



**MINISTRY OF HEALTH OF UKRAINE
NATIONAL UNIVERSITY OF PHARMACY
Department Clinical Laboratory Diagnostics**

LABORATORY DIAGNOSTICS

**WORK PROGRAM
of educational component**

training for _____ Master _____

field of knowledge _____ 22 Healthcare _____

in specialty _____ 226 Pharmacy, industrial pharmacy _____

of educational program _____ Pharmacy _____

specialization _____ Pharmacy _____

Kharkiv-2022

The work program of the educational component **Laboratory Diagnostics** in specialty **226 Pharmacy, industrial pharmacy** of educational program **Pharmacy** in specialization(s) **Pharmacy** for applicants for higher education **3** year of study.

EDUCATIONAL COURSE TEAM:

Dolzhykova O.V. – associate of professor of IHE of Department Clinical Laboratory Diagnostics, D. of Phar. S., PhD, associate of professor

Work program has been considered and approved at the Department meeting of the Department Clinical Laboratory Diagnostics

Record from «07» September 2022 No. 1

Head of the Department _____



Prof. Rymma YEROMENKO

Work program has been approved at the meeting of the Methodical Commission of Biomedical Sciences

Record from «12» September 2022 No. 1

Head of Specialized Committee _____



Prof. Nadiia KONONENKO

1. 1. Description of the educational component

Language of study: English

Status of the educational component: selective

Prerequisites for studying the educational component: medical biology, pharmacology, medical and biological physics, medical chemistry, biological and bioorganic chemistry, morphological disciplines, human anatomy and physiology, microbiology, therapy and integrates with these disciplines.

The subject of educational component study «**Laboratory Diagnostics**» is studying of the indexes of the blood, urine, digestive system in the norm and during diseases, changing of indexes of the blood, urine, digestive system under influencing of drugs.

Information content of the educational component. 3 ECTS credit 90 hours are assigned to the study of the educational component.

2. Objectives and tasks of the educational component

The purpose of teaching the educational component «Laboratory Diagnostics» is introduce in to the knowledge about systemic normal laboratory parameters and their changes due to pathology; learn the basic principles of technology information search about laboratory medicine in professional journals and to use it in practice, provide a knowledge about the occurrence and development of typical pathological processes; give systematic knowledge about the influence of drugs on laboratory parameters; create a base that defines professional competence and general erudition of pharmacist.

The main tasks of the educational component «**Laboratory Diagnostics**» is to familiarize students with the principles of organization and operation of laboratory and diagnostic facilities of different types; to provide a knowledge about the rationale of laboratory diagnosis, which will be required in the professional competence and general erudition a pharmacist; assess the facts in evidence in laboratory parameters in scientific publications.

3. Competence and planned educational outcomes

Educational component «**Laboratory Diagnostics**» ensures the acquisition of applicants for higher education the following **competences**:

CG 11. Ability to evaluate and ensure the quality of performed works.

CG 12. Ability to conduct research at the appropriate level.

PC 5. The ability to monitor the effectiveness and safety of the use of medicinal products by the population according to the data on their clinical and pharmaceutical characteristics, as well as taking into account subjective signs and objective clinical, laboratory and instrumental criteria for the examination of the patient.

Integrative final program learning outcomes (PLO), the formation of which is facilitated by the educational component:

PLO 4. Demonstrate the ability to independently search, analyze and synthesize information from various sources and use these results to solve typical and complex specialized tasks of professional activity.

PLO 17. To use the data of clinical, laboratory and instrumental studies to monitor the effectiveness and safety of the use of medicinal products.

As a result of studying the educational component, the applicant for higher education will be

know:

- the composition and function of blood, urine, feces, sputum, gastrointestinal contents;
- principles of exploitation and rules of the main types of instrumentation, analyzers, and other equipment, which are used in clinical laboratories for laboratory research;
- the terminology of laboratory diagnostics.

be able to:

- assess the information content of biological material for research in laboratories;
- interpret the results of laboratory tests of blood, urine, feces, sputum, gastrointestinal contents;
- interpret erythrocytic parameters of clinical blood to detect anemic syndrome;
- interpret laboratory parameters of clinical blood to detect the inflammation;
- to characterize the factors that may influence the biomaterial;
- distinguish the typical changes in the results of clinical and laboratory studies of blood, urine, feces, sputum, gastrointestinal contents under the influence of various drugs.

possess:

- technologies of microscopy, photoelectric calorimetry, spectrophotometry, chromatography, gas chromatography, atomic absorption, polarography, inversion voltammetry, etc.
- methods of conducting medical documentation.

