МИНОБРНАУКИ РОССИИ

Федеральное государственное бюджетное образовательное учреждение высшего образования "Пермский государственный национальный исследовательский университет"

Кафедра фармакологии и фармации

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Рабочая программа дисциплины

TOXICOLOGICAL CHEMISTRY

Код УМК 93073

Утверждено
Протокол №6
от «23» марта 2020 г.

Пермь, 2020

1. Наименование дисциплины

Toxicological chemistry

2. Место дисциплины в структуре образовательной программы

Дисциплина входит в обязательную часть Блока « С.1 » образовательной программы по направлениям подготовки (специальностям):

Специальность: **33.05.01** Фармация

направленность Программа широкого профиля (для иностранных граждан)

3. Планируемые результаты обучения по дисциплине

В результате освоения дисциплины **Toxicological chemistry** у обучающегося должны быть сформированы следующие компетенции:

33.05.01 Фармация (направленность : Программа широкого профиля (для иностранных граждан))

ОПК.5 Способен осуществлять профессиональную деятельность в соответствии с этическими нормами и морально-нравственными принципами фармацевтической этики и деонтологии

Индикаторы

ОПК.5.1 Осуществляет взаимодействие в системе «фармацевтический специалист-посетитель аптечной организации - медицинский специалист» в соответствии с нормами фармацевтической этики и деонтологии

4. Объем и содержание дисциплины

Направления подготовки	33.05.01 Фармация (направленность: Программа широкого профиля (для иностранных граждан))
форма обучения	очная
№№ триместров, выделенных для изучения дисциплины	11
Объем дисциплины (з.е.)	6
Объем дисциплины (ак.час.)	216
Контактная работа с преподавателем (ак.час.), в том числе:	84
Проведение лекционных занятий	14
Проведение практических занятий, семинаров	42
Проведение лабораторных работ, занятий по иностранному языку	28
Самостоятельная работа (ак.час.)	132
Формы текущего контроля	Входное тестирование (1) Итоговое контрольное мероприятие (1) Письменное контрольное мероприятие (2)
Формы промежуточной аттестации	Экзамен (11 триместр)

5. Аннотированное описание содержания разделов и тем дисциплины

Conducting into toxicological chemistry. The main sections of toxicological chemistry. The main directions of chemical toxicological analysis. Organization of forensic medical examination in the Russian Federation.

1. Toxicology and toxicological chemistry. Subject and tasks. Relationship with other disciplines (medical - forensic medicine, clinical toxicology, narcology; medicobiological, pharmaceutical). Toxicological chemistry as a special pharmaceutical discipline. Features Importance in the pharmacist training system. The main sections of toxicological chemistry (analytical toxicology, biochemical toxicology). The main areas of use of chemical-toxicological analysis: forensic chemical examination, analytical diagnosis of acute poisoning and drug addiction.
2. Stages of formation and development of toxicological chemistry. The first chemical schools in Russia and prominent scientists who contributed to the development of toxicological chemistry. Teaching toxicological chemistry at different stages of pharmacy development. Isolation of toxicological chemistry into an independent pharmaceutical discipline. Creation of departments of toxicological chemistry.
3. The organizational structure of the forensic medical examination in the Russian Federation. Decisions and orders related to the organization of forensic, forensic chemical examinations. Legal and methodological foundations of forensic chemical examination. The main documents regulating the work in the field of forensic chemical examination. Decision on the appointment of expertise, accompanying documents. The importance of the data of the inquiry, medical history and the results of the forensic investigation of the corpse for forensic chemical examination. Objects of research (material evidence) - the internal organs of the corpses of people and animals, food products, human excreta, clothing, water, air and other environmental objects. The rules of forensic research in forensic departments of forensic laboratories, the bureau of forensic medical examination of health authorities.
4. The concept of poison. General characteristics of substances that cause poisoning (pharmaceuticals, chemical plant protection products, industrial poisons, household chemicals, poisons of plant and animal origin). Classification of toxic substances.
5. Physico-chemical characteristics of drugs. Application in solving biochemical and analytical toxicology issues, including questions of the interphase distribution of substances at the stages of penetration through the body membranes, extraction of substances from biological objects.

Chemistry of acid-base equilibria. Constants of ionization, dissociation of acids and bases. Acidity constants of weak bases. Ionization indicators. The strength of acids and bases. The effect of solvents. The degree of ionization. PH dependent. Solubility of drugs and drugs. Distribution ratios. Solubility of non-electrolytes. Solubility of ionic compounds. Spectral characteristics of drugs and drugs.

Biochemical toxicology. Toxicokinetics of foreign compounds. General patterns of distribution of substances in the body. Factors affecting distribution. Basic toxicokinetic distribution parameters.

Toxicokinetics of foreign compounds. General patterns of distribution of substances in the body. Factors affecting distribution. Basic toxicokinetic distribution parameters. Binding to serum proteins. Binding to components of organs and tissues. Types of relationships. Dissociation constants of the ligand protein complex. The number of major binding sites. Hugh-Klotz and Scatchard equation. The percentage of binding to serum proteins.

Mathematical models characterizing the course of pharmacokinetic processes. General characteristics of toxic effects.

Dependence of the effect dose. Gaussian curve.

Biotransformation of foreign compounds in the body. Stages and main ways of biotransformation. Factors affecting the metabolism of foreign compounds. Metabolites and toxicity.

Biotransformation of foreign compounds in the body. Stages of biotransformation. The formation of

pharmacologically active metabolites. Inactivation. Metabolism and toxicity. The main ways of biotransformation of foreign compounds. Metabolic transformations catalyzed by microsomal liver enzymes. Aliphatic and aromatic hydroxylation. Epoxidation. N-hydroxylation, N-, S-oxidation. Dealkylation. Deamination. Desulfurization and other microsomal oxidation reactions. Microsomal enzyme reduction reactions. Recovery of nitro compounds, azo compounds. Reductive dehalogenation. Other metabolic transformations. Non-microsomal oxidation. Oxidative deamination. Oxidation of alcohols, aldehydes. Aromatization of alicyclic compounds. Non-microsomal metabolic recovery processes.
Hydrolysis reactions involving microsomal and non-microsomal enzymes. Other transformations. Conjugation Reactions Formation of conjugates with glucuronic acid. Esters with sulfuric and phosphoric acid. Methylation. Acetylation. Peptide conjugation. Other reactions.
Factors affecting the metabolism of foreign compounds. Genetic factors and intraspecific differences. Induction of metabolizing enzymes, inhibition of metabolism. Age features, prolonged use of drugs, pathological conditions and others. Metabolites and toxicity.
The concept of secondary metabolism in microorganisms, plants, animals. The formation of secondary compounds (amines, etc.) in the process of decay of tissues and organs. Metabolism of toxic substances under the influence of bacteria. The main reactions of secondary metabolism (decarboxylation, deamination, aromatic hydroxylation, etc.).
Excretion of foreign compounds and their metabolites. Excretion of toxic compounds through the kidneys. Reabsorption and excretion. Forced diuresis as one of the effective methods of treating patients with acute poisoning in the management of reabsorption processes. Excretion of foreign compounds with bile. Other excretion routes, including specific ones (hair, nails). The influence of the physicochemical properties of toxic substances and environmental factors on the speed and nature of their elimination from the body. Kinetics of excretion. Half-life.
Kinetics of excretion. Half-life.
General characteristics of toxic effects. The formation of the effect as a factor in the interaction of poison, the body and the environment. The concept of toxicity receptors. Selective Toxicity. Toxic doses and toxic concentrations of a substance in the blood. Correlation of the relationship of the level of a substance in the blood with a toxic effect.

