SYLLABUS OF THE EDUCATIONAL COMPONENT

BIOCHEMICAL TRANSFORMATION OF MEDICATIONS IN THE BODY

for applicants for higher education of 3 year of study full-time form of education
of educational program "Pharmacy",
in specialty "226 Pharmacy, industrial pharmacy"
field of knowledge "22 Publik Health"
training for second (Master`s) level of higher education

TEACHERS

	**Seniuk Igor Valerievich**	**citochrom@gmail.com**

1. **The name of higher education establishment and department:** National University of Pharmacy, Department of Biological chemistry and Veterinary medicine.

2. **Address of the department:** Kharkiv, Kulikivska str., 12, ground floor, т. 057-706-30-99.

3. **Web site of the department:** https://biochem.nuph.edu.ua/en/

4. **Information about teachers:**

Seniuk Igor

PhD, associated professor of Department of Biological chemistry and Veterinary medicine of National University of Pharmacy. Experience of scientific and pedagogical work – 30 years. He teaches courses "Biological Chemistry", "Functional Biochemistry". Research interests: study of mechanisms of pathogenesis and ways of correction of hepatobiliary system.

5. **Consultations:** are held online on the ZOOM platform after a class with their teacher.

6. **Brief summary of the educational component:** the educational component "Biochemical Transformation of Drugs in the Body" is an elective component for the specialty 226 "Pharmacy, Industrial Pharmacy", educational program "Pharmacy" for 3rd year students (4.10d).

7. **The purpose of teaching the educational component:** the purpose of teaching the educational component "Biochemical transformation of drugs in the body" is to form knowledge about the absorption, distribution, biotransformation and excretion of drugs and their metabolites from the body.

8. **Competencies in accordance with the educational program:**

Soft-skills / General competencies (GC):

GC 4. Ability to abstract thinking, analysis and synthesis, to learn and modern professional training.

GC 9. Skills in the use of information and communication technologies.

Hard-skills / Professional (special) competencies (PC):

PC 4 Ability to ensure the rational use of prescription and over-the-counter medicines and other pharmacy products in accordance with the physicochemical, pharmacological characteristics, biochemical, pathophysiological characteristics of a particular disease and pharmacotherapeutic regimens for its treatment.

PC 12 Ability to use in professional activities knowledge of regulatory and legal acts of Ukraine and recommendations of good pharmaceutical practices.

9. The program learning outcomes: (PLO):

PLO 14. Determine the advantages and disadvantages of medicines of different pharmacological groups, taking into account their chemical, physicochemical, biopharmaceutical, pharmacokinetic and pharmacodynamic features. Recommend over-the-counter medicines and other pharmacy products to consumers with the provision of advisory assistance and pharmaceutical care.

PLO 16. Determine the influence of factors that affect the processes of absorption, distribution, deposition, metabolism and excretion of medicines and are due to the state, characteristics of the human body and physicochemical properties of medicines.

PLO 18. Select biological objects of analysis, determine xenobiotics and their metabolites in biological media and evaluate the results obtained taking into account their distribution in the body.

10. Status of the educational component: selective.

11. Prerequisites of the educational component: "Biochemical Transformation of Drugs in the Body" as an educational component is based on the study of organic chemistry, biological chemistry, physiology and pharmacology by higher education students and is integrated with these educational components and lays the foundation for further mastering of knowledge and skills in specialized theoretical and professional and practical clinical educational components (pharmacokinetics, pharmaceutical chemistry, clinical pharmacology with pharmacopoeia, etc.)

12. The volume of the educational component: 3.0 ECTS credits, educational component number of hours per general 90 hours. Lectures - 9 hours, practical classes - 21 hours, independent work - 60 hours.

13. Organization of training: conducting lectures, practical classes, consultations, writing written works, testing, interviews and watching video content with comments for better learning of the educational material.

The format of teaching the educational component

Content of the educational component:

Module 1. Biochemical Transformation of Drugs in the Body.
Content module 1. General principles of biotransformation of xenobiotics. Phase of modification of drug compounds.

Topic 1. General principles of biotransformation of xenobiotics. Biotransformation systems of drugs.
Topic 2. Phase I (modification) of xenobiotic metabolism. Metabolism of substrates under the action of enzymes of oxidative systems. Control of the assimilation of CM 1.

Content module 2. The conjugation phase of drug compounds. Factors that affect the metabolism of drugs.

Topic 3. II Phase (conjugation) of xenobiotic metabolism. Conjugation and transport processes.
Topic 4. Features of drug transformation. Ways of transformation of certain groups of drugs.
Topic 5. Factors affecting drug metabolism. The role of metabolism (biotransformation) in drug toxicity. Control of the assimilation of CM 2.

14. Forms and types of academic achievements supervision:

- *Current control:* oral questioning, written tasks, solving situational tasks, computer testing.
- *Control of content modules:* this is the control of the assimilation of the amount of knowledge that was obtained by the applicant for higher education during the content module. It is conducted in the form of written work and computer testing.
- *Semester control:* this is conducted in the form of computer testing.

15. Evaluation system of the educational component: the results of semester control in the form of semester exam are evaluated on the ECTS scale, 100-point and four-point scale ("excellent", "good", "satisfactory", "unsatisfactory").

