

MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Department of general and clinical pharmacology and pharmacognosy



APPROVED

Vice-rector for scientific and pedagogical activity

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« 01 » 09 2023 y.

**WORKING PROGRAM IN THE DISCIPLINE**

**«DRUG TOXICOLOGY »**

**(full-time education)**

**Level of higher education:** second (master's degree)

**Field of knowledge:** 22 «Health care»

**Specialty:** 226 «Pharmacy, industrial pharmacy»

**Educational and professional program:** Pharmacy, industrial pharmacy

The program was compiled on the basis of the educational and professional program "Pharmacy, industrial pharmacy", training of specialists of the second (master's) level of higher education in the specialty 226 "Pharmacy, industrial pharmacy" field of knowledge 22 "Health care", approved by the Scientific Council of ONMedU (from 29.06 .2023, protocol No. 8).

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The work program was approved at the meeting of the department of pharmacology and pharmacognosy

Protocol No. 1 dated August 28, 2023

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Head of the department

Yaroslav ROZHKOVSKY

### 1. Description of the discipline:

| Name of indicators | Field of knowledge, specialty, specialization, level of higher education | Characteristics of the discipline |                 |
|--------------------|--|-----------------------------------|-----------------|
| Total number:      | Field of knowledge<br>22 «Health care»                                   | <i>Full-time (day) education</i>  |                 |
| Credits of ECTS: 3 |  | <i>Basic discipline</i>           |                 |
| Hours: 90          | Specialty<br>226 « Pharmacy, industrial pharmacy »                       | <i>Course: VI</i>                 | <i>4</i>        |
| Content topics - 2 |  | <i>Semester:</i>                  | <i>VII</i>      |
|                    | Level of higher education second<br>(master's degree)                    | <i>Lectures</i>                   | <i>0 hours</i>  |
|                    |  | <i>Seminars</i>                   | <i>0 hours</i>  |
|                    |  | <i>Practical classes</i>          | <i>30 hours</i> |
|                    |  | <i>Laboratories</i>               | <i>0 hours</i>  |
|                    |  | <i>Independent work</i>           | <i>60 hours</i> |
|                    |  | <i>including individual tasks</i> | <i>0 hours</i>  |
|                    |  | <i>Form of final control</i>      | <i>Credit</i>   |

### 2. Goals and objectives of the discipline

**The purpose of discipline is to master the student with knowledge of the main sections of drug toxicology.**

#### **The main tasks of studying discipline**

- mastering of the basic principles and theoretical principles of medical toxicology by students;
- to get acquainted with some notions of toxicology, to study the main features of exogenous poisoning and to learn how to calculate the quantitative assessment of poisoning of substances .;
- to get acquainted with possible ways of poisoning to the body and biotransformation phenomena, detoxification at the level of the system of organs and cells.

**The process of studying the discipline is aimed at forming the elements of the following competencies:**

IC - the ability to solve complex tasks and problems in a certain area of professional activity or in the learning process, involves research and / or innovation and is characterized by the complexity and uncertainty of conditions and requirements

General (GC):

GC02. Ability to apply knowledge in practical situations.

GC04. Ability to think abstractly, analyze and synthesize, learn and be modernly trained.

GC06. Knowledge and understanding of the subject area and understanding of professional activities.

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

GC 12. Ability to conduct experimental research at an appropriate level.

GC 13. The ability to realize their rights and obligations as a member of society, to understand the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.

Specialists (SC):

SC 01. The ability to conduct health education among the population.

SC 02. Ability to advise on non-prescription and prescription drugs, medical devices and other pharmacy products; pharmaceutical care in the selection and sale of OTC drugs.

SC 03. The ability to provide pre-medical care to patients and victims in extreme situations and in emergency conditions.

SC 04. Ability to ensure the rational use of non-prescription and prescription drugs, medical devices and other goods in the pharmacy range.

SC 05. Ability to monitor the effectiveness and safety of drug use by the population.

SC 06. The ability to determine drugs, xenobiotics, toxins and their metabolites in biological fluids and tissues of the body, to conduct chemical and toxicological studies in order to diagnose acute poisoning, drug and alcohol intoxication.

**Program learning outcomes (PLO):**

PLO 02. Apply knowledge from general and specialized disciplines in professional activity.

