

**SYLLABUS OF THE EDUCATIONAL COMPONENT**

**TOXICOLOGICAL CHEMISTRY**

(the name of the educational component)

**for applicants for higher education of 4 year of study full-time form of education (2023\2024 year of study)**

**of educational program «Pharmacy»**

(Educational Program Name)

**in specialty «226 Pharmacy, industrial pharmacy»**

(Code and Specialty Name)

**in specialization «226.01 Pharmacy»**

(Code and Specialization Name)

**field of knowledge «22 Public Health»**

(Code and Knowledge Field Name)

**training for Master**

(Higher Educational Level Name)

**TEACHER**



**Baiurka  
Serhii Vasylovych**

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- 1. The name of higher education establishment and department:** National University of Pharmacy, department of Medicinal Chemistry.
- 2. Address of the department:** 4, Valentynivs'ka str., Kharkiv, 61168.
- 3. Web site of the department:** <https://medchem.nuph.edu.ua/en/main/>
- 4. Information about teacher:**

**Baiurka Serhii Vasylovych**

Doctor of Pharmacy, Professor, Professor of the Medicinal Chemistry Department of National University of Pharmacy. The experience of a scientific and a scientific and pedagogical activity is 31 years. Reads the courses of "Toxicological Chemistry", "Medical and Analytical Toxicology" in ukrainian and english. Scientific interests deal with chemical-toxicological analysis of antidepressant drugs.

- 5. Consultations:** The consultations take place every Monday from 12.00 to 12.50. Consultations are carried out by prof. Baiurka S.V.

- 6. Brief summary of the educational component:** Toxicological Chemistry is a professionally oriented, complex discipline in the system of higher pharmaceutical education. Toxicological Chemistry deals with chemical nature and reactions of toxic substances; their origin and uses; and the chemical aspects of their exposure, transformation, and elimination of biological systems. It emphasized the chemical formulas, structure, and reactions of toxic substances The discipline forms the basis of expert thinking, promotes the development of skills in the field of Forensic and Clinical Toxicology (the Forensic-Toxicological Laboratory of Bureau of forensic-medical examinations, the Emergency Centre for acutely poisoned patients, the Industrial Sanitary Laboratory which performs industrial and ecological supervision, the Toxicological Laboratory for Diagnostics of drug abuse and alcoholism).

- 7. The purpose statement of studying the educational component:** to master the abilities for estimation of the safety of potent toxic substances of various chemical groups, the skills for performing the forensic toxicological examinations and the studies in the field of clinical toxicology.

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

Soft- skills / General competences (GC):

**GC 11.** Ability to assess and ensure the quality of performed work.

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

**PC 6.** Ability to identify medications, xenobiotics, toxins and their metabolites in body fluids and tissues, to conduct chemical and toxicological tests to diagnose acute poisoning, drug and alcohol intoxication.

**PC 15.** Ability to organize and participate in the production of medications in the context of pharmaceutical companies, including the selection and justification of the technological process, equipment in accordance with the requirements of Good Manufacturing Practice (GMP) with the appropriate development and design of the necessary documentation. Determine the stability of medications.

**PC 20.** Ability to develop methods for quality control of medications, including active pharmaceutical ingredients, medicinal plant raw materials and excipients using physical, chemical, physicochemical, biological, microbiological, pharmacotechnological and pharmacorganoleptic control methods.

**9. The program learning outcomes: (PLO):**

**PLO 16.** To determine the influence of factors influencing the processes of absorption, distribution, deposition, metabolism and excretion of the drug and due to the condition, features of the human body and physico-chemical properties of medications.

**PLO 17.** To use clinical, laboratory and instrumental research data to monitor the efficacy and safety of medicines.

**PLO 18.** To select biological objects of analysis, to carry out the definition of xenobiotics and their metabolites in biological environments and to estimate the received results taking into account their distribution in an organism.

**10. Status of the educational component:** selective.

**11. Prerequisites of the educational component:** Toxicological Chemistry is based on the study of physical and chemical properties of inorganic and organic substances (educational components of Inorganic, Organic and Analytical chemistry), biochemical processes occurring in the body (the educational component of Biochemistry), structure of organs, body systems and their disorders (educational components of Anatomy, Physiology, Pathology and Pharmacology) and integrates with these educational components.

**12. The volume of the educational component:** Number of ECTS credits – 4, number of hours per educational component: general – 120, lectures – 6, laboratory classes – 54, individual work – 60.