Points from the educational component are calculated according to this ratio:

Types of evaluation	Maximum number of points (% of the number of points per module - for content modules)
Module 1 Biochemical Transformation of Drugs in the Body.	
Content module 1: General principles of biotransformation of xenobiotics. Phase of modification of drug compounds. - evaluation of topics (1-3) (work in classes 1-3); assessment of topics (1-3): oral questioning, written assignments. - supervision of content module 1 performance of written tasks and passing test tasks.	50 (50 %)
Content module 2: The conjugation phase of drug compounds. Factors that affect the metabolism of drugs. - evaluation of topics (1-2) (work in classes 1-2); assessment of topics (1-3): oral questioning, written assignments. - supervision of content module 1 performance of written tasks and passing test tasks.	50 (50 %)
Semester credit of the module: "Functional Biochemistry"	-
Semester Supervision of Module 1	100

The individual work of applicants for higher education is evaluated during the progress supervision and during the content module supervision

16. Academic policies of the educational component:

- *Policy on academic integrity*. It is based on the principles of academic integrity, given in the POL "On measures to prevent cases of academic plagiarism in NUPh". Cheating in assessing the performance of a higher education applicant during control activities in practical (laboratory) classes, control of content modules and semester offset are prohibited (including with the use of mobile devices). Detection of signs of academic dishonesty in the written work of the student is the basis for its non-enrollment by the teacher.
- *Policy on attendance.* The applicant for higher education is obliged to attend classes (POL "On the organization of the educational process of NUPh") according to the schedule (https://nuph.edu.ua/rozklad-zanyat/), adhere to ethical standards of conduct.
- *Policy on deadlines, working out, rating increase, elimination of academic debt.* Working out of missed classes by a higher education student is carried out in accordance with the Regulation "Regulations on working out missed classes by students classes and the procedure for eliminating academic differences in curricula at NUPh" according to the established at the department schedule of working out missed classes. Raising rating and elimination of academic debt from the educational component is carried out by applicants for education in accordance with the procedure specified in the Regulations "On the procedure for evaluating results of higher education applicants at NUPh". Applicants for higher education are obliged to comply with all deadlines set by the department for the performance of types of written work on educational component. Works that are submitted in violation of deadlines without good reason, are evaluated at a lower grade - up to 20% of the maximum number of points for this type of work.
- *Policy on appealing the assessment of the educational component (appeals).* Applicants for higher education have the right to appeal (appeal) the assessment of the educational component received during control measures. The appeal is carried out in accordance with the Regulations on Appealing the results of semester control of knowledge of higher education applicants at NUPh". Any form of violation of academic integrity is not tolerated. In case of such events - response in accordance with the provisions of NUPh.

17. Information and educational and methodical support of the discipline:

The main reading suggestions	1. Harper`s Illustrated Biochemistry / Rodwell V. W., Bender D. A., Botham K. M., Kenelly P. J., Weil P. A. – 31st ed. – USA: The Mc-Graw-Hill Companies Inc.- 2018/ – 800 p. 2. Lippincott Illustrated Reviews: Biochemistry. 7th edition. D.R.Ferrier; Wolters Kluwer, 2017. 565 p. 53 11. McKee T., McKee J. R. Biochemistry. The molecular basis of life. Seventh edition. Oxford University Press, 2019. 448 p.

	3. MCQs in biochemistry 2nd edition / A. Ya. Sklyarov et al.: Lviv: Danylo Halytsky Lviv National Medical University Press, 2020. 319 p. 4. Nelson D. L., Cox M. M. Lehninger Principles of Biochemistry. 8-th edition. W.H. Freeman and Company, New York, 2021. 1328 p.
Supplementary reading suggestions for in-depth study of the educational component	1. Bernard Testa, Stefanie D. Krämer. The Biochemistry of Drug Metabolism: Principles, Redox Reactions, Hydrolyses, 2 Volume Set. April 2010. p. 950 2. Introduction to Biochemical Pharmacology and Drug Discovery https://www.intechopen.com/chapters/41543 3. Biotransformation of Drugs: Overview & Issues https://study.com/academy/lesson/biotransformation-of-drugs-definition-types-process.html
Current electronic information resources (magazines, websites) for in-depth study of the educational component	Educational site http://pharmel.kharkiv.edu. Website of the Department of Biological chemistry and Veterinary medicine http://biochem.nuph.edu. Library of NUPh http://lib.nuph.edu.ua.
Moodle distance learning system	https://pharmel.kharkiv.edu/moodle/course/view.php?id=3982

18. Material, technical and software support of the educational component: LabAnalyt SP-V1000 spectrophotometer, aqua distiller Dl-10, LabAnalyt DM 0412 clinical centrifuge, pH meter pH-305, R-Line personal computer with Intel Core i3-8100 processor, Philips 223V5LSB, R-Line workstation with IntelCore i5-7400 processor, EPSON EB-X05 projector, TC-80 thermostats, Application software and online services: a set of services for organising online and distance learning - Google Workspace for Education Standard, licence type – free licence for education, unlimited; software for organising video conferences ZOOM, licence type - free license for education for 1 year with the possibility of extension; modular object-oriented dynamic learning environment MOODLE 3.9.8, licence type - Open Source.