PLO 03. To comply with the norms of the sanitary and hygienic regime and the requirements of safety equipment when carrying out professional activities.

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

PLO 15. Provide pre-medical assistance to patients in emergency situations and victims in extreme situations.

PLO 16. Determine the influence of factors that affect the processes of absorption, distribution, deposition, metabolism and excretion of the medicinal product and are determined by the condition, features of the human body and the physico-chemical properties of medicinal products.

**Expected learning outcomes. As a result of studying the academic discipline, the student must:**

**know:**

- nomenclature and modern classifications of medicines,
- the main ways of pharmacological correction of dysfunctions of organs and systems,
- manifestations of possible side effects,
- symptoms of overdose,
- measures to prevent blamenennyu and help to eliminate unwanted reactions;
- modern approaches and methods for the implementation of interdisciplinary research, the theory of the knowledge process and the technology of the pedagogical process;
- modern achievements in the direction of scientific research

**be able to:**

- justify an adequate dosage form in accordance with the routes of drug administration;
- to predict the consequences of the interaction of drugs with their combined administration, drugs and food components, drugs and alcohol;
  - search for information on the safe use of drugs in modern reference books, scientific and professional periodicals;
  - provide comparative characteristics of medicinal products in terms of safety indicators
  - analyze data on educational and special literature when solving professional problems associated with forensic toxicological analysis
    - to propose methods for the isolation and analysis of toxicants, based on their nature, nature and condition of the object of research
    - demonstrate the release of toxicants and their metabolites from objects of biological origin (isolation, purification, concentration)
      - to demonstrate the identification and quantification of isolated toxicants using chemical, biochemical and physicochemical research methods
      - evaluate the results obtained taking into account the circumstances of the case: toxicokinetics, storage in the troupe, medical measures for detoxification, age, sex and other factors
      - document the results of forensic toxicological studies (keeping a working journal, writing a forensic toxicological study report). own:
        - a complex of knowledge on toxicokinetics and toxicodynamics of potent medicinal substances

**possess**

- Conduct research in accordance with the selected toxicological methods;
- Interpret the results of the obtained modern research methods;
- Conduct a critical analysis of pharmacological, toxicological, biochemical, morphological data;

- Use modern advances in science and technology when conducting a diagnostic search and defining the goals and objectives of scientific research;
- Develop research design; be able to choose research methods that are adequate to the set goals and objectives;

Receive and interpret new scientific facts that expand the scope of knowledge in the problem under study

### 3. The content of the work program

#### PART 1. General toxicological toxicology (toxicological alphabet)

Subject, goals and objectives of the toxicological toxicology. The concept of the basic terms of drug toxicology. Causes of different sensitivities of an organism to a toxicant. The value of physicochemical properties of drugs for their toxicity. Classification of drugs for their toxic effects. Toxicometry Toxicokinetics. Mechanisms of toxic action of drugs. General principles of diagnosis of poisoning. Principles of detoxification of an organism at poisoning. Antidotes

#### PART 2. Private drug toxicology

##### 2.1. Medications affecting the central nervous system.

Opioid (narcotic) analgesics. Neopioid (non-narcotic) analgesics. Nonsteroidal anti-inflammatory drugs Sumatriptan. Psychomimetics. Antipsychotic drugs (neuroleptics). Anxiolytics (tranquilizers). Hypnosis (hypnotics). Anticonvulsants (anticonvulsants). Antiparkinsonian remedies. Sedation agents. Psychostimulants Antidepressants Analeptics Nootropic drugs. Adaptogens

##### 2.2. Medicinal products that affect the peripheral nervous system

Antimicrobials. Preparations of mediator action. Baclofen

##### 2.3. Drugs that affect the metabolism.

Drugs with pituitary hormones activity. Pituitary hormones secretion inhibitors. Preparations with activity of pancreatic hormones. Synthetic oral hypoglycemic agents. Drugs with the activity of thyroid hormones. Drugs with activity of adrenal cortex hormones. Vitamin Products.

##### 2.4. Drugs that Affect the Blood

Drugs that reduce blood coagulation. Drugs that increase blood coagulation. Drugs affecting erythropoiesis. Drugs affecting the cardiovascular system. Heart glycosides. Antiarrhythmic drugs. Antianginal drugs. Antihypertensive drugs. Diuretics Preparations for the treatment of atherosclerosis. Drugs that affect the cerebral blood flow.

