

Educational Program of the First Stage of Higher Education Pharmacy

Name of educational program: Pharmacy

Qualification/ awarded academic degree: Bachelor of Pharmacy

Length of program: 240 (1 ECTS Credit equals to 30 hours)

Language of study: Program is accomplished in English language.

Aim of Educational Program

Aim of program is preparing bachelors with specialty of pharmacy - of higher academic education oriented on practical activity, having competitive, appropriate competence liberal values, professional growth, who will be able to: make qualified pharmaceutical help, manufacturing of curing means, holding pharmaceutical analysis, ruling of structural units of pharmaceutical establishments and continuation of high education on the next stage.

Pharmacy as the field develops very quickly. Today, the world and Georgian pharmaceutical market as well is presented by various curing means. Qualified medical assistance should be followed by appropriate pharmaceutical assistance and rational pharmacotherapy that is impossible without qualified pharmaceutical staff. Medicine is different product from other kind of product, it is effective and safe only in the hand of specialist, and otherwise it harms human treatment.

For today, under marketing economical condition the number of pharmaceutical institutions (chemistry, pharmaceutical industry and etc) has importantly grown. Besides, there is increasing demand on pharmaceutical staff.

The faculty of pharmacy of Tbilisi State Medical University has great experience, traditions, appropriate human resources and material-technical base for preparing qualified staff with specialty of pharmacy.

Educational program "pharmacy" includes getting 240 credits. Bachelor's program "pharmacy" provides basic education on basic (exact, natural and humanitarian sciences), social, pharmaceutical and medical disciplines and developing of abilities of effective usage of learnt theoretical material in practice.

After finishing the educational program graduate will get knowledge about preparation of pharmaceutical raw material, processing, technology of curing means, analysis, standardizations, rational pharmacotherapy and organization of pharmaceutical activities, will generate practical abilities for fulfilling pharmaceutical activities (pharmaceutical assistance, pharmaceutical and pharmacognostic analysis, pharmaceutical technologies) and also ability and values for continuation study on the next stage.

Methods of reaching study results

While carrying out the program following methods are used:

- 1. Discussion/debates** – one of the widely spread method of interactive studying. The process of discussion raises the quality of participation and activity of students. This process isn't limited only to questions asked by professor. This method develops the ability of conformation ones' own idea and discussion.
- 2. Collaborative work** – studying by this method means dividing groups and giving tasks to them, the members of the group individually think about issue and share information with other members. Due to the goal set there is possibility to share functions among the members during the process of study that provides maximal attendance of all students in the process of study.
- 3. Demonstrative method** – this method means visual presentation of information. From the standpoint of reaching result it is quite effective, demonstration of material to be studied is possible by teacher and student as well. This method helps us to make the perception of different stage of educational material more significant. Say concretely, what student should do all alone. Demonstration may carry simple image or take such difficult face as carrying out multistep experiment.
- 4. Method of explaining** – is based on discussion around the given issue, while reporting the material, professor is giving a concrete example that is discussed in detail in the frame of given theme.
- 5. Activity oriented studying** – demands active attraction of student and professor in the process of study, where practical interpretation of theoretical material takes special loadings.

6. Verbal or oral method – presentation of new material orally by using multimedia or without it, by animation showing of apparatus-machines and technology processes. During the process of study there are used: interactive technologies, method of analysis and synthesis, method of explanation, problematic lection – introduction of material in the regime “menology - dialogues” and others.

7. Writing method – During the process of study and especially during laboratory lessons students are able to make writings about the ways of solving objectives of concrete situation in the forms of made records.

8. Practical methods – During the process of study and especially during laboratory lessons student is making technology processes independently by using appropriate apparatus-machines.

Requirements for involvement:

- Foreign Nationals with corresponding documentation should apply (send the documents) to the Ministry of Education and Science of Georgia. After approval from the Ministry they have right to start the undergraduate course.
- Georgian citizens are required to pass through the National Exams.

Learning courses of the English medium MD program

N	LEARNING COURSES	semesters	number of credits
	MANDATORY SUBJECTS		3
1.	Basics of Higher Mathematics	I	3
2.	General and Inorganic Chemistry	I	6
3.	Basics of Anatomy	I	3
4.	Basics of Histology	I	3
5.	Botany I (plant morphology, anatomy, physiology)	I	5

6.	Medical Physics and Biophysics	I	3
7.	Professional Latin Language	I	2
8.	Medical Biology	I	2
9.	Foreign Language 1	I	3
10.	Human Physiology I	II	4
11.	Basics of Molecular Genetics	II	3
12.	Botany II (plant systematic)	II	6
13.	Medical Parasitology	II	3
14.	Pharmacy Care I	II	3
15.	Information Technologies	II	2
16.	Bioethics	II	3
17.	Foreign Language II	II	4
18.	Organic Chemistry I	II	4
19.	Medical Microbiology	II	4
20.	Human Physiology II	III	4
21.	Clinical Skills	III	2
22.	Analytical Chemistry	III	6
23.	Basics of Hygienic in Pharmacy	III	3
24.	Pathology I	III	3
25.	Scientific Skills	III	2
26.	Foreign language III	III	2
27.	Instrumental Methods of Analysis	IV	4
28.	Basics of Biochemistry	IV	6
29.	Pathology II	IV	3
30.	Physical and Colloidal Chemistry	IV	6
31.	Pharmacognosy I	IV	5
32.	Organic Chemistry II	IV	4
33.	Immunology	IV	2
34.	Pharmaceutical Chemistry I	V	5

35.	Pharmacognosy II	V	5
36.	Technology of Galenic Preparations	V	10
37.	Pharmacology I	V	4
38.	Toxicological Chemistry I	VI	4
39.	Pharmaceutical Chemistry II	VI	10
40.	Pharmacology II	VI	4
41.	Toxicological Chemistry II	VI	4
42.	Technology of Pharmaceutical Dosage Forms	VI	10
43.	Pharmaceutical Organization and Economics	VII	8
44.	Basics of Pharmacokinetics	VII	4
45.	Clinical Pharmacy	VII	8
46.	Pharmacotherapy	VII	8
	Module of Practical Abilities		
47.	Pharmacy care II	VIII	6
48.	Pharmaceutical Technologies	VIII	8
49.	Pharmaceutical Analysis	VIII	8
50.	Pharmacognostic Analysis	VIII	4
51.	Pharmacotherapeutical Choice	VIII	2
52.	ELECTIVE COURSES		2
53.	Basics of Ecology	I	2
54.	Toxicology of Narcotic Drugs	I	2
55.	Extreme Condition Etiology, Pathogenesis and Prevention Principles	V	2
56.	Basics of Biopharmacy	V	2
57.	Basics of Pharmaceutical Cosmetology	VI	2
58.	Internal Diseases	VI	2
59.	Basics of phytotherapy	VII	2
60.	Pharmaceutical enterprise	VII	2

61.	Pharmaceutical product commodities	VII	2
62.	Principles of pharmaceutical management and marketing	VII	2

Basics of Higher Mathematics

Supreme mathematics, as a natural science in medicine and pharmacy is tool to calculate and analyze research data. It's role in medicine and pharmacy.

Function – functional relationship between quantities, their determination and importance area, properties, also some simple and trigonometric function attributes, which have direct connection to medicine. After understanding of this point student must be able to find functional connection between different quantities and showing it in graphical models, and establish its attributes.

Derivative of a function and differentials. Usage of derivative in finding a function. Topics discussed in this chapter are: term function limit, continuity, growth of function. Derivative of a function, difficult derivative of a function, queue function. Connection between growth function and differential, geometrical importance of differential. Connection of derivative to function and determination of extremum values using derivative. Research of a function and construct a diagram. Multiple variable function, difficult differentials. After studying of this chapter student must be able to understand physical concept of the derivative, it's relation to physics (such as speed and acceleration). Usage of derivative in some medical and biological tasks, also good understanding of extremum theory and its use in solving some biological problems. Differentials in approximate calculations, differentials in error theory. Primary function. Integrals, characteristics; primary methods of integration: direct integration, integration by changing variables, partial integration, integral term, its major properties, newton-leibniz formula. After studying of this chapter student must be able to calculate area of flat figures, calculate of mean value of function.

Differential equation. Term of differential equation, primary and secondary differential equations, that does not contain function, second line equation that does not contain argument, second line equation with constant coefficient. The ways of solving them. After passing this theoretical part student must be able to solve and create differential equations in medical and biological tasks.

General and Inorganic Chemistry

General and inorganic chemistry presents the fundamentals of pharmaceutical science. It predates teaching other chemical, as well as biochemical and pharmaceutical disciplines. The course allows a student to master modern views of the structure of atoms and molecules, chemical bond, reactivity, redox and acid-base (proton transfer) processes. The main objective of the second part of the course is to teach chemistry, physical-chemical properties and bioactivity of simple and complex compounds of representative and transition elements. The course provides a student with knowledge of reactivity and in vivo indices of biogenic elements that is required for studying subsequent disciplines. Knowledge of transition metal chemistry facilitates understanding of catalytic activity of enzymes as well as toxicity of coordination complexes, etc.

Apart knowledge of fundamental topics of natural science, the course of general and inorganic chemistry provides a student with important functional and metacognitive skills such as perception and use of large reference data, deduction of acquired theoretical knowledge to the real life systems and, on the present base, interpretation of behavior and indices of biosystems, skills for carrying out laboratory experience, etc.

The course of general and inorganic chemistry presents the initial, basic stage of development of the aforementioned professional skills to tomorrow's pharmacists. Chemical foundations. Mission of chemistry in medicine and pharmacy. Stoichiometry. Quantum-mechanical model of atoms. Wave-particle nature of electrons. De Broglie hypothesis. The uncertainty principle. Orbital and electronic cloud. Characterization of energetic states via quantum numbers. Electronic configurations in atoms. Energetic states of electrons in polyelectronic systems. Aufbau principle. Pauli principle. Hund's rule.

Periodic law and periodic system of chemical elements as highlighted with quantum mechanics.

Chemical bond. Nature of chemical bonding. Classification of bonding in chemistry. Experimental characteristics of bonds, such as bond energy, bond length, bond order. Directional and nondirectional chemical bonds. σ - and π -bonds. Orbital hybridization and molecular geometry. Hydrogen bond and its biological action. Bonding in biosystems. Quantum-mechanical theories of chemical bonding. Valence bond and Molecular orbital theories. Intermolecular interactions. Coordination complexes. Complex formation and ligand exchange equilibrium. Simple complexes and chelates. Nature of chemical bonds in complexes. Use of coordination complexes in medicine and pharmacy. An introduction to chemical thermodynamics and kinetics. Electron transfer reactions. Redox equations. Ion-electron balance reactions. Redox processes in living organisms. Review of solutions and their properties. Biological mission of solutions. Water as unique solvent. Classification of solutions. Units of concentration. Solubility and dissolution process. Solubility of gases. Henry's and Sechenoff's laws. Ideal solutions. Diluted solutions. Colligative properties. Chemical reactions and equilibrium in the solutions of electrolytes. Theory of electrolytic

dissociation. Degree of ionization and dissociation constant. Ostwald's law of dilution. Solubility product. Action of electrolytes in living organisms.