Chemical-toxicological analysis (forensic) on a group of substances isolated by extraction and sorption. Medicinal substances. Methods of isolating (isolating) medicinal substances from biological objects.
The value of forensic chemical analysis for the expert opinion of a specialist when working with narcotic and potent drugs.

Methods of isolating medicinal and narcotic substances from biological fluids during chemical-toxicological analysis for diagnostic purposes. Theoretical foundations of sample preparation in the study of biofluids.
Analytical diagnosis of narcotic and other intoxicating substances.
1. Introduction to the problem. Organization of a service for analytical diagnosis of drug addiction, substance abuse. Terminology (drug addiction, substance abuse, narcotic drug, alcohol abuse, psychotropic substances, etc.) Lists of narcotic substances, toxic and potent substances. Epidemiology of alcoholism, drug addiction, substance abuse. Organization of narcological assistance to the population and forms of combating drug addiction. Responsibility for drug-related offenses (Criminal Code, Code of Criminal Procedure, Code of Administrative Violations of the Russian Federation, Civil Code of the Russian Federation, Civil Procedure Code of the Russian Federation, Code of Marriage and Family). Legal measures to ensure the preservation of narcotic drugs (regulatory documents of the Ministry of Health of the Russian Federation and law enforcement agencies). UN Convention 1961, 1971, 1983 Standing Committee on Drug Control under the Ministry of Health of the Russian Federation, its functions and tasks. The main documents regulating the activities of chemical

toxicological laboratories. Objects of study. The tasks of the chemical-toxicological service in the provision of narcological assistance.
2. Features of chemical-toxicological analysis of drugs that cause intoxication. Analysis requirements. The main stages of the analysis. Physico-chemical properties and pharmacokinetics of drugs that cause intoxication. Characterization of biological objects. Sampling and preparation of samples for analysis. The choice of methods. Methods of analysis on the skin and its appendages and secretions. Rapid testing of narcotic and intoxicant substances.
3. Identification of certain groups of narcotic substances (opiates, phenylalkylamines, cannabinoids and other narcotic substances).
Interpretation of the results of the analysis of biological objects on the content of substances that cause intoxication.
New methods of chemical toxicological analysis to solve the problems of analytical diagnosis of narcotic substances on the fact of non-medical use of narcotic drugs and psychotropic substances. Immunochemical methods of analysis.

The basics of conducting directed and general (non-directional) analysis. The use of screening methods for testing for an unknown drug substance (TLC - screening).
General characteristics of analysis methods. Methods of detection and determination of medicinal substances during forensic chemical examination. The limits of detection, specificity. Possibilities of use in chemical toxicological analysis. Importance in the program of integrated use of methods. Processing the results of a qualitative analysis using a specific method. Interpretation of the results of the study.
Chemical methods, their advantages and disadvantages. Types of basic reactions, chemism. Detection limits and specificity of chemical reactions of staining during express tests and in combination with chromatographic methods. Sedimentary reactions. Microcrystalloscopic reactions. Biological methods. Pharmacological tests and their significance in the identification of certain alkaloids.
Chromatographic research methods (methods of thin layer chromatography, high performance liquid chromatography, gas-liquid chromatography).
Spectral methods. Spectrophotometry in the UV and visible regions of the spectrum. Classification of organic compounds by electronic absorption spectra. Sample preparation for research by spectroscopic methods. Fluorescence and phosphorescence. Mass spectrometry. The principles of mass spectrometry. Combination of mass spectrometry with other physicochemical methods. Method capabilities and limitations when used in chemical toxicological analysis.
Directed chemical-toxicological analysis when using thin-layer chromatography as a method of preliminary research. Targeted analysis of substances undergoing intensive metabolism in the body (for example, derivatives of 1.4-benzodiazepine). Reproducibility of qualitative analysis methods as applied to the study of various biological objects (organs, tissues, rotted cadaveric material, biological fluids of patients with acute poisoning of chemical etiology). The influence of various factors on the results of the analysis (the presence of endogenous compounds in biological samples, the processes of putrefactive decomposition of tissues and organs, metabolic transformations of drugs and drugs).
Quantitative analysis. A review of modern physico-chemical methods of analysis used for the quantitative determination of drugs. Spectral methods (direct and differential spectrophotometry using barbituric acid derivatives as examples). Photocolorimetric methods for quantification. Method of extraction photometry. Processing the results of quantitative analysis. Informational content of quantitative analysis data for forensic examination and clinical toxicologists.

Methods for the detection and determination of drugs during forensic chemical examination (barbiturates, phenothiazine derivatives, alkaloids).
Forensic chemical methods for the analysis of compounds, Biological research methods in a model experiment.

Immune methods during forensic examination and analytical diagnosis of acute poisoning and drug addiction.

Enzyme-linked immunosorbent assay in forensic chemical examination. Immunofluorimeter Reader Immunological methods of analysis. Homogeneous and heterogeneous immunoassay. Prospects for the development of immunological methods in relation to the main areas of chemical-toxicological analysis. An integrated approach when using analysis methods. Principles of rational combination of methods.

Checkpoint number 1

Testing the knowledge of the material passed (Biotransformation of toxic substances in the body. Toxicokinetics and toxicodynamics. Basic mathematical models. Immune, chromatographic and spectral methods for conducting forensic chemical analysis and analytical diagnosis of acute poisoning and drug addiction. Examination of alcohol poisoning. Legal acts governing the examination)

Analytical diagnosis of acute poisoning. Providing specialized care to patients with acute poisoning. The role of chemical toxicological analysis in the diagnosis of acute poisoning.

