module 3. Fundamentals of medical parasitology</p>	<p>1 semester 120 hours / 4 credits</p>	<p>Lectures № 18 Practical classes №№ 54 Topics for self- study №№ 48</p>
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Note: 1 ECTS credit is 30 academic hours.

List of topics of the subject «Biology with the fundamentals of genetics»

Module 1. «Biological features of the organization of life»

Content module 1 «Cytological foundations of life organization and biology of individual development».

Topic 1. Levels of organization of the living. Optical systems in biological research.

Subject, purpose and tasks of biology as a science. The main characteristics of the living. Life forms: cellular and non-cellular. Levels of organization of living matter. Methods of biological research. Microscopy, its varieties. Basic concepts of the development of biology. Relationship between biology and other sciences. Importance of biology for medicine and pharmacy

Topic 2. Cell morphology. Structural components of the cytoplasm and nucleus, cell membranes

A cell is an elementary structural and functional unit of the living. The 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. Significance of membranology for pharmacy Pro- 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. Basic processes of cell life.

Topic 3. The hereditary apparatus of the cell. Morphology of chromosomes. Human karyotype.

The nucleus is the central information apparatus of the cell. Levels of organization of hereditary material. Structural and functional characteristics of the interphase nucleus. Chromatin: structural organization, eu- and heterochromatin. Sex chromatin. Morphofunctional character and classification of human chromosomes. Chromosomal analysis. Human karyotype.

Topic 4. Characterization of nucleic acids. Gene structure of pro- and eukaryotes. Organization of information flow in the cell. Regulation of gene expression.

The role of nucleic acids in the storage and implementation of hereditary information. Genetic code. The structure of the gene. DNA replication. Protein synthesis. Organization of information flow in the cell. Regulation of gene expression.

Topic 5. Gametogenesis. Biological features of human reproduction. Fertilization. Natural types of ontogeny.

Reproduction methods: sexual and asexual. Methods of division of somatic cells. Cell cycle. Characteristics of the interphase. cell populations. Mitosis. Changes in cells and their structures during mitosis. Varieties of mitosis (amitosis, polythemia, endoreproduction). regulation of mitosis. The concept of mitotic activity of tissues. Mitosis disruption. somatic mutations.

Gametogenesis: spermatogenesis and oogenesis. The structure of germ cells. Features of human reproduction. Artificial insemination. Cell life outside the body, cell cloning. Achievement of cell and tissue culture methods and their significance for biology and medicine. Methods for the formation of germ cells. Meiosis, his especially. Conjugation. Crossing over. Mechanisms leading to the genetic diversity of gametes. meiosis regulation. meiosis disorder.

Topic 6. Features of the prenatal period of human development. Causes of congenital malformations. Postnatal period of ontogeny.

The main stages of human ontogenesis: pre-embryonic, embryonic, post-embryonic. Embryogenesis: zygote, cleavage, gastrulation, histo- and organogenesis. Mechanisms of growth and morphogenesis. Genetic control of development. Differentiation of cells, germ layers, tissues. Features of human prenatal development, critical periods. teratogenic factors. Congenital malformations, their classification. The use of stem cells and fetoplacental preparations in medicine.

The main changes in the body in the pre-reproductive, reproductive and post-reproductive periods of ontogenesis. Regeneration and its types: physiological and reparative. Features of regenerative processes in humans. The value of regeneration for homeostasis. Achievement of modern transplantology. tumor growth. Old age as the final stage of ontogeny. Signs of aging at different levels of the organization. Theories of aging. Life expectancy and problems of longevity. Gerontology and geriatrics The concept of death as a biologically natural phenomenon. Extension of human life. Fundamentals of human ecology. Healthy lifestyle.

Content module 2 «Fundamentals of medical genetics»

Topic 7. Manifestations of the main patterns of inheritance on the example of Mendelian traits of an individual (mono-, di- and polyhybrid crossing)

Subject, purpose and tasks of medical genetics. Genetic research methods: genealogical, cytogenetic, biochemical, molecular genetic, twins, etc. Basic concepts of genetics. The human genotype as an integral system. The human phenotype as a combination of specific and personal characteristics and parameters of the organism. Classification of trait inheritance. Monogenic and polygenic inheritance of human traits. Laws of G. Mendel and their cytological bases.