Acid-base theories. Protolytic reactions. Self-ionization of water. Ionic product of water. pH and its variations in organisms. Detection of pathologies via pH measurements. Lewis acids and bases. Neutralization and hydrolysis. Hydrolytic action in organisms. Buffers. Classification of buffer systems. Mechanism of action. Buffer capacity. Buffer systems of organism. Buffer systems of blood. Plasma. Protein buffers. Erythrocytes. s-elements, their properties and biological mission. Hydrogen. Physical and chemical properties. Hydrogen-containing compounds. Water as unique hydrogen-containing compound. s-elements of group 1A. Their physical and chemical properties. s-elements of group 2A. Their physical and chemical properties. Their affinity to complex formation. d-elements of group 6. Chromium. Cr(III), Cr(VI), their acid-base and redox features. Complex formation involving chromium.

d-elements of group 7. Manganese. Its chemical activity and use in medicine. d-elements of group 8. Iron. Fe(II), Fe(III), their acid-base and redox features. Complex formation involving iron. Its use in medicine. d-elements of group 1B. Copper. Cu(I) and Cu(II) complexes. Copper-containing enzymes. Silver. Bactericide products of silver. d-elements of group 2B. Zinc. Zn(I) and Zn(II). Complex formation involving zinc. Zinc-containing enzymes and pharmacological preparations. Biological mission of zinc.

p-elements of group 3. Aluminum and its compounds. Ampholytes. Complex formation involving aluminum. Biological mission of aluminum-containing compounds. p-elements of group 4. Carbon and silicon. Their compounds. Allotropy. Use of carbon- and silicon-containing inorganic compounds in medicine and pharmacy. p-elements of group 5. Nitrogen. Phosphorus. Arsenic. Their compounds and biological mission. p-elements of group 6. Oxygen. O₂ as a ligand. Redox properties of peroxides. Sulphur. Its properties. Physical and chemical properties of sulphur-containing compounds. Their use in medicine and pharmacy. Halogens. Their compounds and biological mission. Halogens with positive oxidation number. Their oxy derivatives.

Basics of Anatomy

Skeletal system - Vertebral Column, sacrum, thorax skeleton, ribs, sternum, pelvis. Upper and lower limbs. Anatomy of skull – cranial and facial bones, Fossas, Foramens. Arthrology of vertebral column, thorax skeleton and skull. Joints of upper and lower limbs and pelvis. Myology of Head, neck, thorax, back, abdomen, upper and lower limb muscles, muscles of pelvis.

System for substance metabolism – Gastro-intestinal system organs – mouth, tongue, palate, teeth. Salivary glands, pharynx, esophagus, stomach, small intestines, colon, liver, gallbladder, pancreas, peritoneum. Respiratory system – nose, nasal cavity, larynx, trachea and bronchi; Lungs – pleura, mediastinum. Eliminating system – kidney, ureter, urinary

bladder, and urethra. Reproductive system – anatomy of male reproductive system – testicles, testicular tubule, testicular follicle, prostate. Female reproductive system – ovaries, fallopian tubes, uterine. Endocrine system – pituitary, thyroid, parathyroid, adrenal glands. hormonal apparatus of reproductive glands.

Cardiovascular system – anatomical structure of heart. Blood circulation in systemic and pulmonary loops. Aorta and its branches. carotid arteries, subclavian arteries, thoracic aorta, abdominal aorta, iliac arteries, its branches. Veins – vena cava superior and inferior, fetal blood circulation, lymphoid system. Immune system.

Nervous system – spinal cord anatomy, spinal cord nerves – cervical, brachial and lumbar and sacrum plexus, its branches and innervation areas. Brain – medulla oblongata, pons, cerebellum, IV ventricle, midbrain, III ventricle, hemispheres, basal nucleus. Limbic system. Brain blood vessels. Brain nerves – their innervation areas. Vegetative nervous system – sympathetic and parasympathetic systems. Conductive pathways of nervous system. Sensory organs – anatomy of the eye and the ear.

Basics of Histology

The course provides the basic knowledge of organization of the cell, its arrangement in tissues, basic types of tissues and their structural and functional characteristics.

Botany I and II

Subject, history, major principles of organization of living cells, chemical composition, metabolism, growth, development, ontogenesis, evolution and self production. Organization of life on different levels, types of evolution, hypothesis of endosymbiosis, Microsystems of living organisms.

Topics of botany. Autotrophs and biosphere. Human and plant. Plant resources and civilization. Centers of officinal plants. Botany and pharmacy.

Structure of plant cell. Prokaryotic and eukaryotic cells. Cells of plant, animal and fungal origin. Protoplast, cell membrane and vacuole.

Tissues. Meristem, covering tissue, conductive tissue, mechanical tissue, major tissue, secreting tissue.

Basic knowledge about biochemistry and physiology of plants. Energy and the living cell. Photosynthesis, breathing and boiling. Movement of substances in the plant.

Vegetative organs of the plant. Branching. Organogenesis. sprout and sprout system. Distribution of leaves. Sprout specification and metamorphosis. Primary and secondary

anatomical structure of stem. Morphology and anatomy of the leaves. Root and root system. Anatomical structure of the root. Living forms of the plant.

Plant growth, development and division. Reproductive organs of the plant. Morphology of the flower. Fertilization. Types of the flowers. Fruit morphology. Seed. Utilization of fruits and seeds.

Systematization, as a biological science. Taxonomical categories and taxons, binary nomenclature. Methods of plant systematization. Research objects. Basics of evolution theories. Major steps of ecological process. Macroevolution and phylogenesis.

Non cell type and prenuclear organisms. Nuclear organisms (eukaryotes)

The kingdom *Protoctista*. *Fungi like protoctista*. *Water-plant protocrista*. *Their classes*. *Importance in the nature and human life*.

The Fungi kingdom, their classes. Sporadic plants: their classes.

Seed plants: their classes. Classes of gymnosperm. Classes of Flowering plants or angiosperms. Criteria of evolutionary progress of flowering plants. Major taxonomic groups.

Class of dicotyledon. Subclass: Magnoliidae, Ranunculidae, Caryophyllidae, Hamamelidae, Dilleniidae, Rosidae, Lamiidae, Asteridae.

Class of monocotyledon. Subclass: Alismatidae, Lilidae, Arecidae.

Geographical elements of plants. Main terms of botanical geography. Plants geography or phytogeography. Chorology, the study of the spatial distribution of organisms. The study of flora. Floristic characteristic of Earth. Historical geography of plants.

Elements of ecology. Main terms. Light, temperature, water. Chemical, mechanical and biotic factors.

Elements of Geobotany. Main terms. Composition and structure of phytocenosis.

Classification of plants. Climatic zones. Climatodiagrams. Plant zones of Georgia

Medical Physics and Biophysics

Physics as a fundamental natural science significance of up to date medicine and biology. Subject of Medical Physics and Biophysics and its role to a better understanding of the functioning of living organisms.

The basic forms of matter. Four kinds of interactions. Laws of conservation. Subject of biomechanics.

Biothermodynamics: basic concepts. First principle and its application for the determination of energetic content of biosubstances. Second principle of thermodynamics equilibrium and stationary state. Thermodynamic potentials: free energy, chemical and electromechanical potentials. transformation of energy in living systems – energy conjugating systems. Basic

physical characteristics of oscillatory motion. Addition of harmonic oscillations. Random oscillations and their harmonic spectrum. Self-excited oscillations. Oscillation process in living systems. Propagation of waves in anelastic medium. Equations of a plane a spherical wave. Energy of an elastics wave. Acoustic waves. The physical basis of audiometry and application in medicine. The Doppler effect for sound waves. Ultrasound. Piezoelectric effect. Electrostriction. The ultrasound generator. The effects of ultrasound. Some medical applications of ultrasound. Infrasound. Harmful effects of infrasound and noise. Electric conduction of cells and tissues for direct and altering currents. Impedance. Impedance dispersion. Ions. Electrolytic application of Ohm's law. Dielectric polarisation. Electrophoresis. Stimulation with electric pulses. Medical application of electric pulses. Magnetic field. The Bion-Savart law. Magnetic field in a substance. Ferromagnetism, diamagnetism and paramagnetism. Biomagnetism and Magnetobiology. The complete electromagnetic spectrum. Thermal radiation. Kirchhoff's law. Infrared and ultraviolet radiations and their application in medicine. Interaction of light with matter. Absorption spectra. Bouguer's law. Polarisation of light. Types of polarisation. Polarimetry. Polarisation microscopy. The biological effects of light. Fiber optics. Optical activity. Diffraction. Roentgen-structural analysis. The principal characteristics of quantum theory. Quantum numbers. Chemical bonds. Bond energies. Vander Walls bonds. Hydrogen bonds. The energy states of molecules. The electronic structure of solids /macromolecules/. Energy band model. Common features in the structure and function of macromolecules/proteins and nucleic acids/. Interaction with atomic systems. Emission, absorption and scattering of light. The law of radiation attenuation. Luminescence. Emission and absorption spectrometry in medicine. Mechanism of luminescence, fluorescence and phosphorescence. Induced emission. Laser beam. Laser light in medical practice. X-ray sources and their spectra. Braking and characteristic radiation. Interpretation of X-ray spectra. Some problems of X-ray diagnostic Image formation. Computed tomograph. The de Broglie equations. Electron microscopes. Mass and binding energy of a nucleus. nuclear forces, radioactivity. Radioactive isotopes. The decay law. Biological half-life. Nuclear radiation and its applications. Cosmic radiation. Measurement of nuclear radiations. Dosimetry basic concepts. Biological dose. Dose equivalent. Radioactive isotopes as tracers. Ionising radiation and the living organism. Radiation hazard and chemical hazards. Therapeutic radiation sources. Particle accelerator in medicine.

Biophysics

Structure and some properties of biological membranes. Fluid-mosaic model of the structure of biological membrane.

Membrane permeability. Ion channels. Transport phenomena. Transport phenomena in gases. Basic law of transport. Diffusion: free diffusion, non-free diffusion. Thermoconduction. Inner friction. Blood viscosity. Chromatographic separation of multi-component systems. Passive and active transport. Na—K ATPase. Artificial membranes. liposome. Medical applications of artificial membranes. Diffusion. Fick's law of diffusion. Donnan model /equilibrium model/.

Osmosis. Osmotic pressure. Filtration. Skeletal muscle and its organization. Reactions. Muscle contraction as a conjugated mechano-chemical process. Hill's equations. Electrical characteristics of skeletal muscle. Ion distribution and fluxes. Contractile responses. molecular basis of contraction. relation between muscle length, tension and velocity of contraction. Genesis of the membrane potential. Electric properties of resting cells.

Resting potential and the Goldman-Hodgkin-Huxley-Katz model /transport model/. Electric properties of excited cells.. The electric model of the action potential. Propagation of the action potential. Voltages recorded on the surface of the body. Electrocardiography. Potential connected with cerebral and muscular functions and with light sensation.