4. The educational component structure

Names of content modules and topics	The amount of hours					
	full time study					
	the whole amount	including				
		lect.	sem.	pract.	lab.	self-study
Content module 1. Introduction into laboratory diagnostics. Laboratory research methods of blood, urine. The influence of drugs on laboratory parameters.						
Topic 1. The organization workplace for laboratory conduct research of blood. The composition and functions of blood. Erythrocytopoiesis, morphology of red blood cells, white blood cells, neutrophils, platelets. Determination of blood groups.	8	1	-	2	-	5
Topic 2. The main clinical parameters of the blood system. The diagnostic value of parameters of the blood system. Laboratory indexes. Differential diagnosis. Side effects of medications that affect the blood system. Drugs and pathology of blood.	8	1	-	2	-	5
Topic 3. The research of physical and chemical properties of urine. Methods of diagnostics.	8	1	-	2	-	5
Topic 4. The changes of urine indicators due to infectious and inflammatory process and kidney disease. Side effects of drugs that affect the function of the urinary system. Drugs and pathology of the urinary system.	8	1	-	2	-	5
<i>Thematic Module Control.</i>	9	-	-	4	-	5
The whole amount of hours for the content module 1	41	4	-	12	-	25
Content module 2. Laboratory research methods of a sputum. Methods of investigation of a gastrointestinal tract. The influence of drugs on laboratory parameters.						
Topic 5. Determination of physical properties of sputum. Side effects of drugs that affect the function of the respiratory system. Medicines that cause destruction of the respiratory system.	8	1	-	2	-	5
Topic 6. Clinical and laboratory study of the gastrointestinal tract. General information about the structure and function of the gastrointestinal tract. Chemical research of secretory function of the stomach.	8	1	-	2	-	5
Topic 7. Clinical and laboratory study of the gastrointestinal tract. General information about the duodenal contents. Physical properties of bile.	8	1	-	2	-	5
Topic 8. Macroscopic examination of feces. Microscopic examination of feces. Chemical examination of feces. Coprogram feces in various states of the digestive system..	7.5	0.5	-	2	-	5
<i>Thematic Module Control</i>	7	-	-	2	-	5
Topic 9. Side effects of drugs that affect the function of the digestive system. Drugs and pathology of the gastrointestinal tract.	5.5	0.5	-	-	-	5
The whole amount of hours for the content module 2	44	4	-	10	-	30

Semester credit from module 1	5	-	-	2	-	3
<i>The whole amount of hours for the course</i>	90	8	-	24	-	58

5. Contents of the educational component

Content module 1. Introduction into laboratory diagnostics. Laboratory research methods of blood, urine. The influence of drugs on laboratory parameters.

Topic 1. The organization workplace for laboratory conduct research of blood. The composition and functions of blood. Erythrocytopoiesis, morphology of red blood cells, white blood cells, neutrophils, platelets. Determination of blood groups. Rules blood sampling for general clinical analysis. The method of determining the number of erythrocytes, concentration of hemoglobin, color index, leukocyte formula, erythrocyte sedimentation rate. Technology puncture the skin of a finger. Scheme of blood maturation. Embryonic and postembryonic hematopoiesis. Leukocytopoiesis. Age-related changes in blood composition. The functions of leukocytes. Quantitative changes of white blood cells, leukocytosis and leukopenia. Leukemoid reaction. Neutrocytosis. Neutropenia. Neutrophilic shift of leukogramme. Trombosytopoiesis.