Introduction to clinical toxicology. Content of the subject, tasks and main sections. The prevalence of acute poisoning, the nature and causes. Features of poisoning in childhood. Organization of specialized care for acute poisoning. Diagnosis of acute exogenous poisoning. The main methods of organizing detoxification in acute poisoning. Methods of enhancing natural detoxification pathways. Artificial detoxification methods - intracorporeal methods (peritoneal dialysis, intestinal dialysis, detoxification sorption; extracorporeal methods - hemodialysis, hemosorption, plasma sorption, lymphophoresis and lymphosorption, blood exchange replacement, plasmapheresis). Antidote detoxification.

Chemical and toxicological laboratories of the centers for the treatment of acute poisoning, hospitals. Tasks. The main documents regulating the activities of chemical and toxicological laboratories. Rights and obligations of laboratory assistants in chemical toxicological laboratories.

Features of chemical toxicological analysis in the context of emergency medical care for patients with acute poisoning. Requirements for chemical toxicological analysis. The specifics of the analysis. The choice of analysis methods. Methodology depending on available clinical data. Methods of preliminary and confirmatory analysis. Chromatographic research methods. Thin-layer, gas-liquid and high-performance liquid chromatography. Spectral analysis methods. Immune methods, etc. Integrated use of methods for reliable diagnosis.

Characterization of biological objects. Sampling and preparation of samples for analysis. Liquid-liquid extraction.

Solid-liquid extraction (sorption) on modified polymers and silica gels as the most effective way to concentrate the analyzed compounds from aqueous extracts, biological fluids. Patterns of sorption of medicinal compounds from aqueous media. Characteristics of sorbents. Physicochemical sorption constants. Optimal conditions for sorption and desorption. The effect of the binding of toxic substances to plasma albumin on the efficiency of sorption. Quantification, methods of concentration by solid-phase extraction. Preparation of blood samples for the extraction of toxic substances by sorption. Preparation of urine samples during the extraction of toxic substances by sorption. Automation of the process of solid-liquid extraction. Combination of concentration methods with purification and analysis methods.

Features of the isolation of a number of medicinal substances in the objects of research in the form of glucuronides (for example, morphine). Acid hydrolysis of objects. Optimal conditions for hydrolysis and isolation of analytes.

Isolation of drugs during screening analysis.

Fundamentals of the construction of a directed and general (non-directional) chemical-toxicological analysis. Acquaintance with clinical data, preliminary diagnosis of poisoning. Determination of the range of analytes.

Designing a study plan. Conducting analysis based on the integrated use of methods. Reproducibility of methods as applied to the study of biological fluids (using the example of thin-layer chromatography). Interpretation of the results of the study. Drawing up a conclusion.
Quantitative analysis. Objects of study. The choice of methods. Spectral analysis methods using derivatives of barbituric acid and 1,4-benzodiazepine as an example. The value of the data of the quantitative determination of toxic substances in the blood of patients with acute poisoning for toxicologists.

Features of chemical toxicological analysis during the analytical diagnosis of acute poisoning.
Methods for determination of psychoactive substances in biological fluids (blood-urine). Features of chemical toxicological analysis in the conditions of emergency medical care for patients with acute poisoning. Requirements for chemical toxicological analysis. The specifics of the analysis. The choice of analysis methods. Methodology depending on available clinical data. Methods of preliminary and confirmatory analysis. Chromatographic research methods. Thin-layer, gas-liquid and high-performance liquid chromatography. Spectral analysis methods. Immune methods, etc. Integrated use of methods for reliable diagnosis. Characterization of biological objects. Sampling and preparation of samples for analysis. Liquid-liquid extraction.
Solid-liquid extraction (sorption) on modified polymers and silica gels as the most effective way to concentrate the analyzed compounds from aqueous extracts, biological fluids. Patterns of sorption of medicinal compounds from aqueous media. Characteristics of sorbents. Physicochemical sorption constants. Optimal conditions for sorption and desorption. The effect of the binding of toxic substances to plasma albumin on the efficiency of sorption. Quantification, methods of concentration by solid-phase extraction. Preparation of blood samples for the extraction of toxic substances by sorption. Preparation of urine samples during the extraction of toxic substances by sorption. Automation of the process of solid-liquid extraction. Combination of concentration methods with purification and analysis methods.
Features of the isolation of a number of medicinal substances in the objects of research in the form of glucuronides (for example, morphine). Acid hydrolysis of objects. Optimal conditions for hydrolysis and isolation of analytes.
Isolation of drugs during screening analysis.
Fundamentals of the construction of a directed and general (non-directional) chemical-toxicological analysis. Acquaintance with clinical data, preliminary diagnosis of poisoning. Determination of the range of analytes.
Designing a study plan. Conducting analysis based on the integrated use of methods. Reproducibility of methods as applied to the study of biological fluids (using the example of thin-layer chromatography). Interpretation of the results of the study. Drawing up a conclusion.

Features of chemical-toxicological analysis of drugs that cause intoxication. Stages of analysis. The choice of methods. Preparation of samples for analysis. Identification of certain groups of narcotic substances. Opiates.
The method for determining stupefying drugs. Features chemotoxicological analysis of drugs that cause intoxication. Analysis requirements. The main stages of the analysis. Physico-chemical properties and pharmacokinetics of drugs that cause intoxication. Characterization of biological objects. Sampling and preparation of samples for analysis. The choice of methods. Methods of analysis on the skin and its appendages and secretions. Rapid testing of narcotic and intoxicant substances.
Identification of certain groups of narcotic substances (opiates, phenylalkylamines, cannabinoids and other narcotic substances).
Interpretation of the results of the analysis of biological objects on the content of substances that cause intoxication.
New methods of chemical toxicological analysis to solve the problems of analytical diagnosis of narcotic substances on the fact of non-medical use of narcotic drugs and psychotropic substances. Immunochemical

methods of analysis.

Cannabinoids. Physicochemical properties. Pharmacokinetics and metabolism of cannabinoids. Evidence of cannabinoids in various biological objects.

Features of the forensic chemical examination of cannabinoids. Cannabinoids (cannabidiol, cannabiol, tetrahydrocannabinol, tetrahydrocannabinol acid).
Phenylalkylamines (ephedrine, ephedron, amphetamine, methamphetamine).

Chemical-toxicological analysis (forensic) on a group of substances isolated by extraction with organic solvents.

Methods of forensic chemical analysis of compounds isolated by extraction with organic solvents.

Pesticides General characteristics of the group. Classification. Toxicity. Behavior in the body. Isolation methods from biological objects and other research objects. Clinic of poisoning. Clinical diagnosis. Detoxification methods.