Initiation of impulses in sense organs and receptors. Signal transduction signal conversion. Threshold intensity.

Hearing /as an example of sensory function/. Energy transmission. Analysis of the mechanical stimulus in the cochlea.

Vision /as an example of sensory function/. The photoreceptor mechanism. electroretinogram. Information and entropy. Communication systems. Feedback mechanisms.

Professional Latin Language

History of the Latin language. Alphabet. Pronouncing of vowels. Orthography of "y" in medical terminology. Diphthongs. Pronouncing of consonant letters. Pronouncing of consonant letters /continuation/. Letter combinations. Graphs. Grammatical categories and lexical forms of noun. I declension of noun. II declension of noun /masculine and neutral genders/. III, IV, V declension of noun. Grammatical categories of adjective. I and II groups of adjective. Degrees of comparison. Coordinated and uncoordinated attributes. Grammatical categories and lexical forms verb. Definition of stem. Imperative mood.

Adverb. Pronoun Prescription. Abbreviations for inscription, subscription and signa. Clinical terms, Ancient proverbs and idiomatic expressions

Medical Biology

The subject Medical Biology is aimed to present to students the basics of the contemporary knowledge about biological processes bearing in mind their medical orientation and their future work in medical practice which is changing and improving in accordance to the scientific progress in biomedical sciences. Therefore modern biological concepts are presented to students in an integrated manner using important medical examples. After mastering the subject medical biology students should be able to follow new trends in biomedical sciences important for full understanding of preclinical subjects.

Georgian Language 1, 2 and 3

The Period before ABC (greeting, apologize, thanks). Phonetic. Georgian vowels (a, e, i, o, u). Consonants (b, g, d, v, l, m, n, r, s). Specific consonants (k, t, p, w, W, y, x) Acquaintances. Grammar: The verb „to be” yofna (aris) in Present. Personal Pronouns, Countries, cities. Georgian proper names. The towns and rivers of Georgia. My family. Grammar: Numerals. About me. Grammar: Declension of the nouns. Grammar: The use of numerals. Subjective Personal markers. Grammar: The Verbs: to study - My day. Grammar: the verb „to have” qona, yola – maqvs, myavs Meals.

Grammar: The number of the nouns. Animals. Grammar: Objective Personal markers. Colors. Grammar: The Objectives. In the Shop, at the Market. Grammar: The verbs: to sell, to buy, to give In the pharmacy. Grammar: The verb „to be” (aris) in Past and Future tenses. Furniture. Grammar: Postpositions - ze, - Si, -Tan, -Tvis, - viT. Telephone talk. Grammar: Postpositions, Seasons, The weather. Grammar: The verbs: it's cold , it's warm, Traffic. Travel. Lexical-Grammar exercises. At the Gents` s. Studying and Education; At school. At university. Grammar: Interrogative sentence The school and teachers. At a Public Library. Grammar: Interrogative sentence. At the book-shop. Grammar: Word-building. At the book-shop. Grammar: Word-buildin Application. Grammar: Future tense. Dialogue by pictures. Grammar: The Verbs: to love , to hate Bus travel; Traveling by car; air Travel. Excursion. Autobiography. Grammar: Imperative mood. My City and country. Grammar: Predicate; Subject. Nations, countries and towns. At the hotel. Hotel Services. Grammar: Agreement

of the Predicate and Subject in number. Dictation, Lexical-Grammar exercises. At the Restaurant; Synonyms. Grammar: The attribute declension of adjective Antonyms (colors, the Adjective); Grammar: The Attribute declension of adjective In the theatre; At the Exhibition. In the cinema. Grammar: Adverbial modifier Phone Dialogues. Grammar: Conjunction of Verbs: Past and Future tenses. Lexical unit. Means of politeness. Grammar: Verbs (to sit).

Human Physiology I

The physiology and its history. The physiology as a background of the clinical and experimental medicine. Physiological methods of investigation. Acute and chronic experiments. Registration of physiological processes. .

Energetic, chemical and informative maintenance of body functions. Homeostasis and homeokinesis – the process of stabilization of the internal environment – is essential of the cells of the body are to function normally.

Physiology of neuron. Origin of the resting membrane potential. Generation of action potential and its propagation. Factors determining the conduction velocity of fibers. Structure and function of synapses. Pharmacology of synaptic transmission. Neuro-muscular transmission. Transduction of sensory stimuli into nerve impulses. Contraction of muscle. Different morphological and functional characteristics of the three principal types of muscle. Excitation-contraction coupling. Molecular mechanisms of muscle contraction. Sources of energy for muscle contraction.

Mechanics of muscle contraction. Characteristics of whole muscle contraction. Properties of cardiac and smooth muscles. Organization of the nervous system. General design of the central nervous system. Processing of information. Neuronal circuits. Processing of signals in neuronal pool. Sensory system. Somatic and special senses. Afferent fibers and their physiologic classification. Sensory pathways for transmitting somatic signals into the central nervous system. Function of the thalamus. Sensory cortex. The physiology of motor system. Motor functions of the spinal cord. Motor cortex and corticospinal tract. The control of posture. Motor functions of the basal ganglia. The role of the cerebellum in motor control. States of brain activity. Evoked and spontaneous electric activity. The brain waves and use of the EEG to monitor cerebral function in humans. The physiology of sleep and wakefulness. Control of cerebral activity by ascending signals from the brain stem and limbic system. Intellectual functions of the brain. Behavior. Learning and memory. The organization of the pathways that control speech. The autonomous nervous system.

Sympathetic and parasympathetic divisions and their functions. Chemical transmission in the autonomous nervous system. Central nervous control of autonomic activity. The hormonal regulation of the body. The concept of glands, hormones and target tissues. The principles of hormone action. Role of the CNS in the regulation of the endocrine system via the hypothalamic-pituitary axis. The properties of blood. The principal roles of the blood and its constituents. The physical and chemical characteristics of the red blood cells. Blood clotting. Vascular-platelet and coagulative hemostasis. Clot retraction and dissolution. Blood types. Resistance of the body to infection. The heart. The initiation of the heartbeat. The ECG. The heart as a pump. The cardiac cycle. The regulation of heart function. The hemodynamics. Vascular distensibility and functions of the arterial and venous system. The microcirculation and capillary fluid exchange. The local control of blood flow. Rapid and long-term regulation of arterial pressure. Regulation of cardiac output and venous return. The respiratory system. The pulmonary ventilation. The principles of gas exchange in the alveoli. Transport of oxygen and carbon dioxide in blood. The regulation of respiration. Respiration in high altitudes. The digestive system. The general principles of gastrointestinal function. The secretory, motor and absorptive function of gastrointestinal system. Secretion of bile by the liver and its role in the fat digestion and absorption. The factors, that regulate hunger, appetite and satiety. Urine formation by the kidney. Glomerular filtration. Renal blood flow. Tubular reabsorption and secretion. The homeostatic function of kidney. Regulation of extracellular fluid osmolarity. Integration of renal mechanisms for control of blood volume and extracellular fluid volume. Regulation of acid-base balance. Metabolism. Energetic and metabolic rate. Dietary balances. Thermoregulation. The heat production and loss. The nervous and hormonal mechanisms of thermoregulation. Supreme functions of central nervous system and its mechanism. Regulation of functions via conditional and unconditional reflexes. Different functional types of central nervous system. Sleep, emotion, motivation.

Basics of Molecular Genetics

The role of genetics and genomics in medicine. Human genome and chromosomes. Regulation of gene expression and its relation to medicine. Genetic diversity in humans. The concept of genetic polymorphism. Hereditary variability and DNA polymorphism. Hereditary variations and protein polymorphism. Genotypes and phenotypes in populations. Main concept of single-gene inheritance. Genetic analysis of multifactorial diseases. The relative role of genes and environment in the formation of multifactorial diseases. Modern methods of human molecular study. Analysis of individual DNA and RNA

sequences. PCR – polymerase chain reaction. Analysis of DNA sequence. FISH – fluorescence in situ hybridization. Western-blot analysis of proteins. Modern approaches to the treatment of genetic diseases. Gene therapy. Risks associated with gene therapy. Personalised genetic medicine. Development of new directions in pharmacogenetics and pharmacogenomics.

Medical Parasitology

The course of Medical Parasitology includes medical ecology and studies the impact of ecological factors on normal functioning of human organism. It studies the basic principles of the origin and development of anthro-po-ecological systems. Parasitic diseases represent a major global problem nowadays, especially in the countries of the third world, where millions of people die due to parasitic disease annually. The course of Medical Parasitology studies the biology of parasites, united in various systematic groups: their classification, morphologic characteristics, biochemical and physiologic aspects of their vital activity, their life cycle in host organisms, including humans

Pharmacy Care I

Bioethics

Biomedical Ethics and Ethical Theories. Principles of Biomedical Ethics (Principle of Nonmalificence, Principle of Beneficence, Principle of Respect for Patient Autonomy, Principle of Justice, Rule of Veracity, Rule of Confidentiality).

Key stages of development and establishment of pharmaceutic bioethics; pharmacy and bioethics; ethical aspects of introduction of the therapeutic agents in medicine; falsification of medicines as the result of violation of ethical norms; description of contemporary pharmaceutic market from the viewpoint of bioethics; pharmaceutical assistance and protection of the consumers' rights; establishment of the national service of pharmaceutical supervision; training and re-training of the health professionals in the sphere of assessment of benefits, risk and reasonable application of the therapeutic agents; changing of the stereotypes on the work of physicians for the purpose of elimination of prescribing unnecessary and unreasonable medicines; changing of the patients' attitude towards unknown medicines and especially self-treatment; development and replication of the education and

information programs for the medical and pharmaceutical professionals; identification and study of undesirable side effects;

Physician-Patient Models & Patient Autonomy. Hospitals Ethics Committees. Ethical, Theological & Medical reflections on the concepts of Death & Life. The Morality of Euthanasia. The definition & criterion of Death.

The Morality & Rationality of Suicide. The Refusal of Life-sustaining Treatment Suffering & Palliative Care. Moral problems of Reproductive Technologies (Artificial Insemination, In-vitro Fertilization, Surrogate Motherhood). Moral Problems of Genetics. Genetic Manipulation with Human Beings. Human Cloning. Ethical problems of Eugenics. Prenatal Diagnosis & Selective Abortion. The Morality of Abortion & Maternal-Fetal Conflicts. On the Moral & Legal Status of Fetus. Ethical Issues in Transplantology (Moral Problems of Human Rights Defense in Transplantology. Recipient Selection criteria). The Ethical Implications of Fetal Tissue Transplantation & Xenotransplantation.

Ethical Issues Regarding the Mentally Ill & the Mentally Retarded. Mental Health as rational Autonomy. Involuntary Hospitalization & Deinstitutionalization. Sterilization & the Rights of the Mentally Retarded. Declaration of General & Special Rights of the Mentally Retarded.