##### 2.5. Chemotherapeutic agents

Beta-lactam antibiotics. Tetracycline and macrolides. Aminoglycosides Antibiotics of different groups. Fluoroquinolones. Sulphanilamide preparations. Anti-TB drugs. Preparations for the treatment of helminthiasis. Antifungal drugs. Antiviral drugs. Antimalarials. Anti-psychoactive drugs. Antiseptics and disinfectants.

##### 2.6. Drugs of other groups.

Antiblast preparations. Antihistamines Medicinal allergy. Ciclosporin. Iron preparations. Preparations of heavy metals. Arsenic preparations.

2.7. Symptomatic treatment of poisoning in children and possible complications of detoxification therapy.

### 4. The structure of the discipline

| Topic  | Number of hours |           |           |          |     |
|--|-----------------|-----------|-----------|----------|-----|
|  | That's all      | Including |           |          |     |
|  |                 | lectures  | practical | seminars | IWS |
| Topic 1. General medicinal toxicology (toxicological alphabet) | 6               | 0         | 0         | 0        | 6   |
| Topic 2. Private medical toxicology                            | 8               | 0         | 4         | 0        | 4   |
| Topic 3. Medicines affecting the central nervous system        | 10              | 0         | 2         | 0        | 8   |
| Topic 4. Medicines affecting the peripheral                    | 26              | 0         | 22        | 0        | 4   |

|   |    |   |    |   |    |
|---|----|---|----|---|----|
| nervous system  |    |   |    |   |    |
| Topic 5. Drugs affecting metabolism   | 8  | 0 | 4  | 0 | 4  |
| Topic 6. Drugs affecting the blood  | 4  | 0 | 0  | 0 | 4  |
| Topic 7. Chemotherapeutic agents  | 4  | 0 | 0  | 0 | 4  |
| Topic 8. Drugs of other groups.   | 16 | 0 | 0  | 0 | 16 |
| Topic 9. Symptomatic treatment of poisoning in children and possible complications of detoxification therapy. | 10 | 0 | 0  | 0 | 10 |
| Hours in general:   | 90 | 0 | 30 | 0 | 60 |

## 5. Topics of lectures / seminars / practical / laboratory classes

### 5.1 Thematic plan of lectures

Lectures classes are not provided

### 5.2. Topics of practical classes

| <b>№</b><br><b>п/п</b> | <b>Title of the topic</b>  | <b>Number</b><br><b>of hours</b> |
|------------------------|--|----------------------------------|
| <b>1</b>               | <b>2</b>   | <b>3</b>                         |
| 1.                     | Toxicological characteristics of narcotic and non-narcotic analgesics, non-steroidal anti-inflammatory drugs and CNS inhibitors  | 4                                |
| 2                      | Toxicological characteristics of CNS depressants and anesthetics   | 2                                |
| 3                      | Toxicological characteristics of antihistamines and drugs for the treatment of allergies   | 2                                |
| 4                      | Chemical and toxicological analysis of medicinal substances - barbituric and salicylic acid derivatives, pyrazolone5, alkaloids (purine derivatives)   | 2                                |
| 5                      | General scheme of chemical and toxicological analysis of alkaloids   | 2                                |
| 6                      | Chemical and toxicological analysis of alkaloids of pyridine, piperidine and tropane derivatives   | 2                                |
| 7                      | Chemical and toxicological analysis of opiates and opioids   | 2                                |
| 8                      | Chemical and toxicological analysis of quinoline and indole derivatives alkaloids  | 2                                |
| 9                      | Chemical and toxicological analysis of alkaloids of phenylalkylamine derivatives and hallucinogens of various chemical groups  | 2                                |
| 10                     | Chemical and toxicological analysis of medicinal substances of 1,4-benzodiazepine derivatives  | 4                                |
| 11                     | Chemical and toxicological analysis of medicinal substances of phenothiazine derivatives and n-aminobenzoic acid   | 2                                |
| 12                     | Chemical and toxicological analysis of distillates for alcohols, phenol, acetone and acetic acid. use of the GRK method in the chemical and toxicological analysis of volatile substances Final lesson | 4                                |
|                        | total:   | <b>30</b>                        |

### 5.3. Topics of seminars classes

Seminars classes are not provided.

### 5.4. Topics of laboratory classes

Laboratory classes are not provided.