Chemical-toxicological analysis of substances isolated by extraction and sorption. Pesticides
General idea of pesticides, their significance, toxicity. The problem of residual pesticides. Classification of pesticides (in the direction of use, by the nature and mechanism of action, chemical classification). Prevalence and causes of poisoning. Clinic of poisoning and clinical diagnosis. Body detoxification methods.
Isolation of pesticides from biological objects. Methods and methods of purification of extracts, concentration.
General characteristics of modern pesticide analysis methods. Biological research methods and their significance. Thin layer chromatography. General and private chemicals. The method of gas-liquid chromatography using selective detectors (for example, organophosphorus substances). Features of sample preparation. Analysis conditions. The detection limit in the study of blood, peritoneal fluids, wash water (for example, compounds of the FOS group). The specificity of the technique, given the drugs used in detoxification therapy. Elemental analysis, including sample preparation for analysis. Chemical methods of analysis. Microcrystalloscopic analysis. Reproducibility of qualitative analysis methods as applied to the study of various biological objects (organs, tissues, rotted cadaveric material, biological fluids of patients with acute poisoning). Quantitative analysis methods. Correlation of the relationship of the level of a substance in the blood with a toxic effect.
Chemical-toxicological analysis of pesticides, derivatives of phosphoric acid (metaphos), thiophosphoric (trichloromethaphos-3), dithiophosphoric (karbofos), phosphonic (chlorophos) acids. The structure and properties. Toxicity. Toxic concentrations, relationship with toxic effect. Absorption, distribution, metabolism of pesticides. Chemical-toxicological analysis (of native substances and metabolites) using preliminary and confirmatory research methods. Quantitation.
Chemical-toxicological analysis of pesticides of the group of organochlorine derivatives (hexachlorocyclohexane, heptachlor) and carbamic acid derivatives (sevin).
Organic mercury compounds (alkyl mercury salts). Classification. Application. Toxicity. The prevalence of poisoning, causes. Physicochemical properties. Features of toxicokinetics. Objects of study. Isolation of ethyl mercuric chloride from objects of animal and vegetable origin, biological fluids. Qualitative and quantitative analysis (for example, ethyl mercuric chloride). Using modern methods for the analysis of organic mercury compounds.
Chemical toxicological analysis of synthetic pyrethroids.

A group of substances isolated from biological objects by mineralization. Ecology of the environment and the prevalence of poisoning by compounds of heavy metals and arsenic. General characteristics of the group.

Ecology of the environment and the prevalence of poisoning by compounds of heavy metals and arsenic. The

list of "metal poisons" subject to forensic chemical research. Toxicity and physico-chemical properties.
Toxicokinetics. Absorption of heavy metal compounds, distribution, binding mechanism in the body, excretion. Clinic of poisoning, clinical diagnosis.
Isolation of "metal poisons" from biological objects. Objects of study. Rules for the selection and direction of objects for analysis. Transportation and storage conditions. Preservation of objects. Primary preparation. Methods of isolating compounds of heavy metals and arsenic from biological samples (dry ashing, wet ashing, other methods). General and private methods of isolation. The essence of the methods. Advantages and disadvantages. The choice of method and conditions of isolation. The technique of mineralization with concentrated acids. Preparation of mineralization for research.
. Heavy metal analysis methods. Fractional analysis method. The essence of the method. Features Principles and methods for the separation of metal ions (liquid-liquid extraction of metal chelates, ionic associates, precipitation reactions, complexation, etc.). Organic reagents in fractional analysis method. Characterization of reagents, reaction conditions, chemistry. The methodology of the fractional method of metal analysis. Complex use of chemical and microcrystalline reactions. Fractional analysis for individual ions. Quantitation.
Modern methods for the separation and determination of metal ions. The use of atomic absorption spectroscopy and other spectral methods in the determination of "metal poisons."
Interpretation of the results of chemical toxicological analysis taking into account the natural content of metals in the body.

Methods of isolating compounds of heavy metals and arsenic from biological objects. Fractional analysis method of "metals". Features Principles and methods of separation of metal ions. Organic reagents in fractional analysis method.

Methods for the separation of salts of heavy metals from biological samples. Heavy metal analysis methods. Fractional analysis method. The essence of the method. Features Principles and methods for the separation of metal ions (liquid-liquid extraction of metal chelates, ionic associates, precipitation reactions, complexation, etc.). Organic reagents in fractional analysis method. Characterization of reagents, reaction conditions, chemistry. The methodology of the fractional method of metal analysis. Complex use of chemical and microcrystalline reactions. Fractional analysis for individual ions. Quantitation.
Modern methods for the separation and determination of metal ions. The use of atomic absorption spectroscopy and other spectral methods in the determination of "metal poisons."
Interpretation of the results of chemical toxicological analysis taking into account the natural content of metals in the body.

Fractional analysis for individual ions. Methods for the quantification of "metallic" poisons. Modern methods of separation and determination of metal ions.

Modern methods of separation and determination of metal ions in biological objects. Ecology of the environment and the prevalence of poisoning by compounds of heavy metals and arsenic. The list of "metal poisons" subject to forensic chemical research. Toxicity and physico-chemical properties.
Toxicokinetics. Absorption of heavy metal compounds, distribution, binding mechanism in the body, excretion. Clinic of poisoning, clinical diagnosis.
Isolation of "metal poisons" from biological objects. Objects of study. Rules for the selection and direction of objects for analysis. Transportation and storage conditions. Preservation of objects. Primary preparation. Methods of isolating compounds of heavy metals and arsenic from biological samples (dry ashing, wet ashing, other methods). General and private methods of isolation. The essence of the methods. Advantages and disadvantages. The choice of method and conditions of isolation. The technique of mineralization with concentrated acids. Preparation of mineralization for research.

Checkpoint number 2

Testing the knowledge of the material passed (Fractional analysis for individual ions. Methods for the quantitative determination of "metal" poisons. Modern methods for the separation and determination of metal poisons. Isolation of organic compounds from biofluids and cadaveric material. Isolation of pesticides from biological material. Isolation of "volatile poisons" from biological material).

Inorganic and organic mercury compounds. Classification. Alkyl mercury salts, their properties, use, prevalence of poisoning. Toxicokinetics. Chemical toxicological analysis on the example of ethyl mercuric chloride. Isolation. Detection.

Salts of mercury. Toxicological significance. Methods of analysis.

A group of substances isolated by distillation. General characteristics of the group. Isolation methods. Methodology for the general non-directional analysis of distillates for "flying poisons" (analytical screening).

Distillation methods, forensic chemical analysis. Classification of substances. A list of the most toxicologically important groups of substances. General characteristics of the group. Aliphatic alcohols (alkanols). Methyl alcohol. Ethanol. Alcohols (C3-C5). Diols (ethylene glycol). Alkyl halides (chloroform, chloral hydrate, carbon tetrachloride, dichloroethane). Aldehydes, monoatomic phenols and their derivatives (phenol, cresols), ketones (acetone). Carboxylic acids (acetic acid). Hydrocyanic acid and its derivatives.