HIV infections/ AIDS. Ethical Issues in Human Experimentation.

Trafficking, trading with people transplantable organs and tissues – ethical and legal issues. Justice & Health-Care Policy. Autonomy, Equality & a Just Health-Care System. Justice & Health-Care System. Allocation & the Problem Rationing. Human Rights & Medical Personal Responsibilities in International Documents (Biomedical Research, Prisoners, Human Genome).

Organic Chemistry I

Bonding in organic compounds. Effects of substituents. Moieties and functions. Electronic configuration of organogens. Delocalization in organic compounds. Stereostructure of organic molecules. Stereochemical formulae. Chirality. Stereochemical nomenclature. Enantiomers and diastereomers. Conformation in acyclic and cyclic compounds. Stereoselectivity of leads and drugs.

Acid-base properties of organic compounds. Acidity and basicity, as important characteristics of organic compounds conditioning their physical-chemical properties and

biological activity. Bronsted-Lowry theory. Lewis theory. Use of principle of hard and soft acids and bases for prognostications of feasible interactions among various reaction centers.

Alkanes and cycloalkanes. General overview. Preparation methods. Physical properties. Halogenation, nitration, sulphohalogenation, sulphooxidation of alkanes; dehydration, oxidation, isomerization and cracking. Representatives of alkanes and cycloalkanes. Spectroscopic identification.

Alkenes and alkadienes. General overview. Preparation methods. Physical properties. Electrophilic, nucleophilic and radical addition reactions in alkenes. Oxidation and reduction. Electrophilic and radical addition reactions in conjugated alkadienes. Representatives of alkenes and alkadienes. Spectroscopic identification.

Alkynes. General overview. Preparation methods. Physical properties. Electrophilic and nucleophilic addition reactions in alkynes. Oxidation and reduction. Acidic properties of alkynes. Dimerization and cyclooligomerization. Representatives of alkynes. Spectroscopic identification. General overview and chemical properties of synthetic polymers.

Arenes. General overview. Preparation methods. Physical properties. Mechanism of electrophilic substitution in arenes. Effects. Acidic properties of arenes. Effect of a substituent on reactivity and orientation of electrophilic substitution. Most important reactions of monocyclic and fused arenes. Representatives of arenes. Spectroscopic identification.

Alkyl halides. General overview. Preparation methods. Physical properties. Nucleophilic substitution at tetrahedral carbon. The mechanisms of nucleophilic substitution. Elimination. Nucleophilic substitution and elimination as competitive reactions. Representatives of alkyl halides. Spectroscopic identification.

Alcohols. General overview. Preparation methods. Physical properties. Acidic properties of alcohols. Nucleophilic and electrophilic reactions. Reactions of α -acidic center. Oxidation. Representatives of alcohols. Phenols. General overview. Preparation methods. Physical properties. Acidic properties of phenols. Reactions occurring at electrophilic and nucleophilic centers. Electrophilic substitution into aromatic ring. Oxidation and reduction of phenols. Representatives of phenols. Spectroscopic identification.

Ethers. General overview. Preparation methods. Physical properties. Basicity of ethers. Halogenation, oxidation of ethers. Electrophilic substitution into aromatic ethers. 1,2-epoxides. Sulphur-containing organic compounds. Thiols, thioethers and sulphides. General overview. Preparation methods. Physical properties. Their basicity, acidity and nucleophilicity. Representatives of sulphur-containing compounds. Spectroscopic identification.

Aldehydes and ketones. General overview. Preparation methods. Physical properties. Reactions with oxygen-, nitrogen-, sulphur- and carbon-containing nucleophiles. Oxidation and reduction of carbonyls. Representatives of simple carbonyl compounds. Spectroscopic identification.

Carboxylic acids. General overview. Preparation methods. Physical properties. Nucleophilic substitution reactions. Acidity. Decarboxylation and halogenation. Representatives of simple carboxylic compounds. Spectroscopic identification.

Derivatives of carboxylic acids. Acyl halides. Anhydrides. Esters. Amides. Nitriles. Their preparation, physical and chemical properties.

Medical Microbiology

Systematization and nomenclature of microbes; Morphology of bacteria, fungi, prokaryotes, viruses. Physiology of bacteria, fungi, prokaryotes, viruses. Bacteriophage; Distribution of microbes in the environment and their role in substance recycle. Human organism microflora. Disbacteriosis; Influence of environmental factors (physical, chemical, biological) on microbes. Destruction of microbes in the environment. Sanitary microbiology. Microbial genetics, biotechnology, pharmaceuticals against microbes; Infectious process and infectious disease; Characteristics of microbes causing infectious disease; Pathogenic factors of microbes; Term epidemiological process. Ecological epidemiological classification of infectious disease. Immune system and non specific resistance factors; Antigens and human immune system; Primary forms of immune reactions. Characteristics of immune system depending on localization and condition. Immunodiagnostic reactions and their use for immunoprophylaxes and immunotherapy. Principles of microbiological diagnostics of infectious disease; aerobic gram positive cocci; aerobic gram negative cocci. Enterobacteria; Vibrions; Gram negative aerobic rods; Gram negative anaerobes; Spore forming gram positive rod. Corynebacteria, micobacteria, aktinomycete, nocardia; Spirochete, Campylobactery, Helicobactery, spirals; Rickettsia, Chlamydia, Micoplasma; RNA-containing viruses (picornavirus, reovairus), flavi, toga, bunia, orthomixo, paramixoviruses; rabdo-, filo-, corona-, retro-, arena-, calciviruses; DNA-containing viruses (parvo-, papova-, pox-, adeno-, hepadna-, circinovirus); Slow viral infections and prion type disease; Oncogenic viruses; Superficial mycoses, epidermomycoses, systemic mycoses, opportunistic mycoses, micotoxycosis. Non classified pathogenic fungi; Sarcodines, Ciliates, Sporozoans, blastomycetes.

Clinical Skills

The aim of the course is to provide students with basic clinical skills (manipulations) technique knowledge and ability to perform their skills using manikins and simulators and to discuss related clinical cases. Teaching process of the course is performed with practical lessons for II year students of faculty of medicine. The duration of the course is 9 days of practical lessons and final exam . At practical lessons clinical skills are demonstrated and then separately performed by each student on manikins and simulators. Proper clinical models/cases are discussed. At the end of the course there is an exam in basic skills of patient care.

Analytical Chemistry

Analytical Chemistry and chemical analysis. Evaluation of sensitivity of analytical reactions. Preparation of analytical samples. Analytical classification of cations and their groups. Acid-base classification of cations and their groups. Systematic classification of cations via acid-base method. Analytical classification of anions and their groups. Qualitative analysis of anions. General theoretical background of analytical chemistry. Principles of the theory of electrolytes as applied to analytical chemistry. Rate laws, law of mass action and applications in analytical chemistry.

Heterogeneous equilibrium in the system of precipitate-saturated solution of poorly soluble electrolytes; its importance in analytical chemistry. Acid-base equilibrium and its importance in analytical chemistry. Hydrolysis. Evaluation of pH of solutions of products of salt hydrolysis. Application of the concept of hydrolysis in analytical chemistry. Buffer systems. Calculations of pH of buffers. Buffer capacity. Application of buffer systems in analytical chemistry. Statistical procession of results of quantitative analysis. Evaluation of confidence intervals. Quantitative chemical analysis. Classification of methods of quantitative analysis. Gravimetric analysis. Titrimetric analysis. Basic definitions. Principles of selection of agents and reactions for titrimetric use. Units of concentrations. Classification of methods of titrimetric analysis. Types of titration. Measuring the endpoint of a titration. Acid-base titration (the method of neutralization). Theory of acid-base indication. Titration curves of neutralization. Errors on indication. Calculation and protection from the errors. Redox equilibrium and its importance in analytical chemistry. Redox titration. Redox indicators. Permanganate and dichromate as oxidizing agents. Iodometric titration. Iodatometric, bromatometric, bromometric and titritometric method.

Equilibrium of complex formation and its use in analytical chemistry. Complexometric titration. Titrants used in Complexometric titration. Equilibrium of aqueous solution of complexes. Composition and stability of metal complexes. Indicators of complexometric titration. Types of complexometric titration. Errors on indication. Application of complexometric titration in analytical chemistry. Precipitation titration and its indication. Argentometric, thiocyanatometric and sulfatometric methods. Acid-base titration in non-aqueous environments. Analytical methods of separation and concentration: precipitation, co-precipitation, extraction. Their use in pharmaceutical analysis. Principles of chromatographic methods

Basics of Hygienic in Pharmacy

Environment and health. Importance of creating safe and healthy environment for human. Sources of environment pollution.

Characteristics of air.

Atmospheric air, its chemical composition and physical properties. Influence of atmospheric air pollution on human health.

Water as a health factor

Natural chemical composition of water and influence of polluted water on human health. Epidemiological importance of water. Provision of safe drinkable water to people. Hygiene norms of drinkable water.

Soil and its influence on human health. Geochemical, toxicological and epidemiological importance of soil. The ways of polluting human organism by toxic agents from soil. Prevention of chemical and biological pollution of soil and reduction of health risks caused by these factors.

Pharmacy hygiene, Hygiene norms of organizing and equipping a pharmacy, Characteristics of pharmacy business, Personal and work hygiene of pharmacy staff, Hygiene requirements of sanitation of pharmacy, Sanitary-educational training in pharmacy

Hygiene requirements of drug quality control laboratory, Pharmacies of medicinal and prophylactic facilities, hygiene of pharmaceutical wholesaler

Hygiene norms of chemico-pharmaceutical industry, Hygiene requirements of synthetic drug manufacturers

Hygiene of antibiotics production, major toxicities and toxicological characteristics of chemical compounds. Improvement of work environment. Hygiene requirements of galenic and neogalenic drug production.

Hygiene characteristics of work area conditions during production of phytodrugs, ampoules, tablets, dragees.

Sanitary-hygiene and medicinal-prophylactic arrangements of above mentioned industries. packaging and labelling of ready drug forms.

Pathology I and II

Basic nosology. Main terms. Study about diseases, etiology, pathogenesis, morphological substrate of disease. Basic pathologies of the cell, pathogenesis of hypoxia. Local and primary reactions of human organism on damaging agent. Primary adaptational syndrome. Reactions of acute phase. Activation of proteolytic system. Primary reactions of human body on disease, shock, collapse and coma. Mechanism of influence damaging factors on organism and results.

Damaging mechanism of radiation energy. Mechanical and thermal factors damaging activity.

Pathology of local blood circulation and microcirculation: arterial hyperemia, venous hyperemia, ischemia, stasis, thrombosis, embolus.

Inflammation, etiology of inflammation, signs of inflammation, blood vessel reaction during inflammation, morphological picture of inflammation. Inflammation mediators and their mechanism of action.

Organism's hypersensitivity (allergy). Basic pathogenesis of hypersensitivity reactions.

Carbohydrate and water metabolism pathology.

Lipids and proteins metabolism pathology.