Topic 8. Multiple allelism. Genetics of human blood groups. Interaction of allelic and non-allelic genes.

The main types of interaction of allelic and non-allelic genes. complementarity, polymerism, epistasis. Expressivity and penetrance of genes.

Topic 9. Linked inheritance of traits. Sex genetics. Chromosomal theory of heredity T. Morgan.

The current state of human genome research. Genetic maps of chromosomes. Clutch group. Crossing over. Sex as a set of characteristics that provide sexual reproduction. Primary and secondary sexual characteristics. Theories of sex determination. Gender redefinition mechanisms. sex chromosomes. Features of the inheritance of sex-linked, sex-dependent and sex-limited traits.

Topic 10. Variability, its forms and manifestations. Molecular mechanisms of human variability.

Variability in humans because of sexual reproduction and an integral property and manifestation of life. Classification of variability and characteristics of its types. Phenotypic variability. Reaction rate. Genecopy and phenocopy. Analysis of the mechanisms of the occurrence of mutations. Mutagenesis. Mutagens: physical, chemical, biological. Genetic monitoring. Ways to reduce the risk of mutations.

Topic 11. Human genetics. Genealogical and twin methods.

The concept of human hereditary diseases, their classification. Genetic, chromosomal, genomic, multifactorial human diseases: prevention, diagnosis and possible treatment.

Topic 12. Chromosomal diseases. Cytogenetic method of their diagnosis.

Chromosomal diseases and their classification. Diseases of autosomes and sex chromosomes.

Topic 13. Molecular diseases. Biochemical method and DNA diagnostics.

Genetic diseases and their classification. Biochemical markers of human diseases.

Topic 14. Population-statistical method. Medical genetic counseling.

The concept of populations. population genetics. Ideal population. Hardy-Weinberg law. Population dynamics. Medico-genetic aspects and family planning. Medical genetic counseling. Prenatal and postnatal diagnosis of hereditary diseases.

Module II. Medico-biological foundations of parasitism

Content module 3. Fundamentals of medical parasitology

Topic 15. Medico-biological foundations of parasitism. Protozoa as human parasites. Phylum Sarcocystophora, Class Lobosea. Representatives of Zoomastigophorea as human parasites.

Subject, purpose and tasks of medical parasitology. Relationship of medical parasitology with other disciplines. The concept of parasitism. Relationship between parasite and host. Classification of parasites and hosts. Methods of prevention and pharmacotherapy of parasitic diseases. General characteristics and cycles of development of the main representatives of protozoan human parasites. Means of prevention of protozoonoses.

Topic 16. Class Zoomastigophora. Morphofunctional characteristics, laboratory diagnosis and prevention of giardiasis, trichomoniasis, leishmaniasis and trypanosomiasis.

General characteristics and cycles of development of the main representatives of protozoan human parasites. Means of prevention of protozoonoses.

Topic 17. Phylum Apicomplexa, class Sporozoa. Morphofunctional characteristics, laboratory diagnostics and prevention of malaria, toxoplasmosis.

Methods of prevention and pharmacotherapy of parasitic diseases. General characteristics and cycles of development of the main representatives of protozoan human parasites. Means of prevention of protozoonoses. Transmissible human diseases.

Topic 18. Medical helminthology. Type Plathelminthes, class Trematoda. Laboratory diagnostics and prevention of fascioliasis, dicrocellosis, paragonimiasis.

Classification of helminths. Basic concepts of medical helminthology. General characteristics and cycles of development of representatives of helminths of human parasites. Means of prevention of trematodosis.

Topic 19. Phylum Plathelminthes, class Trematoda. Laboratory diagnostics and prevention of opisthorchiasis, clonorchiasis, schistosomiasis.

Classification of helminths. Basic concepts of medical helminthology. General characteristics and cycles of development of representatives of human helminth parasites. Means of prevention of trematodosis.

Topic 20. Type Plathelminthes, class Cestoda. Laboratory diagnostics and prevention of teniasis, teniarhynchosis, cysticercosis, hymenolepiasis,

General characteristics and cycles of development of representatives of flat helminth parasites of humans. Means for the prevention of cestodosis.

Topic 21. Type Plathelminthes, class Cestoda. Laboratory diagnostics and prevention of echinococcosis, diphyllbothriasis, alveococcosis.