Properties Application. Toxicity. The prevalence of poisoning. Toxicokinetics. Metabolism. Clinic of poisoning. Clinical diagnosis.

Isolation of "flying poisons" from biological objects. Objects of study. Modern methods of isolation, their characteristics, comparative evaluation (steam distillation, simple and azeotropic distillation, other types of distillation). Features of steam distillation for individual compounds. Sample preparation for gas chromatographic analysis.

Methods of analysis of "flying poisons".

Fundamentals of building a general (non-directional) analysis of "flying poisons". The scheme of the study of distillate fractions obtained as a result of the extraction of "flying poisons" from biological objects. The use of chemical reactions in the detection of "flying poisons". Reactions having a negative forensic chemical value. Study of the first fraction of the distillate for hydrocyanic acid using a complex of chemical reactions (the formation of Prussian blue, the formation of polymethine dye, the reaction of benzoin condensation, microcrystalloscopic reactions). Detection limit. Evaluation of the results of the reaction. Features of sample preparation in determining microgram amounts of hydrocyanic acid (steam distillation in combination with nitrogen aeration, dry air distillation, etc.). A photometric method for the quantitative determination of hydrocyanic acid against the background of the formation of a polymethine dye during the determination of microgram quantities of hydrocyanic acid. The study of the second fraction of the distillate for "flying poisons". The use of the gas chromatographic method of analysis in the analytical screening program of "flying poisons".

Gas chromatographic research method as a highly effective method for the separation, detection and determination of "flying poisons".

Gas chromatograph, principles of work, use in forensic chemical analysis.

Gas chromatographic analysis in an analytical screening program.

Possibilities of gas chromatographic analysis in the identification of toxicological conditions. Gas chromatographic research method as a highly effective method for the separation, identification and quantification of "flying poisons". Basic chromatographic parameters. Types of columns. Fixed liquid phases. Solid media. Detectors. Qualitative analysis. Analysis conditions. Determination of the parameters of qualitative analysis (retention time of "flying poisons").

Chemical methods for the analysis of "flying poisons." Advantages, disadvantages. Types of chemical reactions,

detection limit, specificity.
Quantitative analysis of "flying poisons". Determination of "flying poisons" by gas-liquid chromatography. Absolute calibration method, internal standard. Reproducibility of qualitative analysis methods in relation to the study of various biological objects (organs, tissues, rotted cadaveric material, biological fluids of patients with acute poisoning). The influence of various factors on the results of the analysis (the presence of endogenous compounds in biological samples, the processes of putrefactive decomposition of tissues and organs, metabolic transformations of the analyzed substances).

Chemical and quantitative analysis of volatile poisons.
Methods of analysis of volatile poisons.

The problem of the examination of alcohol intoxication. Toxicokinetics of ethyl alcohol. Quantitative diagnosis of intoxication. Analysis methods used in narcology and forensic examination. Gas chromatographic method.
Stage alcohol intoxication. Forensic chemical examination. Examination of alcohol intoxication. Ethanol. Properties, mechanism of action on the human body. Toxicity.
Problems and prevalence of alcoholism. Examination of alcohol intoxication. Clinic of poisoning with ethyl alcohol. Clinical diagnosis of intoxication.
Toxicokinetics. Suction of alcohol. Distribution in the body, biotransformation, excretion. Expert assessment of ethyl alcohol content in a chemical-toxicological study of various internal organs (blood, urine and cerebrospinal fluid, etc.). Objects of study. Rules for sampling from living persons, cadaveric material.
Analysis methods used in the chemical-toxicological analysis of drug intoxication and forensic chemical examination (qualitative-quantitative). Preliminary qualitative tests for ethyl alcohol in the study of exhaled air and biological fluids. Chemical and modern biochemical research methods.
Gas chromatographic method for the study of ethyl alcohol. Qualitative analysis. Quantitation.

Chemical toxicological analysis for a group of substances isolated by water extraction in combination with dialysis. Features of chemical toxicological analysis.
Methods of forensic chemical analysis of substances isolated by water extraction in combination with dialysis. General characteristics of the group. The prevalence of poisoning, causes. Toxicity. Clinic of poisoning and clinical diagnosis.
Objects of study. Preliminary tests for the presence of the analyzed compounds. Preparation of biological samples for research. Isolation Dialysis. Prospects for the use of membrane filtration (nitrocellulose filters, membrane filtration).
Features of chemical-toxicological analysis of acids (sulfuric, nitric, hydrochloric), alkalis (sodium, potassium and ammonium hydroxides), nitrates and nitrites. Preservation in cadaveric material.
Chemical-toxicological analysis of substances requiring special isolation methods.
Fluorine compounds. Analysis of substances that do not require special isolation methods.
Harmful fumes and gases. Carbon monoxide
The prevalence of poisoning, causes. Toxicity. Classification of poisoning by severity. The mechanism of toxic action. Differential diagnosis of carbon monoxide poisoning.
Toxicokinetics. Absorption, distribution, excretion from the body. Clinic of poisoning and clinical diagnosis. The method of hyperbaric oxygenation in a complex of methods of detoxification therapy.
Objects of study. Sampling rules.
Qualitative analysis. Chemical rapid methods for the detection of carboxyhemoglobin in the blood.
Quantitative determination of carboxyhemoglobin in the blood. Spectroscopic research method. The principle of the method. Research Methodology. Gas-liquid chromatography method in the analysis of carbon monoxide. Evaluation of the results of quantification.

Toxicology and chemical toxicological analysis of fluorine compounds. Harmful fumes and gases. Carbon monoxide. Properties, causes, prevalence of poisoning, mechanism of toxic effects.
Toxicology of fluoride. Methods of forensic chemical analysis. Carboxyhemoglobin. Toxicokinetics and toxicodynamics.

Differential diagnosis and general principles of detoxification therapy. Toxicokinetics. Methods of chemical toxicological analysis. Evaluation of the results of the study.
Stages of treatment of acute poisoning. The main groups of drugs. Mechanism of action. Indications.

Checkpoint number 3
Examination. Testing of knowledge in the discipline "Toxicological chemistry".

6. Методические указания для обучающихся по освоению дисциплины

Освоение дисциплины требует систематического изучения всех тем в той последовательности, в какой они указаны в рабочей программе.

Основными видами учебной работы являются аудиторные занятия. Их цель - расширить базовые знания обучающихся по осваиваемой дисциплине и систему теоретических ориентиров для последующего более глубокого освоения программного материала в ходе самостоятельной работы. Обучающемуся важно помнить, что контактная работа с преподавателем эффективно помогает ему овладеть программным материалом благодаря расстановке необходимых акцентов и удержанию внимания интонационными модуляциями голоса, а также подключением аудио-визуального механизма восприятия информации.