Blood pathology; Variations of circulating blood volume. Pathology of erythrocytes and hemoglobin. Pathogenesis of anemia and erythrocytosis. Leukocyte pathology; pathogenesis of leucosis.

Pathology of blood circulation: mechanisms involved in impaired blood circulation, pathogenesis of coronary insufficiency. Heart arrhythmias, their mechanism, mechanism of blood vessels tone pathology.

Pathology of the respiratory system: Mechanisms of respiratory failure; Types of impaired breathing act and its mechanisms.

Pathology of the digestive system.

Pathology of the liver, pathogenesis of kernicterus.

Pathology of the kidney.

Endocrine system pathology. Central nervous system pathology

Scientific Skills

Instrumental Methods of Analysis

Instrumental methods of analysis, the main tasks and importance in drug analysis; classification of the methods, The equipment used in pharmaceutical analysis; measurement errors, their sensitivity, accuracy, selectivity and calibration Optical methods of analysis, classification; main principles of optical equipment, refractometry, interferometry, polarimetry Optical methods based on molecular and atom emissions; visual colorimeter, nephelometer, photometer; Molecular-absorptive and atom-absorptive optical methods; photometer, turbidimeter, optical laws of absorption; Methods spectrophotometer analysis, UV/Mass/IR spectrometry Overview of electrochemical methods, classification, their importance in drug analysis; Potentiometry, potentiometric titration, characteristics of electrodes Conductometry, Polarography, polarographic methods in drug analysis Classification of chromatographic methods, their importance in analysis of drugs Paper chromatography, Thin Layer Chromatography, R_f values, mobile and immobile phases, start and finish line, process of sorption and desorption Column chromatography, Ion-exchange Chromatography, ion capacity, ion equilibrium; High Performance Liquid Chromatography, Schematic design of the method, mobile and immobile phases, chromatographic columns, detectors, registering parts, injectors, drug analysis and factors affecting it. Gas Chromatography, gas transducers, detectors, chromatographic columns, main principles of the method, analysis of gaseous substances, importance of this method in chemico-toxicological analysis. Chromato-mass spectrometry, identification of composition of unknown substances and their analysis, main principles of the method, absorption lines, importance of this method in chemico-toxicological forensic analysis.

Basics of Biochemistry

Metabolic Fuels and Dietary Components; The Fed or Absorptive State. Fasting; DEE-daily energy expenditure; Xenobiotics.

Water, Acids, Bases, and Buffers; Acid-Base Balance of the body;

Amino Acids and Proteins; General Structure of the Amino Acids; Classification of Amino Acid Side Chains; Variations in Primary Structure; Modified Amino Acids
Structure-Function Relationships in Proteins; General Characteristics of Three-Dimensional Structure ; The Three-Dimensional Structure of the Peptide backbone; Secondary, Tertiary and Quaternary Structures; Quantization of Ligand Binding
Structure-Function Relationships in Myoglobin and Hemoglobin;
Enzymes as Catalysts; classification, mechanism of action; Functional Groups in Catalysis; Optimal pH and temperature. Mechanism-based Inhibitors.
Vitamins. Classes of vitamins; functions; Examples of hypo- and avitaminoses.
Cell Signaling. Chemical Messengers - General Features of Chemical Messengers; Intracellular Transcription factor Receptors;
Cellular Bioenergetics: ATP and O₂. sources of acetyl-CoA; Reactions, enzymes and coenzymes of the TCA Cycle
Synthesis of ATP from glucose. Glycolysis. Functions of glycolysis. Regulation of Glycolysis.
Carbohydrates digestion, absorption, transport.
Gluconeogenesis.
Glycogen synthesis and degradation.
Changes of blood glucose level and the major hormones of metabolic homeostasis. Insulin and Glucagon, their role in regulation of carbohydrate metabolism.
Oxidation of fatty acids; metabolism of ketone bodies;
Digestion, absorption and transport of lipids.
Triacylglycerol metabolism;
Lipoproteins. Cholesterol metabolism. Transport of cholesterol by lipoproteins. Lipoproteins' receptors. Biochemical aspects of atherosclerosis. Regulation of lipid metabolism
Digestion of proteins and absorption of amino acids.
Detoxification of ammonia
Thermodynamics of surface layer. Surface tension. Physical phenomena on surfaces. Wetting.
Adsorption. Molecular mechanism and thermodynamic analysis. Gibbs' adsorption isotherm. Langmuir and Freundlich equations. Adsorption of electrolytes. Chromatography.
Dispersed systems. Classification, preparation, purification. Molecular-kinetic and optical properties of colloids. Brownian motion. Diffusion. Sedimentation-diffusion equilibrium. Osmotic pressure in colloids.
Electrokinetic phenomena. Electrophoresis. Electro-osmosis. Sedimentation and streaming potentials. Methods based on electrophoresis and their use in medicine.

Structure of colloid particles. Electrical double layer. Theory of micelle. Electrokinetic potential.

Kinetic and thermodynamic stability of colloids. Flocculation. Flocculation threshold. Flocculation with electrolytes. Protection of colloids. Theories of flocculation and coagulation. Peptization.

Various classes of colloids. Aerosols, powders, foams, suspensions, emulsions.

Micellar solutions of surfactants.

Macromolecules. Correlation between structure and properties. Dissolution and swelling of polymers. Factors affecting swelling. Viscosity of polymer solutions. Staudinger and Mark-Houwink equations.

Polyampholytes. Isoelectric point. Polymeric nonelectrolytes and polyelectrolytes; their osmotic properties. Donnan membrane equilibrium. Factors affecting stability of polymer solutions. Desalination, coacervation. Gels. Their prope

Physical and Colloidal Chemistry

Foundations of physical and colloid chemistry. Principal stages of its development. The place of physical chemistry among other disciplines of natural science. Importance of physical and colloid chemistry for pharmacy.

Foundations of thermodynamics. Thermodynamic systems and processes. Work and heat. Internal energy of a system. Enthalpy.

First law of thermodynamics. Thermochemistry. Thermal effects. Hess's law. Dependence of heat of the processes on temperature. Kirchhoff's law.

Second law of thermodynamics. Entropy and its change during phase transitions and chemical reactions. Third law of thermodynamics. Absolute and standard entropies.

Thermodynamic potentials. Helmholtz energy (isochoric-isothermal potential). Gibbs energy (isobaric-isothermal potential). Spontaneous processes. Criteria of spontaneity in closed and open systems. Chemical potential. Criteria of thermodynamic equilibrium in various conditions.

Law of mass action. Thermodynamics of chemical equilibrium. Equilibrium of phase transitions. Gibbs' phase rule. Prognostication of phase transitions at condition variations. One component systems. Phase diagrams. Clausius-Clapayron equation.

Two-component systems. Thermal analysis. X-ray phase analysis.

Thermodynamics of dissolution. Ideal solutions. Raoult's law. Henry's law. Dalton's law. Real solutions. Relationship between compositions of vapor (gas above solution) and of solution. Konovaloff's laws. Azeotrope. Partial molar properties. Activity and fugacity.

Colligative properties of solutions of nonelectrolytes and electrolytes. Osmotic pressure and its importance for living organisms (plants and animals). Isotonic (van 't Hoff's) factor.

Theory of strong electrolytes. Determination of activity coefficients of solutions. Binary blends of liquids. Blends of liquids having mutually restricted (limited) miscibility. Separation of miscible liquids. Fractional distillation. Rectification. Separation of immiscible liquids. Steam distillation. Three component systems. Partition coefficient. Extraction.

Electrolytic conductivity. Specific conductivity, equivalent conductivity and their dependence on various factors. Kohlrausch's law. Velocity and ion mobility coefficients. Conductometry and its importance for pharmacy.

Thermodynamics of electrode processes. Electrode and redox potentials; their origin. Nernst and Peters equations.

Diffusion and membrane potentials. Resting potential. Potentiometric analysis and polarography and their importance for medicine and pharmacy.

Chemical reaction rate and its measurements. Molecularity and reaction order.

Mechanisms of chemical reactions. Collision theory. Experimental methods of measuring shelf life of medications. Understanding Transition State theory (TST). Chain and photochemical reactions.

Homogeneous and heterogeneous catalysis.

Pharmacognosy I

Pharmacognosy discipline, its tasks and importance in medicine and pharmacy. Short historical overview of pharmacognosy development. Traditional systems of medicine.

Chemical composition of officinal plants. Substances of primary and secondary synthesis. Mineral substances. Active, additive and adjacent substances.

Raw materials of officinal plants, basics of their preparation: Gathering, Primary treatment, Drying, Standardization, Packaging, Labeling, Storing.

Standardization of officinal plants, normative documents, quality control of raw material, major methods of pharmacognostic analysis of raw materials. Pests of raw materials and the ways of eliminating them.

Carbohydrates: mono- and oligosaccharids. Polysaccharids: inulin, mucus, gum, pectin, plants and raw materials containing above mentioned substances.

Vitamins – characteristics, classification (Lipid and water soluble vitamins). Plants and raw materials that contain: carotins, vitamin K, vitamin C.

Lipids – ways of obtaining it, characteristics, classification, properties, biosynthesis and factors influencing accumulation. Plants and raw materials that contain lipids.

Terpenoid containing officinal plants and raw materials. Essential oils and essence plants. Acyclic, monocyclic and bicyclic monoterpenoids. Aromatic compounds of sesquiterpenes, plants and raw materials that contain them.

Glycosides – cardiac glycosides classification, purification, identification, properties, use in medicine. Plants and raw materials that contain them.

Characteristics of Saponins, classification, steroidal and triterpenoid saponins, plants and raw materials that contain them.

Bitter glycosides, iridoids and plants and raw materials that contain them.

Thioglycosides and cyanogenic glycosides, plants and raw materials that contain them.

Characteristics of alkaloids, classification, distribution in plants, research methods and use in medicine.

Acyclic and side chain nitrogen containing pyrrolidines and piperidines condense nuclei, pyrrolidine and pyrrolizidine alkaloids and plants that contain them. Plants and raw materials that contain alkaloids produced from quinolizidine, quinoline, isoquinoline and indole derivatives. Plants and raw materials that contain purine, diterpenoid and steroid alkaloids.

Phenolic compounds, classification, simple phenols, characteristics of chromones, coumarines and lignans, classification, distribution in plants, medico-biological importance of containing plants and raw materials.

Characteristics of flavanoids, classification, distribution in plants, research methods, medico-biological importance of flavanoid containing plants and raw materials. Substances and plants with P-vitamin activity.

Characteristics of anthracene derivatives, classification, distribution and localization in plants, medico-biological importance. Plants and raw materials containing anthracene derivatives.

Tannic substances, characteristics, classification, distribution in plants and use in medicine. Plants that contain tannic substances. Sources of tannic substances.

Animal lipids. Lipid like substances. Raw material of animal origin.

Organic Chemistry II

Amines. General overview. Preparation methods. Physical properties. Acidic, basic and nucleophilic characteristics. Electrophilic substitution into aromatic amines. Representatives of amines. Nitro-group containing compounds. Physical and chemical properties. Spectroscopic identification.