General characteristics and cycles of development of representatives of flat helminth parasites of humans. Means for the prevention of cestodosis.

Topic 22. Type Nematelminthes. Class Nematoda. Laboratory diagnostics and prevention of ascariasis, enterobiasis, trichuriasis, hookworm, necatorosis.

General characteristics and cycles of development of representatives of round helminths of human parasites. Means of prevention of nematodes.

Topic 23. Type Nematelminthes. Class: Nematode. Laboratory diagnostics and prevention of strongyloidiasis, dracunculiasis, trichinosis, filariasis.

General characteristics and cycles of development of representatives of round helminths-parasites of man. Means of prevention of nematodes.

Topic 24. Medical arachnoentomology. Phylum Arthropoda. Crustacea class. Class Arachnoidea. Morphology, development and medical significance of spiders, mites, scabies.

Features of morphology, nutrition and reproduction of arachnids. Poisonous arachnids (scorpions, spiders). The medical significance of ticks as pathogens and carriers of human diseases. Ticks are residents of human habitation and their medical significance.

Topic 25. Phylum Arthropoda. Insecta class. Morphology, ecology, development and medical significance of cockroaches, bedbugs, fleas, flies, mosquitoes, mosquitoes, midges, midges. The fight against midges.

Progressive and regressive changes in the organization of the class Insecta depending on the habitat. Features of morphology, nutrition and reproduction of insects. Medical significance of lice, fleas, bedbugs, cockroaches as pathogens and carriers of pathogens of infectious diseases.

Topic 26. Practical skills for module 1 and module 2.

Topic 27. Final lesson in the academic discipline.

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 of the following practical skills:

- solve situational problems in the main sections of the discipline,
- differentiate the components of the cell,
- analyze the idiogram of human chromosomes,
- identify the primary structure, the number of amino acids, the molecular weight of the polypeptide according to the structure of the gene encoding it,
- analyze the structure of pro- and eukaryotic genes,
- analyze the sequence of stages of regulation of gene expression,
- to determine the types of inheritance of Mendelian traits of a person,
- determine the genotypes and phenotypes of offspring by the genotypes of the parents,
- exclude paternity when determining the blood groups of the parents and the child;
- develop measures to reduce the degree of manifestation of the pathological condition in patients with hereditary pathology.
- choose appropriate methods for studying human heredity and diagnosing hereditary diseases,
- differentiate human chromosomal diseases,
- conduct a genealogical analysis of pedigrees with hereditary pathology.
- calculate the role of heredity and environmental conditions in the development of traits
- calculate the genetic composition of human populations,
- to determine the place of a person as a biological object in the system of wildlife,
- to substantiate the belonging of human parasitic diseases to the group of transmissible, natural-focal,
- identify the different stages of the life cycle of human parasites,
- to substantiate the methods of laboratory diagnostics of parasitic diseases,
- to prove the effectiveness of methods for the prevention of parasitic diseases, depending on the methods of infection.
- to foresee the influence of environmental factors on the human body

The student's independent work provides 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 the meetings of the student scientific circle, the implementation of scientific and practical researches, participation in specialized competitions, scientific and practical conferences and organization of students' research works.

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

The route for obtaining materials: Department of Pharmacy / for students / Full-time education / Pharmacy, Industrial Pharmacy / 1 course / Educational materials / or through the link <https://www.vnmdu.edu.ua/> department pharmacy #. Access to the materials is carried out through the student's corporate account s000XXX@vnmdu.edu.ua.

5. Forms and methods of monitoring academic performance

Current control in practical studies	Methods: <i>oral or written survey, testing, electronic survey, solving situational problems, conducting laboratory studies, interpreting them and evaluating their results (drawing up a protocol in a workbook)</i>
Control of mastering the thematic section of the discipline at intermediate control lessons	Methods: <i>oral or written survey, electronic testing, situational problem solving, control of practical skills</i>
Final semester control (credit) at the end of the 1 semester (If provided by the curriculum)	According to the Regulation of the Academic process in VNMU named after M.I. Pirogov (link https://www.vnmdu.edu.ua/General information)
Final control of the discipline –is a simple credit	Methods: pre-examination testing, oral questioning (according to the Regulation of the Academic process in VNMU named after M.I. Pirogov (link https://www.vnmdu.edu.ua/General information)
Learning success diagnostic tools	Theoretical questions, tests, clinically-oriented situational tasks, practical tasks, practical skills demonstration