Topic 2. The anemia classification. Laboratory indexes. Differential diagnosis. Side effects of medications that affect the blood system. Drugs and pathology of blood. Etiology, pathogenesis. Clinical manifestations. Characteristics. Laboratory indexes. Differential diagnosis. Basic mechanisms of drug-induced anemia. Drugs used to stimulate erythropoiesis. Purpose iron preparations. Vitamin B₁₂ and folic acid. Drugs that often cause inhibition of leucopoiesis. Medications recommended to stimulate leucopoiesis. Medications which often inhibit platelet function. Anticoagulants, antiplatelet agents, fibrinolytics. Hemostatic drugs. Adverse hematologic effects different groups of drugs.

Topic 3. The research of physical and chemical properties of urine. Methods of diagnostics. Number, color, clarity, smell, relative density. The physical properties of urine in norm and changes it due to pathology. Proteinuria, glucosuria, bilirubinemia, causes and types. Microscopic examination of urine sediment. Quantitative methods urine sediment. Organized urine sediment elements: red blood cells, white blood cells, the epithelium, cylinders. The rules and terms of collecting urine, sequence of studies, interpretation of results. Elements unorganized sediment urine: acidic, alkaline, abnormal urine. Method of Nechyporenko.

Topic 4. The changes of urine indicators due to infectious and inflammatory process and kidney disease. Side effects of drugs that affect the function of the urinary system. Drugs and pathology of the urinary system. Infectious-inflammatory processes in the bladder, urethra, prostate gland. Diagnostic value methods. Pyelonephritis, glomerulonephritis, acute renal failure, urolithiasis. Diagnostic value, methods of investigations. Basic mechanisms of nephrotoxicity drugs. Nephrotoxicity of some drugs. The principles prevent of nephrotoxicity drugs.

Content module 2. Methods of investigation of sputum and gastrointestinal tract. The influence of drugs on laboratory parameters.

Topic 5. Determination of physical properties of sputum. Side effects of drugs that affect the function of the respiratory system. Medicines that cause destruction of the respiratory system. Number, color, odor, texture, stickiness, foam. Microscopic examination of sputum. Epithelium, leukocytes, erythrocytes, formation of fibrous crystals, foreign bodies. Bacterioscopic sputum. Koch bacillus, fungi, protozoa, helminthes. Changes of sputum due to various diseases. Bronchitis, asthma, bronchiectasis, pneumonia, lung abscess, echinococcosis, tuberculosis. Diagnostic value methods. Medicines that stimulate respiration, antitussives, expectorants. Classification. Comparative characteristics of preparations. The most commonly expected adverse effects of drugs. Combined use of expectorant and antitussive agents. Side effects of drugs that affect the function of the respiratory system that affect the function of the respiratory

system. Medicines that cause destruction of the respiratory system. Medications used to treat asthma.

Theme 6. Clinical and laboratory study of the gastrointestinal tract. General information about the structure and function of the gastrointestinal tract. Chemical research of secretory function of the stomach. Volume, color, odor, slime. Physical secretory function of the stomach. Characteristics. Methods of examination (probe, nonprobe). Research of stomach acidity: determination of acidity due to using pH measuring. Diagnostic significance of debit and deficit hydrochloric acid, basal and maximum secretion of alkaline component secretion. Enzymatic activity of the stomach.

Theme 7. Clinical and laboratory study of the gastrointestinal tract. General information about the duodenal contents. Physical properties of bile. Quantity (volume), color, clarity, consistency, response, relative density. Microscopic examination of bile: elements of inflammatory origin, crystal formation; parasites and bacteria. Diagnostic significance of biochemical research of bile. Changes of duodenal contents due to diseases of the biliary tract. Dyskinesia, inflammation, cholelithiasis. Diagnostic meaning methods.

Topic 8. Macroscopic examination of feces. Microscopic examination of feces. Chemical examination of feces. Coprogram feces in various states of the digestive system. Number, color, texture, smell, shape, reaction remains undigested food, mucus, blood, worms, concernments. Elements of the mucous membrane of the intestines, food, crystals microflora. Diagnostic value of determination blood, protein, mucin and stercobilin. At normal digestion, lack of digestion in the stomach, pancreatic insufficiency, block of bile, insufficiency digestion in the small and large intestine. Features of stool in children.