Hydroxy and keto acids. General overview. Preparation methods. Physical and chemical properties. Keto-enol tautomerism. Representatives of hydroxy and keto acids.

Amino acids. General overview. Preparation methods. Physical and chemical properties. α -, β - and γ -amino acids and their characteristic reactions. Lactams, diketopiperazines. Biologically important amino acids and their derivatives.

Electronic and spatial structure of peptide bonds. Primary structure of peptides and proteins. Amino alcohols and amino phenols.

Monosaccharides. Their classification. D and L stereochemical series. Epimers. Tautomers. Mutarotation. Conformations of important D-hexopyranoses. Chemical properties of monosaccharides.

Oligosaccharides. Reducing and nonreducing sugars. Tautomerism. Hydrolysis and methanolysis of disaccharides. Polysaccharides. Homo and hetero polysaccharides. Their ethers and esters, such as acetates, nitrates. Amylose. Amylopectin. Glycogen. Cellulose. Dextrans. Carboxymethyl- and diethylaminoethylcellulose.

Heterocyclic compounds. Five member heterocycles with one and two hetero atoms. Aromaticity. Acid-base properties. Electrophilic substitution. Acidophobicity. Understanding tetrapolar compounds.

Six member heterocycles with one and two hetero atoms. Aromaticity. Basicity. Electrophilic and nucleophilic substitution. Lactim-lactam tautomerism of hydroxy derivatives. Alkylpyridinium and its reaction with hydride ion presents chemical background for NAD^+ redox processes. Uracil, thymine, cytosine.

Seven member heterocycles. Diazepine. Benzodiazepine. Leads and drugs of the benzodiazepine series. Fused heterocycles. Purine. Aromaticity. Hypoxanthine. Xanthine. Uric acid. Adenine. Guanine. Lactim-lactam and amino-imino tautomerisms. Alkaloids. Their classification. Basicity. Salt formation. Representatives of alkaloids.

Nucleosides and nucleotides. Nucleoside mono- and polyphosphates. Their hydrolytic behavior. Ribonucleic and deoxyribonucleic acids. Their primary structure. Nucleoside polyphosphatic and dinucleotide co-ferments: ATP, NAD^+ , NADP^+ .

Saponifiable lipids. Triacylglycerides (fats, oils). Highest fatty acids, such as palmitic acid, linoleic acid, arachidic acid. Hydrolysis of fats and oils. Hydration. Oxidation. Iodine number. Saponification value. Acid value. Waxes.

Nonsaponifiable lipids. Terpenes and terpenoids. Rule of isoprene. mono and bicyclic Terpenes. Mono-, di-, tri- and tetraterpenes. Steroids. Steran. Cholestan. Cholane. Pregnane. Estrane. Androstane. Sterins. Cholic acids. Corticosteroids, estrogens, androgens. Aglycones of cardiac glycosides.

Comparative analysis of reactivity of selected classes of organic compounds

Immunology

Introduction to the Immune System. Cells, Tissues, and Organs of the Immune System. Inflammation. Complement System. Mechanisms of Innate Immunity. T Cell Receptors and MHC Molecules. Antibodies. Antigen Presentation. Cell Cooperation in the Antibody Response. Cell-mediated Cytotoxicity. Regulation of the Immune Response. Defence Against Infectious Agents. Immediate Hypersensitivity (Type I). Hypersensitivity (Type II). Hypersensitivity (Type III). Hypersensitivity (Type IV) Primary Immunodeficiency. Secondary Immunodeficiency. Autoimmunity and Autoimmune Disease. immunity to Cancers. Transplantation and Rejection

Pharmaceutical Chemistry I

Topics of pharmaceutical chemistry and its tasks. Historical steps of development of pharmaceutical chemistry.

Classification of pharmaceuticals. Sources and methods of obtaining pharmaceuticals.

Standardization of pharmaceuticals. GMP, ISO and other quality assurance standards of pharmaceuticals. Validation of drug quality assurance processes. State registration and expertise rules of pharmaceuticals. Committees for drug quality control. Pharmaceutical analysis.

Physical and chemical methods of analysis. Optical, chromatographic and spectrometric methods of analysis. Shelf life and stability of pharmaceuticals. Non organic pharmaceuticals, distilled water, water for injection, medical oxygen.

Halogens and its compounds with metals. Sodium thiosulfate, Sodium nitrite, sodium fluoride, compounds of calcium and magnesium.

Barium sulfate. Aluminum bismuth, Compounds of Zinc, Silver and Copper.

Compounds of Iron, Complex compounds of Platinum. Radiopharmaceuticals.

Organic pharmaceuticals. Acyclic alkanes and their compounds containing halogens and oxygen.

Alcohols and its ethers. Aldehydes and its derivatives.

Carbohydrates, monosacharids and polysacharids, carbonic acid and its derivatives.

Polyoxycarbonic acid lactones. Urethane, ureide, aliphatic amino acids.

Classification of antibiotics. Penicillin, Cephalosporin.

Aminoglycoside. Alicyclic compounds. Basic characteristics of terpenes. Monocyclic, bicyclic and tetraterpenes.

Basic characteristics of steroids. Calciferols. Cardenolides. Corticosteroids Androgens, Gestagens and Estrogens. Statins, Aromatic compounds. Phenols, quinone and its derivatives, Estrogens of aromatic structure, Naftoquinones.

Tetracyclines. Derivatives of Aurelic acid. Aromatic acids and their derivatives with diethylaminoacetanilides. Para amino salicylic acid and ortho amino benzoic acid derivatives, oxyphenilalkilamines, arilalkilamines and their derivatives.

Heterocyclic compound and their classification and methods of analysis; Oxygen containing heterocyclic compounds: Nitrofurans and derivatives of benzopyrines; Oxygen containing heterocyclic compounds: Tocopherols and flavanoids. Nitrogen containing heterocyclic compounds: Pyroles, Pirrolidines, Prolynes. Pyrolizidine derivatives, Indole derivatives, Pyrrazole derivatives, Imidazole derivatives, Tropanine derivatives, Pyridine derivatives, Quinoline derivatives, Quinucleidine derivatives. Izoquinolone derivatives. Pyrimidine derivatives, Pyrimidine – Thiazole and Pteridine derivatives. Purine derivatives, Izoaloxazine derivatives, Phenothiazine derivatives Derivatives of Azepines, Benzodiazepines and Oxazines.

Technology of Galenic Preparations

Pharmaceutical technology as branch of science, history, purpose, objectives. Notions and terms of used in medicine technology. Their definition. General principles of producing medicines. Appropriate training. Ways of classification of medicine forms. Pharmaceutical solutions; characterization, classification. Solvents; their characterization, theoretical foundations of solubility processes. Watery – technology of making true solutions. Preparation of concentric solution and their usage. Special cases of preparing liquid form medicines. Standard liquid type preparations and technology of their preparation. Solution preparation technology from standard liquid preparations. Comparative analysis of alcohol, glycerin, ethyl, ether, chloroform, oils, as solutions. Alcoholometry. Technology of preparation of solutions on non-watery solvents. Emulsions; classification. Emulgators; preparatory technology. Suspensions; Characterization, classification, preparatory technology. Syrups; characterization, classification, technology, standardization. Aromatic waters; characterization; technologies, standardization. Watery material got from vegetative raw material; characterization, preparatory technologies. Extract solutions, nomenclature, and methods of getting extracts: Maceration, percolation, solving, special events. Extract standardization, keeping. Extracts; characterization, classification, nomenclature, technologies of liquid extracts, standardization, keeping.

Thick and dried extracts; nomenclature, technology, standardization, keeping. Oil extracts; characterization, nomenclature, technology, standardization, keeping. New galenic preparations; characterization, nomenclature, technology, cleaning methods, standardization. Preparations of individual substances; characterization, classification, nomenclature, technology, ways of production and cleaning, standardization. Biogenic stimulatory preparations: animal, vegetative and mineral origin; characterization, technology, standardization. Preparations got from raw and vegetative materials: juices and extractions; characterization, classification, technology. Organopreparations; characteristics, classification, nomenclature. Peculiarities of material processing. Technology of organ preparations including hormones (thyroidine, adrenaline, insulin), standardization technologies of organ preparation (pepsin) ferments, standardization. Immobilized ferments.

Pharmacology I and II

Basic principles of pharmacology. Introduction. Pharmacology, links to other disciplines. Terms. Branches of Pharmacology. Drugs names. Pharmaceutical formulation of drugs (solid, liquid, soft, gaseous). Prescription writing. Drug discovery and development. Preclinic and clinical evaluation of new drugs. Methods, phases, biomedical ethics.

Basic principles of pharmacodynamics. Mechanism of drug action. Types of target for drug action. Macromolecular Nature of drug receptors. Types of receptor- effector linkage (ionotropic receptor, metabotropic – G-protein coupled, kinase link receptors, nuclear receptors). Types of transducers, effectors and second-messengers. G-proteins and their role. Drugs and receptors interaction. Drug - receptors bonds. Up-regulation, down-regulation, desensitization of receptors. Dose – effect relations . Graded dose-effect curve. Affinity potency, intrinsic activity – efficacy. Agonist-antagonist relationships. Full agonist, partial agonist, inverse agonist, antagonist (competitive, non-competitive, irreversible, reversible). Quantal dose-effect curve. Median effective dose. Median toxic dose Median lethal dose. Therapeutic index.

Basic principles of Pharmacokinetics. Routes of drugs administration. Absorption of drugs . Drugs permeation mechanisms. Factors that influence of absorption. Lipid solubility, pK , pH and ionisation. pH partition and ion trapping. First-pass effect, bioavailability, bioequivalence. Distribution of drugs. Binding of drugs to plasma protein Free and bound drugs. Volume of distribution. Body fluid compartments . Metabolism of drugs. Phase I reactions. Phase II reactions. Induction and inhibition of microsomal enzymes. Excretion of drugs. Elimination of drugs . Pharmacokinetic parameters - Cl total, Cl organ, extraction ratio, half –live period. Rational dosage regimen. Target concentration, steady-state

concentration, maintenance dose, loading dose. Dose (therapeutic, toxic, lethal, drug therapeutic index, therapeutic window). Individual factors altering drug effects – genetics, age, disease. Variation of drug responsiveness – idiosyncratic hyporeactive, hyperreactive reactions, tolerance, tachyphylaxis, hypersensitivity. Drug safety, adverse effects. Drug interaction types. Additive effects, synergism, potentiation, competitive and non-competitive antagonism.

Pharmacology of major organ systems: Introduction to autonomic pharmacology. Cholinergic and adrenergic transmission. Autonomic receptors (classification, localisation, function). Pharmacological modification of autonomic function.

Cholinergic agonists. Direct-acting cholinergic stimulants. Indirect-acting cholinomimetics (anticholinesterases).

Cholinergic blockers. M- cholinergic blocking agents. Ganglion blockers. Peripheral skeletal muscle relaxants.