### 6. Independent work

| №<br>п/п | Title and contents  | Number<br>of hours |
|----------|---|--------------------|
| 1        | Subject, sections and tasks of toxicology and medicinal toxicology. Definition of basic concepts and terms. Modern approaches to the assessment of toxic properties of new drugs. General patterns of toxicokinetics of medicinal substances. Toxicodynamics of drugs and general principles of diagnosis and treatment of drug poisoning | 6                  |
| 2        | Toxicological value of narcotic and non-narcotic analgesics. Nonsteroidal anti-inflammatory drugs (NSAIDs).   | 4                  |
| 3        | Toxicological significance of psychotropic drugs (hypnotics, neuroleptics, tranquilizers, TCA, CNS stimulants).   | 4                  |
| 4        | Toxicological value of P-adrenoblockers and other anti-hypertensive agents.   | 4                  |
| 5        | Toxicological characteristics of local anesthetic agents  | 4                  |
| 6        | Toxicological characteristics of vitamin medicines.   | 4                  |
| 7        | Toxicological characteristics of drugs that affect the blood.   | 4                  |
| 8        | Toxicological characteristics of chemotherapeutic agents: antibiotics, sulfonamide drugs, antituberculosis agents.  | 4                  |
| 9        | Toxicological characteristics of antifungal drugs.  | 4                  |
| 10       | Toxicological characteristics of antihelminthic antimycotic drugs.  | 4                  |
| 11       | Toxicological characteristics of antiviral and antimalarial drugs.  | 4                  |
| 12       | Toxicological characteristics of antiarrhythmic drugs   | 4                  |
| 13       | Symptomatic treatment of poisoning in children and possible complications of detoxification therapy   | 10                 |
|          | Total:  | <b>60</b>          |

### 7. Teaching methods

**Practical exercises:** conversation, solving situational problems, preparing and presenting reports, performing tasks in an album.

**Independent work:** independent work with a textbook, independent work with an album.

### 10. Methods of control and criteria for assessing learning outcomes

**Current control:** oral questioning, testing, assessment of the implementation of theoretical skills, solving situational problems, assessing activity in the classroom.

**Final control:** credit.

Evaluation of the current educational activity in a practical session:

1. Evaluation of theoretical knowledge on the subject of the lesson:

- methods: survey, solving a situational problem

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

2. Evaluation of practical skills and manipulations on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

3. Evaluation of practical work on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

The grade for one practical session is the arithmetic average of all components and can only have a whole value (5, 4, 3, 2), which is rounded according to the statistical method.

### Current evaluation criteria in practical training

| Rating                  | Evaluation criteria  |
|-------------------------|--|
| Perfectly<br>"5"        | The applicant is fluent in the material, takes an active part in discussing and solving the situational problem, confidently demonstrates practical skills during work, expresses his opinion on the subject of the lesson, demonstrates an individual approach to setting and solving the algorithm of problems.  |
| Fine<br>"4"             | The applicant has a good command of the material, participates in the discussion and solution of the situational problem, demonstrates practical skills during work, expresses his opinion on the subject of the lesson, demonstrates an individual approach to the formulation and solution of the algorithm of problems  |
| Satisfactorily<br>"3"   | The applicant does not have sufficient knowledge of the material, is unsure of participating in the discussion and solution of the situational problem, demonstrates practical skills during work, expresses his opinion on the subject of the lesson, demonstrates an individual approach to the formulation and solution of the algorithm of problems with significant errors. |
| Unsatisfactorily<br>"2" | The acquirer does not possess the material, does not participate in the discussion and solution of the situational problem, does not demonstrate practical skills during work.   |

The grade for the discipline consists of 100.0% of the grade for the current academic performance.

### 9. Distribution of points received by students of higher education

The average score for the discipline is translated into a national score and converted into points on a multi-point scale (200-point scale).

The conversion of a traditional grade into a 200-point grade is performed by the information and technical department of the University using the "Contingent" program according to the formula:

$$\text{Average success score (current success in the discipline)} \times 40$$

#### Table of conversion of traditional assessment to multi-point assessment

| National assessment for discipline | The sum of points for the discipline |
|------------------------------------|--------------------------------------|
| Excellent ("5")                    | 185 – 200                            |
| Good ("4")                         | 151 – 184                            |
| Satisfactory ("3")                 | 120 – 150                            |
| Unsatisfactory ("2")               | Lower 120                            |

Discipline scores are independently converted to both the ECTS scale and the four-point scale. ECTS scores on a 4-point scale are NOT converted and vice versa. Further accounts are carried out by the Information and Computing Center of the University.