**13. Organization of training:**

**The format of teaching the educational component**

**Content of the educational component:**

| <b>Module 1. Toxicological Chemistry</b>  |
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| <i>Content module 1.</i> Biochemical and analytical aspects of toxicology of heavy metals, volatile poisons, nitrites and nitrates  |
| <b>Topic 1.</b> Introduction into toxicological chemistry. Definition of basic concepts and terms of biochemical toxicology and analytical toxicology.  |
| <b>Topic 2.</b> Biochemical and analytical aspects of heavy metal toxicology. Sample preparation of the biological samples by mineralization. Detection of lead, barium, manganese, chromium in the mineralizate by the fractional method.                  |
| <b>Topic 3.</b> Detection of silver, copper, zinc, bismuth, thallium, antimony, arsenic in the mineralizate by the fractional method.   |
| <b>Topic 4.</b> Inorganic mercury compounds. Human exposure and health effects. Analytical aspects. Sample preparation. Detection of mercury in the destructate by the fractional method. Quantitative determination of heavy metals in biological samples. |

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| <b>Topic 5.</b> Toxicology of toxic gases: hydrogen cyanide, formaldehyde, carbon (II) oxide. Sample preparation when examining biological samples for the presence of volatile poisons. Detection of cyanide and formaldehyde in the distillates by a chemical method. |
| <b>Topic 6.</b> Biochemical and analytical aspects of toxicology of organic solvents and some cauterizing substances. Examination of body fluids for the presence of alcohols by gas-liquid chromatography  |
| <b>Topic 7.</b> Biochemical and analytical aspects of nitrite, nitrate toxicology. Final test of CM 1 assimilation.   |
| <b>Content module 2.</b> Biochemical and analytical aspects of toxicology of drugs and pesticides   |
| <b>Topic 8.</b> Toxicological aspects of opioid analgesics and hypnotics application. Methods of sample preparation in chemical-toxicological analysis of drugs.  |
| <b>Topic 9.</b> Toxicological aspects of non-opioid analgesics and non-steroidal anti-inflammatory drugs application. Toxicological screening of drugs with thin layer chromatography.  |
| <b>Topic 10.</b> Examination of the acid chloroform extract for derivatives of barbituric and salicylic acids, pyrazolone, purine.  |
| <b>Topic 11.</b> Examination of the basic chloroform extract for alkaloids  |
| <b>Topic 12.</b> Toxicological aspects of neuroleptics, tranquilizers and local anesthetics application. Examination of the basic chloroform extract for derivatives of 1,4 benzodiazepine, phenothiazine, p-aminobenzoic acid.   |
| <b>Topic 13.</b> Quantitative determination of drugs in the extracts. Examination of body fluids for drugs in acute intoxications   |
| <b>Topic 14.</b> Biochemical and analytical aspects of pesticide toxicology. Final test of CM 2 assimilation.   |
| <b>Semester Supervision of Module 1</b>   |

#### 14. Forms and types of academic achievements supervision:

##### *Forms and types of academic achievements supervision*

*Progress supervision:* oral survey, writing test tasks, solving situational problems.

*Supervision of content modules:* preparation of test tasks, solution of situational problems.

*Semester exam:* not provided)

*Semester control form:* semester credit.

*Conditions for admission to the supervision of content modules:* For admission to the supervision of content module 1 and 2, it is necessary to have a minimum number of points for the topics (classes) of content module 1 and 2.

*Conditions for admission to semester supervision:* A current rating of more than 60 points, absence of missed laboratory classes, fulfillment of all requirements stipulated in the work program of the educational component.

#### 15. Evaluation system of the educational component:

*Evaluation system of the educational component:* The results of the semester supervision in the form of a semester credit are evaluated on a 100-point, non-differentiated scale ("passed", "failed") and on the ECTS scale.

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

| Types of evaluation  | Maximum number of points<br>(% of the number of points per<br>module - for content modules) |
|--|---|
| <b>Module 1. Toxicological Chemistry</b>   |   |
| <b>Content module 1. Biochemical and analytical aspects of toxicology of heavy metals, volatile poisons, nitrites and nitrates.</b><br>- evaluation of topics (1-7) (work in classes 1-6): work in classes (oral survey, writing test tasks, solving situational problems);<br>- supervision of content module 1 (writing test tasks, solving situational problems). | 48 (48 %)   |

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| <p><b>Content module 2. Biochemical and analytical aspects of toxicology of drugs and pesticides.</b></p> <p>- evaluation of topics (8-14) (work in classes 7-13): work in classes (oral survey, writing test tasks, solving situational problems);</p> <p>- supervision of content module 2 (writing test tasks, solving situational problems).</p> | 52 (52 %) |
| <b>Semester Supervision of Module 1</b>  | 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:**

*The policy of the educational component ("rules of the game")* is determined by the requirements of the department to the applicant for higher education when studying the educational component regarding academic integrity, regarding attending classes, regarding deadlines, working out, increasing the rating, liquidating academic debts, regarding contesting the evaluation of the educational component (appeals), etc. In this point, the Regulations and other normative documents of the National University of Pharmacy are specified, in accordance with which requirements are set for the applicant for higher education when studying the educational component and the policy of the department is formed.