6. Assessment criteria

Knowledge assessment is carried out in accordance with the Regulations of the Academic process in VNMU named after M.I. Pirogov (link <https://www.vnmdu.edu.ua/General> information)

Continuous assessment	On a four point system of traditional assessments: 5 «excellent», 4 «good», 3 «satisfactory», 2 «unsatisfactory»
Midpoint separation assessment	On a four-point system of traditional assessments
Control of practical skills	According to the four-point system of traditional assessments
Pass-fail exam	On a 200-point scale (the arithmetic average grade for the semester is converted into points) Credited: 122 to 200 points Not credited: less than 122 points (See Grading Scale)
Final control of the discipline	<i>Sum of points for pre-examination testing (12-20 points)</i>

	<i>and oral questioning (38-60 points) (for disciplines included in Step 1,2)</i> Exam grade: 71-80 points - «excellent» 61-70 points - «good» 50-60 points - «satisfactory» Less than 50 points - «unsatisfactory» / did not pass
Discipline assessments:	Current academic assessment - from 72 to 122 points (conversion of the average traditional assessment of practical class on a 122-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 1 to 12 points From 122 to 200 points in total.

Discipline Score Scale: National and ECTS

The sum of grades for all types of educational activities	Score ECTS	Score on a national scale	
		For exam, course project (work), practice	for credit test
180-200	A	excellent	credited
170-179,9	B	good	
160-169,9	C		
141-159,9	D	satisfactory	
122-140,99	E	satisfactory	
61-121,99	FX	unsatisfactory with the possibility of reassembly	is not credited with the possibility of reassembling
1-60	F	unsatisfactory with a mandatory reexamination of discipline	is not credited with mandatory reexamination of discipline

1. 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 of educational 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 VNMU named after M.I.Pirogov and the principles of academic integrity (link <https://www.vnm.u.edu.ua/General> information).

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. Late comings are not allowed.

Usage of mobile phones and other electronic devices. Is possible only as a tools for doing tests or performing other tasks, given for teacher for practical work.

Academic integrity. When studying the discipline, the student must be guided by the Code of Academic Integrity and Corporate Ethics of VNMU named after M.I. Pirogov (link : <https://www.vnmu.edu.ua/General> information)/ Code of Academic Integrity). (*Prescribe what measures will be carried out in case of violation of academic integrity (write-off, usage of mobile phone during knowledge assessment, etc.* 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 VNMU named after M.I. Pirogov (link <https://www.vnmu.edu.ua/General> information) at the time of work out schedule (published on the website of the department <https://www.vnmu.edu.ua/> departmentpharmacy#) to the teacher on duty. To work out missed lesson student should perform tasks, given to other students on the practical class, answer the tests and theory questions of a Teacher. Missed Lectures should be shortly noted from the pdf or Powent Point presentations or video materials, located in the Training Materials Folder.

The procedure for admission to the discipline final control is given in the Regulations of the Academic process in VNMU named after M.I. Pirogov (link <https://www.vnmu.edu.ua/General> information). 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 1 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 VNMU named after M.I. Pirogov (link <https://www.vnmu.edu.ua/General> information).

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/General> information)

Politics in terms of remote learning. Distance learning regulated by the Regulations of the elements of remote learning in VNMU named after Pirogov M.I. (<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/> Department of Pharmacy / to Students or <https://www.vnmu.edu.ua/Department of Pharmacy / News>).

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

1. **Educational resources.**

Educational and methodological support of the discipline is published on the website of the department (<https://www.vnmu.edu.ua/> department of Pharmacy / for students). Consultations are held twice a week according to the schedule.

2. **The timetable and distribution of groups** with assigned teachers are published on the web page of the department ((<https://www.vnmu.edu.ua/> department of Pharmacy / for students).

3. Questions to the intermediate and final semester control (credit) of the discipline are published on the web page of the department (<https://www.vnmua.edu.ua> / department of Pharmacy / for students).

The syllabus of the discipline **“Biology with the Fundamentals of Genetics”** was discussed and approved at the meeting of the department of Pharmacy (record № 1, dated «_1_» of September, 2022)

Responsible for the academic discipline



(signature)

Professor Victoria RODONKOVA

Head of the department



(signature)

Professor Olena KRYVOVIAZ

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