#### Conversion of traditional discipline grade and ECTS scores

| Оценка ECTS | Statistical indicator    |
|-------------|--------------------------|
| «A»         | Top 10% of students      |
| «B»         | The next 25% of students |
| «C»         | The next 30% of students |
| «D»         | The next 25% of students |
| «E»         | The last 10% of students |



An assessment on the ECTS scale is given by the educational unit of ONMedU or the dean's office after ranking the grades in the discipline among students who study in the same course and in one specialty. The ranking of students - citizens of foreign countries is recommended by the decision of the Academic Council to be carried out in one array

### 10. Methodological provision of discipline:

Working program of the academic discipline

- Syllabus
- Multimedia presentations
- Methodical developments for practical classes
- Methodical recommendations for independent work of higher education applicants

#### List of didactic teaching aids

| №<br>п/п | List of technical and teaching equipment (DZH), educational equipment | Notes |
|----------|---|-------|
| 1.       | Multimedia projector  |       |
| 2.       | Presentations of lectures (on electronic media)                       |       |
| 3.       | Thematic collections of medicinal products on the basis of LRS        |       |
| 4.       | Microscope  |       |
| 5.       | Petri Cup   |       |
| 6.       | Techno-chemical scales, equilibrium                                   |       |
| 7.       | Test tubes  |       |
| 8.       | Electric stove  |       |
| 9.       | Flasks are different  |       |
| 10.      | Cylinders are different   |       |
| 11.      | Stomachs with pistachios  |       |
| 12.      | Tweezers  |       |
| 13.      | Tripods   |       |
| 14.      | Bottles for solutions   |       |
| 15.      | Chemical Reagents   |       |

#### 11. List of questions to set off:

1. Subject and tasks of medical toxicology. Aims of Drug Toxicology.
2. Ways of receipt of medicinal substances to the human body. Features of the action of drugs.
3. Toxicodynamics and toxicokinetics of medicinal substances. The notion of a toxic process. Types of drugs on the body.
4. Influence of physical and chemical properties of medicinal substances on their therapeutic effect.
5. Alkaloid opium. Features of action and application in medicine.
6. Morphine Toxicodynamics and toxicokinetics. Application and side effects.
7. Opiates and Opioids. Features of pharmacological action. Side effects.
8. Acute and chronic morphine poisoning. Take care
9. Toxicological aspects of some drugs for anesthesia (phencyclidine and ketamine). Toxicodynamics and toxicokinetics.
10. Toxicological characteristics of non-steroidal anti-inflammatory drugs. Methods of treating acute poisoning with these drugs.
11. Toxicological characteristics of glucocorticosteroids.
12. Sleeping facilities. Toxicodynamics and toxicokinetics.
13. Barbiturates. Toxicological characteristics and first-aid measures for acute and chronic poisoning.

14. Zopiclone Toxicological characteristic. Treatment of acute poisoning with the indicated preparation.
15. Sedation. Features of toxicodynamics and toxicokinetics.
16. Neuroleptic drugs. Features of toxicodynamics and toxicokinetics of derivatives of phenothiazine. First-aid measures for poisoning.
17. Toxicological characteristics of tranquilizers. Toxicodynamics and toxicokinetics of benzodiazepine derivatives. Specific antidote therapy in poisoning.
18. Antiepileptic drugs. Toxicological characteristic of carbamazepine. Toxicodynamics and toxicokinetics.
19. Antidepressants. Classification (TCA, MAO inhibitors, SIZZS). Toxicological characteristic.
20. Psychostimulants (amphetamines, caffeine). Toxic effects, clinical manifestations of acute poisoning and their treatment
21. Toxicological characteristics of antihypertensive agents (adrenomimetics, sympatholytics,  $\beta$ -adrenergic blockers). Treatment of poisoning with antihypertensive drugs. Antidote therapy with clonidine poisoning.
22. Heart glycosides. Toxic effect of cardiac glycosides. Cardiac and extracardiac disorders. Treatment of poisoning with cardiac glycosides. Factors that increase the toxicity of these drugs.
23. Chemotherapeutic agents. Macrolides. Features of toxicodynamics and toxicokinetics.
24. Toxicological characteristic of sulfanilamide preparations and their classification. The mechanism and spectrum of antimicrobial action.
25. Penicillin. Toxicological characteristic of drugs. Treatment of complications of therapy with penicillins.
26. Toxicological characteristics of tetracyclines. Mechanism of action and side effects.
27. Toxicological profile of cephalosporins. Mechanism of action and side effects.
28. Toxicological characteristic of macrolides. Mechanism of action and side effects.
29. Anti-tuberculosis drugs and their classification. Toxicodynamics and toxicokinetics of antituberculosis drugs.
30. Toxicological characteristics of antiblast preparations. Treatment of complications of anti-blast therapy.
31. Local anesthetics. Features of toxicodynamics and toxicokinetics of local anesthetics.
32. Toxicological characteristics of cocaine. Clinical picture and treatment of poisoning.