Самостоятельная работа преследует следующие цели:

– закрепление и совершенствование теоретических знаний, полученных на лекционных занятиях;

- формирование навыков подготовки текстовой составляющей информации учебного и научного назначения для размещения в различных информационных системах;

- совершенствование навыков поиска научных публикаций и образовательных ресурсов, размещенных в сети Интернет;

- самоконтроль освоения программного материала.

Обучающемуся необходимо помнить, что результаты самостоятельной работы контролируются преподавателем во время проведения мероприятий текущего контроля и учитываются при промежуточной аттестации.

Обучающимся с ОВЗ и инвалидов предоставляется возможность выбора форм проведения мероприятий текущего контроля, альтернативных формам, предусмотренным рабочей программой дисциплины. Предусматривается возможность увеличения в пределах 1 академического часа времени, отводимого на выполнение контрольных мероприятий.

Процедура оценивания результатов обучения инвалидов и лиц с ограниченными возможностями здоровья по дисциплине предусматривает предоставление информации в формах, адаптированных к ограничениям их здоровья и восприятия информации.

При проведении текущего контроля применяются оценочные средства, обеспечивающие передачу информации, от обучающегося к преподавателю, с учетом психофизиологических особенностей здоровья обучающихся.

7. Перечень учебно-методического обеспечения для самостоятельной работы обучающихся по дисциплине

При самостоятельной работе обучающимся следует использовать:

– конспекты лекций;

– литературу из перечня основной и дополнительной учебной литературы, необходимой для освоения дисциплины (модуля);

– текст лекций на электронных носителях;

– ресурсы информационно-телекоммуникационной сети "Интернет", необходимые для освоения дисциплины;

– лицензионное и свободно распространяемое программное обеспечение из перечня информационных технологий, используемых при осуществлении образовательного процесса по дисциплине;

– методические указания для обучающихся по освоению дисциплины.

8. Перечень основной и дополнительной учебной литературы

Основная:

1. Franz-Xaver Reichl. Regulatory Toxicology / Franz-Xaver Reichl, Michael Schwenk // Publisher Name: Springer, Berlin, Heidelberg. 2014. 946 p. ISBN 978-3-642-35374-1. [Электронный ресурс]. https://link.springer.com/referencework/10.1007/978-3-642-35374-1

2. Pillay V. V. Modern medical toxicology/V. V. Pillay.-New Delhi:Jaypee Brothers Pvt. Ltd.,2015, ISBN 9789350259658.-611. http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=699383

Дополнительная:

1. Corina Ionescu. Drug Metabolism / Corina Ionescu, Mino R. Caira // Publisher Name: Springer, Dordrecht. — 2005. — 420 p. — ISBN 978-1-4020-4142-6. — [Электронный ресурс]. https://link.springer.com/book/10.1007/1-4020-4142-X

2. Jürgen H Gross Mass Spectrometry.A Textbook. Springer International Publishing AG, 2017. Online ISBN 978-3-319-54398-7. Текст: электронный// SpringerLink: [сайт]. URL: https://link.springer.com/book/10.1007/978-3-319-54398-7#toc https://link.springer.com/book/10.1007/978-3-319-54398-7#toc.html

3. Philip C. Burcham. An Introduction to Toxicology / Philip C. Burcham // Publisher Name: Springer, London. — 2014. — 327 p. — ISBN 978-1-4471-5553-9. — [Электронный ресурс]. https://link.springer.com/book/10.1007/978-1-4471-5553-9

9. Перечень ресурсов сети Интернет, необходимых для освоения дисциплины

При освоении дисциплины использование ресурсов сети Интернет не предусмотрено.

10. Перечень информационных технологий, используемых при осуществлении образовательного процесса по дисциплине

Образовательный процесс по дисциплине **Toxicological chemistry** предполагает использование следующего программного обеспечения и информационных справочных систем:
The list of necessary licensed and (or) free software:
1. An application that allows you to view and play the media content of Adobe Acrobat Reader DC PDF files.
2. Programs, demonstrations of video materials (player) “WindowsMediaPlayer”.
3. The program for viewing Internet content (browser) "Google Chrome".
4. Office suite of applications "LibreOffice".

При освоении материала и выполнения заданий по дисциплине рекомендуется использование материалов, размещенных в Личных кабинетах обучающихся ЕТИС ПГНИУ (**student.psu.ru**).

При организации дистанционной работы и проведении занятий в режиме онлайн могут использоваться:

система видеоконференцсвязи на основе платформы BigBlueButton (https://bigbluebutton.org/).

система LMS Moodle (http://e-learn.psu.ru/), которая поддерживает возможность использования текстовых материалов и презентаций, аудио- и видеоконтент, а так же тесты, проверяемые задания, задания для совместной работы.

система тестирования Indigo (https://indigotech.ru/).

11. Описание материально-технической базы, необходимой для осуществления образовательного процесса по дисциплине

1. Lecture classes - An audience equipped with presentation equipment (projector, screen, computer/laptop) with the appropriate software, chalk (s) or marker board.
2. Seminar-type classes (seminars, workshops) - An audience equipped with presentation equipment (projector, screen, computer/aptop) with the appropriate software, chalk (s) or marker board.
3. Laboratory “Laboratory Name”, equipped with specialized equipment. The composition of the equipment is defined in the passport of the laboratory.
4. Group (individual) consultations - An audience equipped with presentation equipment (projector, screen, computer/laptop) with the appropriate software, chalk (s) or marker board.
5. Current control - An audience equipped with presentation equipment (projector, screen, computer/laptop) with the appropriate software, chalk (s) or marker board.
6. Independent work - An audience for independent work, equipped with computer equipment with the ability to connect to the Internet, provided with access to the electronic information and educational environment of the university. Premises of the Scientific Library of Perm State University

Помещения научной библиотеки ПГНИУ для обеспечения самостоятельной работы обучающихся:

1. Научно-библиографический отдел, корп.1, ауд. 142. Оборудован 3 персональными компьютера с доступом к локальной и глобальной компьютерным сетям.

2. Читальный зал гуманитарной литературы, корп. 2, ауд. 418. Оборудован 7 персональными компьютерами с доступом к локальной и глобальной компьютерным сетям.

3. Читальный зал естественной литературы, корп.6, ауд. 107а. Оборудован 5 персональными

компьютерами с доступом к локальной и глобальной компьютерным сетям.

4. Отдел иностранной литературы, корп.2 ауд. 207. Оборудован 1 персональным компьютером с доступом к локальной и глобальной компьютерным сетям.

5. Библиотека юридического факультета, корп.9, ауд. 4. Оборудована 11 персональными компьютерами с доступом к локальной и глобальной компьютерным сетям.

6. Читальный зал географического факультета, корп.8, ауд. 419. Оборудован 6 персональными компьютерами с доступом к локальной и глобальной компьютерным сетям.