Topic 9. Side effects of drugs that affect the function of the digestive system. Drugs and pathology of the gastrointestinal tract. Stimulants of gastric secretion. Inhibitors of gastric secretion. Recommendations Maastricht Conference (2010) on the eradication of *Helicobacter pylori*. Medicines, which influence on the activity of microsomal liver enzymes. Hepatotoxic drugs. Hepatotoxic medicines. Medicines of hepatoprotective effect that influence on the production of bile flow and its composition.

Semester module supervision 1.

6. Lecture Topics

No.	Name of topic	The amount of hours
		full time study
1	Phases of Laboratory Diagnostics. Clinical blood tests. General information about the blood. The main clinical parameters of the blood system.	1
2	Clinical blood tests. Medicines and pathology of blood. Side hematologic effects of various groups of drugs.	1
3	Clinical urinary tests. General information about the urinary system and various diseases. Features of the main indicators of clinical urine analysis depending on the person's age and different physiological states	1
4	Clinical and laboratory diagnostics of kidney disease. Medicines and pathology of the urinary system. Nephrotoxicity of some drugs.	1
5	Clinical and laboratory studies of the respiratory system. Drugs that cause destruction of the respiratory system	1
6	Clinical and laboratory study of the gastrointestinal tract. General information about the structure and function of the gastrointestinal tract.	1
7	Clinical and laboratory study of the gastrointestinal tract. General information about the duodenal contents.	1
8	Medicines that can cause diarrhea. Antidiarrheal medicines. Anti-helminth drugs.	1

The whole amount of hours	8
----------------------------------	----------

7. Topics of seminars

Topics are not provided for in the working curriculum

8. Topics of practical lessons

No.	Name of topic	The amount of hours
		full time study
1	Clinical researches of the blood system. General information about the blood and the hemopoiesis. The morphology of bone marrow cells.	2
2	The main clinical parameters of the blood system. The diagnostic value of parameters of the blood system.	2
3	Methods of research of urinary system. Physiological features of urine formation in the body. Principles of collecting and investigations of urine.	2
4	The value of general clinical analysis of urine. <i>Final test of CM 1 assimilation</i>	6
5	Research sputum. Collecting of sputum and general properties of specimens. Diagnostic value of sputum in pulmonology.	2
6	Clinical study of gastric contents. Technology obtaining of gastric contents for clinical analysis. The value of general clinical analysis of gastric contents.	2
7	Research of duodenal content. Chemical researches of bile. Microscopic examination of duodenal content.	2
8	Examination of stool. Influence of drugs on laboratory values of GIT. <i>Final test of CM 2 assimilation</i>	4
9	<i>Semester credit of the module 1: "Laboratory diagnostics and influence of drugs on laboratory parameters"</i>	2
The whole amount of hours		24

9. Topics of laboratorial lessons

Topics are not provided in the Plan of the education

10. Self-study work

No.	Name of topic	The amount of hours
		full time study
1	The organization workplace for laboratory conduct research of blood. The composition and functions of blood. Erythrocytopoiesis, morphology of red blood cells, white blood cells, neutrophils, platelets. Determination of blood groups.	5
2	The anemia classification. Laboratory indexes. Differential diagnosis. Side effects of medications that affect the blood system. Drugs and pathology of blood.	5
3	The research of physical and chemical properties of urine.	5
4	The changes of urine indicators due to infectious and inflammatory process and kidney disease. Side effects of drugs that affect the function of the urinary system. Drugs and pathology of the urinary system.	5
5	Determination of physical properties of sputum. Side effects of drugs that affect the function of the respiratory system that affect the function of the	5

	respiratory system. Medicines that cause destruction of the respiratory system.	
6	Physical secretory function of the stomach.	5
7	Side effects of drugs that affect the function of the digestive system. Drugs and pathology of the gastrointestinal tract.	5
8	Macroscopic examination of feces.	5
9	Recommendations Maastricht Conference (2010) on the eradication of <i>Helicobacter pylori</i> .	5
	Preparation for thematic and final module control	13
The whole amount of hours		58

Tasks for Self-study work

11. Criteria and evaluation order of educational outcomes

During the study course "Laboratory diagnostics" all student activities are subject to control as the current (in each session) and final (at the time of control tests).