## 12. LITERARY SOURCES

### Basic

1. Poisoning and Drug Overdose, Seventh Edition (Poisoning & Drug Overdose) / Kent Olson, Ilene Anderson, Neal Benowitz, Paul Blanc, Richard Clark, Thomas Kearney, Susan Kim-Katz, Alan Wu - :Mcgraw-Hill Education. Medical, 2017. - 960 p
2. Analytical toxicology: teach. manual for college students. teach shut up / S.V. Baurka [and others] - Kharkiv: NFaU: Golden Pages, 2017. - 384 p.
3. Drug toxicology / ed. prof. SM Drogovoz, prof. V. D. Lukianchuk, prof. B. S. Sheiman. - X.: Title, 2015. - 592 p.
4. Lectures on drug toxicology / SM Drogovoz, [and others] - X. NFaU, 2012. - 56 p.
5. Medical toxicology of drug abuse : synthesized chemicals and psychoactive plants / Donald G. Barceloux, John Wiley & Sons, Inc., Hoboken, New Jersey. – 2012. – 1068 p.
6. Ali Said Faqi, A comprehensive guide to toxicology in nonclinical drug development second edition, - Elsevier Inc. All rights reserved. – 2017. – 988 p.
7. Toxicology Studies: Cells, Drugs and Environment / Ana Cristina Andrezza, Gustavo Scola. - AvE4EvA MuViMix Records. – 2015. – 236 p.

### Additional

1. Clark's analysis of drugs and poisons in pharmaceuticals, body fluids and postmortem material / A. C. Moffat, [et al.]. – 4-th ed. – London ; Chicago : Pharmaceutical Press, 2011.– 2736 p.
2. Baselt, C. R. Disposition of Toxic Drugs and Chemicals in Man / C. R. Baselt. – 9-th ed. – Seal Beach Calif. : Biomedical Publications, 2011. – 1900 p.
3. Toxicological Chemistry. Laboratory workbook / S. A. Karpushina, I. A. Zhuravel, V. S. Bondar, S. V. Bayurka // Kharkiv: NphU, 2012. – 63 p.
4. Toxicological chemistry. Lecture course / Karpushina S.A., Bondar V.S., Zhuravel I.O. // Kharkiv : NUPh : Golden Pages, 2011.– 208 с.
5. Аналітична токсикологія : навч. посіб. для студентів вищ. навч. закл. / С. В. Баюрка [та ін] – Харків : НФаУ : Золоті сторінки, 2017. – 384 с.
6. Frederick T. Drug-Induced Ocular Side Effects / SAUNDERS an imprint of Elsevier Inc. – 2015. – 425 p.
7. Gabrielle M. Hawksworth, Current concepts in drug metabolism and toxicology / Elsevier Inc. All rights reserved. – 2012. – 286 p.

### 13. Electronic information resources

- 1 State Register of Medicines. [Electronic resource]. - Access mode: <http://www.drlz.com.ua/>
2. State form of medicines. [Electronic resource]. - Access mode: <http://www.dec.gov.ua/index.php/ua/informatsijno-poshukova-sistema-elektronnij-formulyar>
3. International Society of Pharmacovigilance. Available at: <https://isoponline.org/>
4. Uppsala Monitoring Center. Available at: <https://www.who-umc.org/blog>
- 5 Website of the department <https://info.odmu.edu.ua/chair/pharmacognosy/files>