Все компьютеры, установленные в помещениях научной библиотеки, оснащены следующим программным обеспечением:

Операционная система ALT Linux;

Офисный пакет Libreoffice.

Справочно-правовая система «КонсультантПлюс»

Фонды оценочных средств для аттестации по дисциплине
Toxicological chemistry

Планируемые результаты обучения по дисциплине для формирования компетенции. Индикаторы и критерии их оценивания

ОПК.5

Способен осуществлять профессиональную деятельность в соответствии с этическими нормами и морально-нравственными принципами фармацевтической этики и деонтологии

Компетенция (индикатор)	Планируемые результаты обучения	Критерии оценивания результатов обучения
ОПК.5.1 Осуществляет взаимодействие в системе «фармацевтический специалист-посетитель аптечной организации - медицинский специалист» в соответствии с нормами фармацевтической этики и деонтологии	Know: moral and ethical standards and principles related to the professional activity of a pharmaceutical worker when communicating with visitors and medical professionals; To be able to: carry out interaction in the system "pharmaceutical worker-visitor to a pharmacy organization" and "pharmaceutical worker-medical specialist" in accordance with the norms of pharmaceutical ethics and deontology; Possess: communication skills when communicating with visitors and medical professionals; methods of using normative, reference and scientific literature for solving professional problems, using modern resources of information support for pharmaceutical business in the context of chemical and toxicological studies	**Неудовлетворител** The student does not know how to interact in the system “pharmaceutical specialist-visitor of a pharmacy organization” and “pharmaceutical specialist-medical specialist”. He is not able to provide advice on the toxicity of drugs, conduct health education and information work among the population about drugs, their use and storage at home, about the sources of poisoning, about drug addiction and substance abuse. Does not know the laws and other regulatory legal acts of the Russian Federation on pharmacy issues; fundamentals of toxicological chemistry; medicines, rules for their storage and dispensing. Does not know the methods and means of pharmaceutical ethics and deontology, psychology of professional communication. **Удовлетворительн** The student has limited knowledge of the interaction in the system “pharmaceutical specialist-visitor of a pharmacy organization” and “pharmaceutical specialist-medical specialist”. It does not fully provide advice on the toxicity of drugs, conduct health education and information work among the population about drugs, their use and storage at home, about the sources of poisoning, about drug addiction and substance abuse. Knows badly the laws and other regulatory legal acts of the Russian Federation on pharmacy issues; fundamentals of toxicological chemistry; the use of medicines, the rules for their storage and dispensing. Does not fully own the norms of pharmaceutical

Компетенция (индикатор)	Планируемые результаты обучения	Критерии оценивания результатов обучения
		Удовлетворительн ethics and deontology. **Хорошо** The student has good knowledge of interaction in the system "pharmaceutical specialist-visitor of a pharmacy organization" and "pharmaceutical specialist-medical specialist". Knows how to provide advice on the toxicity of certain drugs, conduct health education and information work among the population about some drugs, their use and storage at home, about the sources of poisoning, about drug addiction. Knows well the laws and other regulatory legal acts of the Russian Federation on pharmaceutical issues; fundamentals of toxicological chemistry; the use of medicines, the rules for their storage and dispensing. Uses the methods of pharmaceutical ethics and deontology, psychology of professional communication. **Отлично** The student has complete knowledge of interaction in the system "pharmaceutical specialist-visitor of a pharmacy organization" and "pharmaceutical specialist-medical specialist". Knows how to provide advice on the toxicity of medicines, conduct health education and information work among the population about medicines, their use and storage at home, about the sources of poisoning, about drug addiction and substance abuse. Has full knowledge of the laws and other regulatory legal acts of the Russian Federation on pharmaceutical issues; fundamentals of toxicological chemistry; the use of medicines, the rules for their storage and dispensing. He is proficient in methods and means of pharmaceutical ethics and deontology, psychology of professional communication.

Оценочные средства текущего контроля и промежуточной аттестации

Схема доставки : Базовая

Вид мероприятия промежуточной аттестации : Экзамен
Способ проведения мероприятия промежуточной аттестации : Оценка по дисциплине в рамках промежуточной аттестации определяется на основе баллов, набранных обучающимся на контрольных мероприятиях, проводимых в течение учебного периода.
Максимальное количество баллов : 100

Конвертация баллов в отметки

«отлично» - от 81 до 100
«хорошо» - от 61 до 80
«удовлетворительно» - от 50 до 60
«неудовлетворительно» / «незачтено» менее 50 балла

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
Входной контроль	Conducting into toxicological chemistry. The main sections of toxicological chemistry. The main directions of chemical toxicological analysis. Organization of forensic medical examination in the Russian Federation. **Входное тестирование**	Residual knowledge is controlled: 1. By general and inorganic chemistry, chemical properties of elements and their compounds. 2. In physics - the basic laws of physics, physical phenomena and laws. 3. In physical and colloidal chemistry, knowledge of solutions and processes occurring in solutions. The main principles of thermodynamics, thermochemistry. 4. In analytical chemistry. The main provisions of the theory of ionic equilibria in relation to acid-base reactions, redox, precipitation. Methods for the detection of inorganic cations and anions. 5. In organic chemistry. Fundamentals of the qualitative analysis of organic compounds. Identification of organic compounds based on the results of qualitative reactions, as well as UV and IR spectroscopy data. 6. In biochemistry. The theoretical basis of the pathways of the enzymatic transformation of drugs in the body. 7. In pharmaceutical chemistry. Chemical methods underlying the qualitative analysis of drugs. Chemical methods underlying the quantitative analysis of drugs. The principles underlying the physicochemical methods of drug analysis. 8.Pharmacology. Knowledge of the laws of pharmacokinetics and pharmacodynamics of drugs.

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
ОПК.5.1 Осуществляет взаимодействие в системе «фармацевтический специалист-посетитель аптечной организации - медицинский специалист» в соответствии с нормами фармацевтической этики и деонтологии	Checkpoint number 1 **Письменное контрольное мероприятие**	Toxicological chemistry. Biochemical toxicology. Mathematical models characterizing the course of pharmacokinetic processes. Biotransformation of foreign compounds in the body. Chemical toxicological analysis. Methods of isolating medicinal and narcotic substances from Toxicological chemistry. Biochemical toxicology. Mathematical models characterizing the course of pharmacokinetic processes. Biotransformation of foreign compounds in the body. Chemical toxicological analysis. Methods of isolating medicinal and narcotic substances from biological material. The basics of conducting directed and general (non-directional) analysis. Methods for the detection and determination of drugs during forensic chemical examination. Immune chromatographic and spectral methods during forensic chemical examination and analytical diagnosis of acute poisoning and drug addiction.