Modular control is mastering the material diagnostics module. In the module provides for 2 current control learning module.

The theoretical component provides test or survey students on the topic of employment, inspection and evaluation of individual work.

Control of content modules (written control of theoretical knowledge in a colloquium, control of practical skills - determining tissue type and count of blood cells by light microscopy study of some reflexes determine pressure and pulse rights, etc.) Made by the timetable.

Current progress is calculated as the sum of scores of current and content module.

Rating student – a student ordinal position among the students of the course of the basic direction of training, specialty, faculty, which is determined based on its rating points.

Grading Scheme

Routine testing and self-learning work		Sum
Thematic module 1	Thematic module 2	60-100
T №1 – T №4	T №5 – T №9	
30-50	30-50	

Assessment of discipline, culminating exam is defined as the sum of scores for current educational activity (at least 69).

Points are converted regardless of discipline as the ECTS scale and 4-point scale. Score scale ECTS 4-point scale not converted and vice versa.

The number of points in the discipline, which assessed students converted a scale **ECTS** thus:

Mark ECTS	Statistical index
A	Top 10% of students
B	Next 25% of students
C	The next 30% of students
D	Next 25% of students
E	The last 10% of students

The percentage of students determined to voters for the students of the course within the relevant specialty.

Scores of discipline for students who successfully completed the program converted into traditional 4-point scale by absolute criteria listed in the table below.

Total points for the discipline of all educational activities	ECTS	Mark by national scale

From 90 to 100 points	A	perfectly	pass
From 82 to 89 points	B	fine	
From 74 to 81 points	C		
From 64 to 73 points	D		
From 60 to 63 points	E	satisfactorily	
From 35 to 59 points	FX		
From 1 to 34 points	F		
		unsatisfactorily	fail

12. Forms of progress and semester supervision of academic achievements: *Semester credit*

13. Methodological Support

- Workbook "Laboratory diagnostic".
- Tables.
- Visual aids, models, specimens.
- Tests to monitor each topic.
- Computer software testing.
- Training videos.
- Presentations.

14. Reading suggestions

The main reading suggestions

1. Laboratory diagnostics: manual for students of pharmaceutical higher schools and pharmaceutical faculties of medical higher schools of the IV accreditation level / Kryzhna S. I., Lytvynova O. M., Berezhnyakova M. Ye. - Kharkiv: NUPhGolden Pages, 2016. - p.
2. Clinical Research of the Blood System: Методические рекомендации для студентов медицинских и фармацевтических ВУЗов. – X. Изд.во НФаУ, 2012 – 105 с.
3. Notebook “Laboratory diagnostics” / S.I. Kryzhna, M.E. Berezhnyakova, O.N. Litvinova et al. – Kharkiv: NUPh, 2016. – 60 p.

Supplementary reading suggestions

1. Eder. Laboratory Atlas of Anatomy and Physiology, Fourth Edition / Eder, Kaminsky, Bertram; The McGraw-Hill Companies, 2003. – 192 p.
2. Widmaier Eric P. Strang. Human Physiology: The Mechanisms of Body Function: 9th Edition / Eric P. Widmaier, Hershel Raff, Kevin T.; The McGraw-Hill Companies, 2003. – 826 p.3.

15. Electronic resources, including the Internet

1. Clinical laboratory diagnostics. – URL: <https://www.ncbi.nlm.nih.gov/pubmed/>
2. Manual of Laboratory and Diagnostic Tests 7th edition (July 2003): By Frances T Fischbach RN, BSN, MSN By Lippincott Williams & Wilkins Publishers. – URL: <https://murdercube.com/files/Survival/Medical/Labs>
3. Library of Kharkov National University of Pharmacy — <http://www.library@nuph.edu.ua>.
4. Kharkiv State Library of Medicine — <http://www.kh.med.bibc@ukr.net>.
5. Kharkov State Scientific Library. VG Korolenko.
6. Specialized medical and biological internet portals — www.emed.org.ua.
7. PubMed – <https://pubmed.ncbi.nlm.nih.gov>