Adrenoceptor agonists (Alpha- and -beta receptor agonist) and other sympathomimetic agents. Adrenoceptor antagonist (Alpha-receptor antagonist, Beta-receptor antagonist) and adrenergic neuron-blocking agent.

Substances with important actions on smooth muscle (Histamine, serotonin, Vasoactive peptides, The Eicosanoids: prostaglandins, Thromboxanes, Leukotrienes – Biosynthesis and physiology). Nitric oxide, Donors and Inhibitors. Ergot Alkaloids. Antagonists of histamine and serotonin receptors

Anti-inflammatory agents. Non-steroidal anti-inflammatory agents. Agents used in gout.

Immunosuppressant agents. Classification. Steroidal anti-inflammatory agents. Bronchodilators and other agents used in asthma.

Drugs that acting on the cardiovascular system. Introduction.

Drugs used to treat congestive heart failure. General principles of therapy. Classification (Positive inotropic drugs – Digitalis, Bipyridins and phosphodiesterases inhibitors). Vasodilators - Drugs act of renin-angiotensin- aldosterone system. Diuretics (Pharmacodynamics and Pharmacokinetics).

Drug used in ischemic heart disease (classification, pharmacodynamics and pharmacokinetics). Drugs that act on the coagulation cascade, platelet adhesion and activation, fibrinolysis. Drugs used to treat of hypertension (General principles of therapy, classification – drugs that alter sympathetic nervous system function. Vasodilators and Diuretics. Pharmacodynamics and Pharmacokinetics).

Drugs used to treat of arrhythmias (classification, pharmacodynamics and pharmacokinetics). Drugs used to treat of hyperlipidemia. Drugs that act in the central

nervous system. Chemical signaling in the nervous system. Amino acid and other transmitters and modulators. The classification of psychotropic drugs. Anxiolytic and hypnotic drugs. Alcohol. Antipsychotic drugs and lithium. Drugs used in affective disorders. Pharmacological management of Parkinsonism and other movement disorders. Anticonvulsant, antiepileptic drugs.

General anesthetics. Local anesthetics. Opioid analgesic drugs and antagonists. Drug dependence and drug abuse. Drugs that act on the gastrointestinal system (gastric secretion, vomiting, motility of GI tract, drugs for chronic inflammatory bowel disease, drugs affecting the biliary system. Anthelmintic drugs. Drugs used in anemias. Endocrine drugs.

The pituitary and drugs used. Steroidal drugs. Drugs used for contraception. Diabetes mellitus and drugs used in treatment. Drugs used in diseases of the thyroid. Drugs used in treatment of disorders of bone. Chemotherapy. Drugs used in the treatment of infections and cancer. Basic principles of chemotherapy. The molecular basis of chemotherapy. Resistance to antibacterial drugs. Antimicrobial agents that act on cell wall synthesis. Antimicrobial agents that act on bacterial protein synthesis. Sulfonamides, Trimethoprim. Quinolones. Miscellaneous antimicrobial agents. Disinfectants, antiseptics. Antimycobacterial and antisyphilitic drugs. Antifungal and antiviral agents. Antiprotozoal drugs. Cancer chemotherapy. Management of the poisoned patient.

Toxicological Chemistry I and II

Toxicological chemistry, tasks and problems, specifics, objectives. Relationship with other sciences; role in Pharmacy. Organizations of expertise in chemical-toxicological and forensic medicine; rights and obligations of chemical expert. Regulations in expertise procedure and documentation; the regulation of preparation of objectives from human corpse. Preliminary test in chemical-toxicological analysis. The methods of analysis in toxicological chemistry. Extraction, methods of extractions. Microcrystaloscopy; microdiffusion. Poisons and their classification. Intoxication and its classification. Penetration of toxic substances in human body; absorption, distribution conjunction and excretion. Detoxication; methods of detoxication. Biotransformation (metabolism) of toxic substances; Biotransformation of drugs and poisons in human corpse. Volatile poisons, their nature, pharmacokinetics, toxic value, methods of analysis. Metal poisons, their nature, pharmacokinetics, toxic value, methods of analysis. Pesticides, their nature, pharmacokinetics, toxic value, methods of analysis. Narcotics and psychotropic drugs; chemical-toxicological analysis.

Standard, etalon solution, working solution, test and placebo samples, internal standard;

Source of error. Selection and preparation of toxicological samples; description of biological objects, interpretation of received data. Express analysis of narcotics and psychotropic drugs. Immunoassay in chemical-toxicological analysis. Chromatographic methods in chemical-toxicological analysis;

Thin Layer Chromatography as a screening method of narcotics and psychotropic drugs. Opiates; their description, toxicological methods of analysis. Opioids; their description, toxicological methods of analysis. Cannabinoids; their description, toxicological methods of analysis. Chemical stimulants; their description, toxicological methods of analysis. Hallucinogens; their description, toxicological methods of analysis. "Medicinal poisons", the substances which are extracted from biological material with polar solvents. Their physical and chemical properties; penetration into human body, absorption, distribution, localization, metabolism, toxic value, utilization. Isolation "Medicinal poisons", from biological objects, steps of extraction, factors influencing to their extraction from biological objects; purification and concentration. "Medicinal poisons" with acid, neutral and alkaline nature;

Chemical-toxicological analysis of toxic substances with acid nature;

Derivatives of salicylic, barbituric acid and pyrazolone, their usage, toxic properties and action and metabolism; methods of extraction and analysis. Natural substances of alkaline nature- alkaloids, their chemical-toxicological analysis; usage, physical and chemical properties, toxic value and metabolism. Synthesized substances of alkaline nature- phenothiazines, 1,4-benzodiazepines, derivatives of para-amino benzoic acid, their chemical-toxicological analysis; usage, physical and chemical properties, toxic value, metabolism and isolation.

Technology of Pharmaceutical Dosage Forms

Combinations; characterization, classification, technology. Powders; characterization, classification, technology. Methods of defining physical – chemical and technological indexes of powders. Tablets: characterization, classification, nomenclature, theoretical bases of tablet making. Assisting substance group in tablet production, their influence on therapeutical effect of tablet. Industrial production of tablets. Machinery installations in tablet production. Methods of medicine production. Direct compressing without using assisting substances. Tablet production by using assisting substances. Tablet production with granulation. Tablet covering. Destination, methods of tablet covering: by membrane, pelleting, compressing. Triturational tablets; characterization, nomenclature, technology, granules, spansules, dragée, microdragée; characterization, nomenclature, technology.

Indexes of high quality of dense medicine forms and the methods of their determination. Wrapping, keeping. Medical capsules; characterization, classification, nomenclature, technology, standardization, wrapping, keeping. Micro capsules; characterization, basic methods of production, standardization, wrapping, keeping. Ointments; characterization, classification. Demands for bases. Production technology of homogenic and heterogenic ointments, Apparatus and machinery systems in ointment production. Standardization, wrapping and keeping. Supositors: characterization, classification, nomenclature, technology, standardization, wrapping, keeping. Production of rectal medicine forms (ointments, capsule, aerosols, laying, recitals), standardization. Emplastrols; characterization, classification, nomenclature. Technology, standardization, wrapping, keeping of rubber emplastrols, mustard laying, bacterial paper, liquid emplastrols, classification, nomenclature, standardization, wrapping, keeping. Aerosols: characterization, classification, nomenclature. Propelents. Production of ready made production – aerosols, methods of filling aerosol reservoirs. Standardization, wrapping, transportation, keeping. Curing forms of sterile and skeptical preparation. Demands existing for inaction curing forms, production conditions. Solvents used in preparation of inaction solution. Dematerialized and inaction water. Production, waterless solvents. Glass using for ampoules, flacons, syringe tubes and polymeric materials. Glass classes showing high quality and its control. Droti: washing, drying. Preparation of ampoules, washing. Methods of filling up ampoules. Sterilization and its types. Sterility and apirogeny. Stabilization methods of inaction solvents; stabilizer, air production. Preserving agent, antioxidants, Preparatory technology of inaction solvents, Standardization. Infusion solutions; characterization, classification, technology, wrapping, keeping. Inaction emulsion, suspenses, powders and tablets. Technology characteristic features. Ophthalmology curing forms characterization, classification, nomenclature, wrapping, keeping. Otorinology curing forms: characterization, classification, technology.

Basics of Pharmacokinetics

Introduction to pharmacokinetics, importance in development of drugs; The goals and tasks of pharmacokinetics; History of pharmacokinetics in Georgia. Methods of analysis in pharmacokinetic study: chromatographic, microbiologic, spectral, electrochemical; Organization of pharmacokinetic study; Method of standardization. Description of pharmacokinetic process; Compartment models - concepts and their importance in the study of pharmacokinetics. pharmacokinetic parameters. Drug distribution of in human organs and tissues; bioequivalence problems of pharmaceutical forms. Effect of protein

binding. Biotransformation (metabolism) of drug; the main ways of biotransformation; pharmacologically active and inactive metabolites. Pharmacokinetics in pregnant women, in pediatrics and geriatrics; transmission of drug into placenta, into fetus and into human milk. Drugs pharmacokinetic interferences during their absorption, metabolism, circulation and excretion. Dosage adjustment concept in patients with liver and renal failure

Clinical Pharmacy

Discipline of clinical pharmacy, history, peculiarities of development of this field in Georgia; The role of clinical pharmacist in the rational consumption of pharmaceuticals. Concept of essential drugs. Formulars; Determination of primary parameters of clinical pharmacokinetics. Establishment of optimal regimens of dosing during rational treatment. Usage of pharmaceuticals in geriatric and pediatric practice; during pregnancy and breast feeding; Adverse drug responses and side effects; drug interaction. Rational use of cardiovascular system drugs. Drugs used in treatment of arterial hypertension, their interaction and pharmacokinetics; Usage of respiratory system drugs. Drugs used in Gastro intestinal tract disorders and their interaction with other drug groups, also considering pharmacokinetics of drugs. Nonsteroidal antiinflammatory drugs, their interaction with other drugs, pharmacokinetic properties.

Pharmacotherapy

The concept of pharmacotherapy, the role of pharmacist in provision of rational pharmacotherapy. Methods of treatment, the drug and drug names, drug forms, essential medications and their list. Different forms of drug prescription and their use in practice.