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
ОПК.5.1 Осуществляет взаимодействие в системе «фармацевтический специалист-посетитель аптечной организации - медицинский специалист» в соответствии с нормами фармацевтической этики и деонтологии	Checkpoint number 2 **Письменное контрольное мероприятие**	Analytical diagnosis of acute poisoning. Features of chemical-toxicological analysis during the analytical diagnosis of acute poisoning. Analytical diagnosis of drug addiction and substance abuse. Introduction to the problem. Features of chemical-toxicological analysis of drugs that cause intoxication. Cannabinoids. Chemical-toxicological analysis (forensic chemical) on a group of substances isolated by extraction with organic solvents. Characterization of substances isolated from biological material by extraction and sorption. Liquid chromatography in the diagnosis of poisoning. Chemical toxicological analysis and methods for isolating pesticides from biological material. A group of substances isolated from biological objects by mineralization. Methods of isolating compounds of heavy metals and arsenic from biological objects. Fractional analysis for individual ions.

Компетенция (индикатор)	Мероприятие текущего контроля	Контролируемые элементы результатов обучения
ОПК.5.1 Осуществляет взаимодействие в системе «фармацевтический специалист-посетитель аптечной организации - медицинский специалист» в соответствии с нормами фармацевтической этики и деонтологии	Checkpoint number 3 **Итоговое контрольное мероприятие**	Distillation methods, forensic chemical analysis. Classification of substances. Toxicity. The prevalence of poisoning. Toxicokinetics. Metabolism. Clinic of poisoning. Clinical diagnosis. Isolation of "flying poisons" from biological objects. Objects of study. Modern methods of isolation. Fundamentals of building a general (non-directional) analysis of "flying poisons". Possibilities of gas chromatographic analysis for the identification of toxicological conditions. Basic chromatographic parameters. Methods of forensic chemical analysis of substances isolated by extraction. General characteristics of the group. Toxicity. Clinic of poisoning and clinical diagnosis. Objects of study. Preliminary tests for the presence of the analyzed compounds. Preparation of biological samples for research. Isolation Chemical-toxicological analysis of substances requiring special isolation methods. Toxicity. Classification of poisoning by severity. The mechanism of toxic action. Chemical express methods for the detection of carboxyhemoglobin in the blood. Methods of isolating organic substances. Classification of substances isolated by extraction and sorption. Toxicity. The prevalence of poisoning. Toxicokinetics. Metabolism. Clinic of poisoning by substances isolated by extraction and sorption. Clinical diagnosis. Methods for isolating and determining pesticide poisoning. Pharmacokinetics of foreign compounds. Chemical toxicological analysis in forensics. Methods of detection and determination of substances in forensic chemical examination. Acute poisoning and the role of chemical toxicological expertise. Opiates. Cannabinoids. Pesticides Heavy metals. Arsenic.

Спецификация мероприятий текущего контроля

Conducting into toxicological chemistry. The main sections of toxicological chemistry. The main directions of chemical toxicological analysis. Organization of forensic medical examination in the Russian Federation.

Продолжительность проведения мероприятия промежуточной аттестации: **1 часа**
Условия проведения мероприятия: **в часы аудиторной работы**
Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **0**
Проходной балл: **0**

Показатели оценивания	Баллы
the examiner demonstrates knowledge of the basic material on the proposed question; • the examiner has basic terms and concepts, but uses simplified definitions; • the examinee gives a complete, structured answer on the merits of the proposed question; • the examinee can make no more than 2 minor erroneous judgments, inaccuracies or reservations.	20
• the examinee is limited by general concepts and / or gives a general answer on a topic close to the proposed question; • the examinee is not well versed in basic concepts, definitions, terms; • the examinee makes systematic errors in names, terms, etc. • the examinee is limited to general concepts on the proposed issue. • the examinee is confused in terms and concepts.	10

Checkpoint number 1

Продолжительность проведения мероприятия промежуточной аттестации: **1 часа**
Условия проведения мероприятия: **в часы самостоятельной работы**
Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **30**
Проходной балл: **15**

Показатели оценивания	Баллы
Knowledge of immune methods during forensic chemistry	3
Knowledge of the use of screening methods for testing for an unknown drug substance	3
Knowledge of the methods of analytical diagnosis of acute poisoning and drug addiction	3
Knowledge of methods for isolating (isolating) medicinal substances from biological objects during forensic chemical analysis, cleaning methods and techniques	3
Knowledge of the stages and main pathways of biotransformation of foreign compounds, factors affecting the metabolism of foreign compounds, toxicity of their metabolites	3
Knowledge of methods for the detection and determination of drugs during forensic chemical examination	3
Knowledge of the basics of conducting directed and general (non-directional) analysis	3
Knowledge of the concept of biochemical toxicology, general patterns of distribution of substances in the body	3
Knowledge of the subject and method of toxicological chemistry, the main directions of chemical toxicological analysis	3
Knowledge of the methods of isolating medicinal and narcotic substances from biological fluids during chemical-toxicological analysis	3

Checkpoint number 2

Продолжительность проведения мероприятия промежуточной аттестации: **1 часа**
Условия проведения мероприятия: **в часы самостоятельной работы**
Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **30**
Проходной балл: **15**

Показатели оценивания	Баллы
Knowledge of the diagnosis of drug addiction and substance abuse	3
Knowledge of fractional analysis for individual ions, methods for the quantitative determination of "metallic" poisons	3
Knowledge of the fractional method of analysis of "metals", its features; principles and methods separation of metal ions	3
nowledge of the general characteristics of a group of pesticides, their classification, toxicity, behavior in the body, identification methods	3
Knowledge of the physicochemical properties, pharmacokinetics and metabolism of cannabinoids	3
Knowledge of the features of chemical toxicological analysis during the analytical diagnosis of acute poisoning	3
Knowledge of the features of chemical-toxicological analysis of drugs that cause intoxication, stages of analysis, choice of methods	3
Knowledge of the principles of chemical toxicological analysis on a group of substances extracted with organic solvents	3
Knowledge of the role of chemical toxicological analysis in the diagnosis of acute poisoning, analytical diagnosis of acute poisoning	3
Knowledge of the general characteristics, physicochemical properties and toxicity mechanisms of compounds of heavy metals and arsenic	3

Checkpoint number 3

Продолжительность проведения мероприятия промежуточной аттестации: **1 часа**
Условия проведения мероприятия: **в часы самостоятельной работы**
Максимальный балл, выставляемый за мероприятие промежуточной аттестации: **40**
Проходной балл: **20**

Показатели оценивания	Баллы
Answer to additional questions of the second ticket question	10
Full answer to the first ticket question	10
Complete answer to the second ticket question	10
Answer to additional questions of the first ticket question	10