*Academic Integrity Policy.* It is based on the principles of academic integrity stated in the POL "On measures to prevent cases of academic plagiarism at the National University of Pharmacy". Cheating during the evaluation of an applicant for higher education during supervision activities in practical (seminar, laboratory) classes, supervision of content modules and the semester exam is prohibited (including the use of mobile devices). Abstracts must have correct text references to the used literature. The detection of signs of academic dishonesty in the student's written work is a reason for the teacher not to credit it.

*Class attendance policy.* An applicant for higher education is obliged to attend classes (POL "On the organization of the educational process of the National University of Pharmacy") according to the schedule (<https://nuph.edu.ua/rozklad-zanyat/>), to observe ethical norms of behavior.

*Policy regarding deadlines, working out, rating increase, liquidation of academic debts.* The completion of missed classes by an applicant for higher education is carried out in accordance with the POL "Regulations on the completion of missed classes by applicants and the procedure for eliminating academic differences in the curricula of the National University of Pharmacy" in accordance with the schedule for working out missed classes established by the department. Increasing the rating and liquidating academic debts from the educational component is carried out by the applicants in accordance with the procedure specified in the POL "On the procedure for evaluating the results of training of applicants for higher education at the National University of Pharmacy". Applicants of higher education are obliged to comply with all deadlines set by the department for the completion of written works from the educational component. Works that are submitted late without valid reasons are assessed at a lower grade - up to 20% of the maximum number of points for this type of work.

*Policy on appeals of evaluation of the educational component (appeals).* Applicants for higher education have the right to contest (appeal) the evaluation of the educational component obtained during control measures. The appeal is carried out in accordance with the POL "Regulations on appealing the results of the final supervision of knowledge by applicants of higher education at the National University of Pharmacy".

**17. Information and educational and methodical support of the educational component:**

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| <b>The main reading suggestions</b> | <ol style="list-style-type: none"> <li>1. Karpushyna S. A. Toxicological Chemistry with Analytical Toxicology : Textbook for students of higher education institutions / S. A. Karpushyna, S.V. Baiurka : NUPh, 2021. — 352 p.</li> <li>2. Karpushyna S. A. Collection of Multiple Choice Questions on Toxicological Chemistry with answers and explanations / S. A. Karpushyna, K.Yu. Netiosova, S.V. Baiurka – Kh.: NUPh Publishing, 2018. – 92 p.</li> </ol> |
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| <p><b>Supplementary reading suggestions for in-depth study of the educational component</b></p>                              | <ol style="list-style-type: none"> <li>1. Baselt C. R. Disposition of Toxic Drugs and Chemicals in Man / Randall C. Baselt. – [9-th ed.]. – Seal Beach, California : Biomedical Publications, 2011. – 1900 p.</li> <li>2. Clarke's analysis of drugs and poisons in pharmaceuticals, body fluids and postmortem material: 4-th edition / A. C. Moffat; M.D. Osselton; B. Widdop [et al.]. – London, Chicago: Pharmaceutical Press, 2011. – 2736 p.</li> </ol>  |
| <p><b>Current electronic information resources (magazines, websites) for in-depth study of the educational component</b></p> | <p><a href="https://www.ncbi.nlm.nih.gov/pmc/">https://www.ncbi.nlm.nih.gov/pmc/</a></p> <p><a href="https://apps.who.int/iris/handle/10665/42020">https://apps.who.int/iris/handle/10665/42020</a></p> <p><a href="https://www.unodc.org/unodc/en/scientists/guidance-for-the-validation-of-analytical-methodology-and-calibration-of-equipment.html">https://www.unodc.org/unodc/en/scientists/guidance-for-the-validation-of-analytical-methodology-and-calibration-of-equipment.html</a></p> <p><a href="http://www.ich.org/fileadmin/Public_Web_Site/ICH_Products/Guidelines/Quality/Q2_R1/Step4/Q2_R1__Guideline.pdf">http://www.ich.org/fileadmin/Public_Web_Site/ICH_Products/Guidelines/Quality/Q2_R1/Step4/Q2_R1__Guideline.pdf</a>.</p> |
| <p><b>Moodle distance learning system</b></p>  | <p><a href="https://pharmel.kharkiv.edu/moodle/course/view.php?id=4685">https://pharmel.kharkiv.edu/moodle/course/view.php?id=4685</a></p>   |

**18. Technical support and software of the educational component:** : multimedia projector Epson EB-E350, multimedia projector Mitsubishi EX 10, touch screen 23" HP 2310ti Touch, LED panel, 1080p (Full HD), computers, electronic laboratory scales A500 AXIS, electronic analytical scales AN 100 AXIS, electronic laboratory scales TBE0,21-0,001, spectrophotometer CΦ-46, water heaters, circular polarimeter CM-3, circular polarimeter WXG-4, laboratory refractometer Abbe2WAJ-454B2M, refractometer ИРΦ-454B2M, refractometer RL2, photoelectrocolorimeters КΦК-2.

A set of services for organizing online and distance learning – Google Workspace for Education Standard, ZOOM video conferencing software, modular object-oriented dynamic learning environment MOODLE 3.9.8.