General approach to treatment of cardiovascular diseases and groups of drugs used for pharmacotherapy. Disorders of water and sodium homeostases – hyponatremia and hypernatremia, correction of water-sodium homeostase disorders. Rational approach to pharmacotherapy of edema caused by different reasons. Disturbance of renal function and principles of dose correction of drugs during different stages of renal insufficiency. Modern classification of arterial hypertension, pharmacological classes of antihypertensive drugs. Primary and alternative antihypertensive agents. Peculiarities of antihypertensive treatment in special groups: aged, pregnant, children. Management of hypertensive urgency and emergency. Pharmacotherapy of congestive heart failure in accordance with disease stages. Types of dyslipidemia and pharmacotherapy of different disturbances of lipoprotein abnormalities. Monitoring of hypolipidemic therapy. Different approaches to pharmacotherapy of various forms of ischemic heart disease. Treatment with antithrombotics

and anticoagulants. Main aspects of asthma treatment. Principles of treatment of acute asthma. Importance of β_2 -agonists, inhaled and systemic corticosteroids, anticholinergics, methylxanthines and other drugs during asthma treatment. Pharmacotherapy of chronic obstructive pulmonary disease. Rational use of bronchodilators and corticosteroids for treatment of chronic disease and exacerbations. Approaches to rational antimicrobial therapy. Main groups of antibiotics and their application during different clinical cases. The role of pharmacist in rational antimicrobial therapy planning. Rational pharmacotherapy of lower respiratory tract infections (acute bronchitis, chronic bronchitis, bronchiolitis, pneumonias). Selection of antimicrobial agents for different types of pneumonia. Activities defined to reduce and prevent antimicrobial resistance.

Rational pharmacotherapy of gastrointestinal tract diseases (peptic ulcer, chronic gastritis, constipation, vomiting). Three drug regimen and four drug regimen in treatment of peptic ulcer disease, treatment of nonsteroid anti-inflammatory drug (NSAID) induced ulcer. Use of hepatoprotecting drugs and approaches to rational pharmacotherapy of viral hepatitis.

Main pathophysiological mechanisms of inflammation and main principles of pharmacotherapy with NSAIDs. Peculiarities of NSAIDs use. Rational pharmacotherapy of rheumatoid arthritis, the typical inflammatory disorder. Pain, its classification, principles of rational pharmacotherapy pain's diverse types. Opioid agents in pain management, adjuvant analgesics. Rational pharmacotherapy of psychiatric disorders (depressive disorders, psychoses, anxiety disorders, sleep disorders).

ELECTIVES

Basics of Phytotherapy

Basic principles of use of phytotherapeutical medications, their indications and contraindications, advantages, dosage forms, chemical consistence of herbal drugs.

Phytotherapy and phytotherapeutical medications of the CNS, cardiovascular system, respiratory system, digestive system, urinary tract, endocrine system diseases.

Pharmaceutical Enterprise

Basic principles of use of phytotherapeutical medications, their indications and contraindications, advantages, dosage forms, chemical consistence of herbal drugs.

Phytotherapy and phytotherapeutical medications of the CNS, cardiovascular system, respiratory system, digestive system, urinary tract, endocrine system diseases

Basis of biopharmacy

Biopharmacy, as theoretical and scientific background of pharmaceutical technology Objective, tasks. Bioavailability, determination methods of bioavailability: in vitro and in vivo trials. Effect of physical state of active pharmaceutical ingredient on release degree from dosage form. Selective biopharmaceutical aspects of excipients. Effect of preparation technology on release degree of API from dosage form. Effect of type of dosage form on release degree of API from pharmaceutical dosage form. Effect of administration route on release degree of API from pharmaceutical dosage form. Biopharmaceutical aspect of liquid dosage forms for external use. Biopharmaceutical aspect of solid dosage forms. Biopharmaceutical aspect of semi-solid (soft) dosage forms. Biopharmaceutical aspect of aerosols.

Internal Diseases

The goal of the course is to give the students the knowledge and skills essential for recognition of clinical signs of most distributed internal diseases and performing of symptomatic diagnose in the frame of competence of pharmacist.

To gain the course goal the next objectives are developed:

Teach the relations between the complains, symptoms and not specified problems, frequently met in pharmacy practice and main internal diseases.

Teach students the bases of aetiology, pathology and course of the disease, as well as the main complications.

Student must develop the ability to manage the drug use and communicate and work in the multidisciplinary team with physicians and non-physician health providers.

Basics of Pharmaceutical Cosmetology

History of cosmetology development, general concepts and terms, classification of cosmetic products, NTD.

* Biologically active and auxiliary substances (medical plants, vitamins, essential oils, mineral substances, honey, bee wax, mummies, clays, muds, dispersive areas, bases, structural producers, disinfection substances, preservatives, antioxidants, aromatic substances, masks and moisturizers, fillers) used in cosmetology.

* Prescription and technologies of hygienic liquid cosmetic products (skin cleansing aromatic water, blackhead caring, pigmentation spots discoloring, skin protection and regeneration).

* Prescription and technologies of hygienic cosmetic sets (compresses, bathroom sets, masks, teas) and powders (powders, spraying powders, deodorants, masks).

* Prescription and technologies of hygienic soft shaped cosmetic ointment (ointment/nutrients, day cream, cream/soaps for dry, oily, normal skins)

Basics of Ecology

Introduction to ecology. The object and objectives of ecology. Place of ecology in biological sciences disciplines. Environment and livelihood conditions.

Abiotic factors. Sun's radiation energy. Plant ecological groups according to light dependence. Temperature as an ecological factor. Poekilothermic and homoiothermic organisms. Plant ecological groups according to temperature

Water as an ecological factor. Plant ecological groups according to the water consumption and salinity. Importance of water vertical circulation

Air as an environmental factor. Aerobic and anaerobic organisms. Importance of air traffic to plants for hydrobiota. An ecological environmental factor.

Biotic factors. Food as a biotic factor. Autotrophs and heterotrophs. Ecology of biocenosis (synecology). Functional structure of biocenosis. Types of organism interactions in biocenosis.

Dynamics of biocenosis in time. Diurnal and seasonal dynamics. Annual variables or fluctuations. Types of fluctuations

Elements of plant geography. Study about areas and flora. Floristic zones of the earth. Georgia's vegetation zone.

Extreme conditions general characterization. Primary and Secondary extreme conditions.

Role of human organism reactivity during extreme condition. Adaptive responses of the human body in maintaining homeostasis. **General Adaptation Syndrome**, stress reaction, stress ("thermal shock") proteins, acute phase reactions, kinin-kalikrein system and complement system activation, role of disadaptation in extreme conditions development.

Chain reactions and "vicious circle" in extreme conditions pathogenesis, typical disorders of metabolic and physiological processes and their mechanisms.

Shock. Definition, types of shock (traumatic, burn, anaphylactic, hemotransfusional, hypovolemic, cardiogenic, infective-toxic, etc.) and their pathogenesis. Stages of shock and their characteristics, basic functional/structural dysfunctions occurring at various stages of shock. Disorders of macro- and microcirculation at shock its mechanisms and outcomes. Different types of shock and their development features. Definition of shock organ. Shock lungs, shock kidneys. Role of blood rheology changes and disseminated intravascular coagulation in pathogenesis of shock. Principles of shock prevention and treatment.

Coma General description, Sopor, Stupor, delirium, apalium syndromes, lethargia. Main types of coma (alcoholic, hypoglycemic, hypo corticoidic, diabetic, hepatic), Etiology and pathogenesis of comatose states. Stages of coma according to its heaviness.

Functional/structural changes in brain at coma. Principles of coma prevention and treatment.

Collapse. Its characteristics, types (according to etiological factors – infective, hypoxic, orthostatic). The first and secondary collapse, common and different features in shock and collapse pathogenesis. Their differential treatment. Collapse pathogenesis, its reflective and humorous mechanisms. Condition of collapse, Syncope. Heart and blood vessels system functioning disorders during collapse. General principles of collapse intensive care.

Crush Syndrome. Its pathogenesis, released damaging substrates (“hormones”) action on organ’s systems and their functions. Preventive measures against crush syndrome formation.

Hypoxia. Its essence and types: hypoxic, respiratory, circulative, haemal, tissual, their mechanisms. Human body’s functioning disorders during hypoxia, acute hypoxia, its reasons, development mechanisms, treatment. Hypoxia – as typical important complication in extreme conditions. Principles of hypoxia prevention and treatment pathogenesis.

High temperature, its damaging action, burn disease, its stages. Hyperthermia, heat stroke.

Low temperature, its damaging action. Hypothermia, hibernation.

Electrical injury, its damaging action.

Noise and Ultrasound damaging action.

Effect of high partial pressure on organism - Caisson disease, development mechanisms.

Effect of low partial pressure on organism - Mountain disease, Monge Disease, their pathogenesis.

Sun rays damaging action on human organism.

Ionizing radiation. Its damaging action mechanisms, radiation sickness, its types, far results of ionizing radiation action.

Toxicology of Narcotic Drugs

The course includes the training aim about toxicology of narcotic drugs’ and their classification principles, importance of narcotic drugs in medicine and in pharmacy.

In addition, during the course, topics for discussions are:

- the legal turnover of narcotic drugs in Georgia,
- the ways to control the illegal turnover of narcotic drugs and role of the pharmacist in this affair.

Pharmaceutical Product commodities

Theoretical and legal grounds for conducting the expertise of pharmaceutical and medical products; Overview of the state system of pharmaceutical products. Normative-technical documentation and certification; Lane materials; Rubber medical products; Patient care products; Preservation of the pharmaceutical products and medical products; Tare and packaging of finished drugs; Trade information means; Falsification of pharmaceutical products and fight against it; Other pharmacy nomenclature of goods research.

Principles of Pharmaceutical Management and Marketing

Pharmaceutical management and marketing

Management Basics: Pharmaceutical Management and History of Its Development; Principles and methods; Economic, organizational, Administrative, social-psychological methods, self-governance; Managers of pharmaceutical organization and rational management; Division of labor according to management levels, manager and entrepreneur, the correct approach to management - the success of success; Evolution of management opinion, old experience and new practice in the organization's internal environment; Environmental impact on personality behavior, groups, leadership and leadership in pharmaceutical profile establishments; Pharmaceutical organization and its environment. External environmental features; International Business Types and Management Practices Export, Licensing, Joint Enterprises; Social responsibility in pharmaceutical organizations, issue of pharmaceutical ethics and deontology; basics of marketing: Marketing Basics: Pharmaceutical Marketing Management Strategy; Marketing opportunities analysis in pharmacy; Strategic analysis in pharmaceutical business, study of pharmaceutical market strategy, marketing solutions in pharmacy, competition problems. Business market

The Departments involved in the learning process

FACULTY OF MEDICINE

1. The Department of Human Anatomy
2. The Department of Histology, Cytology and Embryology
3. The Department of Pharmacology
4. The Department of History of Medicine and Bioethics
5. The Department of Psychology
6. The Department of Pathophysiology
7. The Department of Microbiology
8. The department of Clinical skills and multidiscipline simulaton

FACULTY OF PGARMACY

9. The Department of Medical Chemistry

10. The Department of Biochemistry
11. The department of Botany and Pharmacognosy
12. The department of Pharmaceutical toxicological chemistry
13. The department of pharmaceutical technologies
14. The department of Social Pharmacy

FACULTY OF PUBLIC HEALTH

15. The Department of Hygiene and Medical Ecology

FACULTY OF PHYSICAL MEDICINE AND REHABILITATION

16. The Department of Physics, Biophysics, Biomechanics and Informational Technologies
17. The Department of Physiology
18. The Department of Medical Biology and Parasitology

CENTERS

19. Center of Foreign Languages
20. Center of Georgian Language
21. Center of scientific skills