

بسمه تعالی

ترجمه فارسی به انگلیسی کوریکولوم آموزشی
کارشناسی پیوسته رشته تکنولوژی علوم آزمایشگاهی

تهیه و تنظیم:

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با همکاری:

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General physics

Lesson code: 01

Unit number: 2 unites

Unit type: theoretical

Predecessor: _

General purpose: learning physical principles of apparatus that used in clinical laboratory.

Lesson description: preliminaries of electricity and optics and teaching of physical principles of different laboratory apparatus.

Main subject: (34 hours)

Teaching primary principle of electricity including:

- Type of electrical current, resistance, condenser, inducer, diode, optical, illuminator and rectifier circuit.
- Application and using method of stab laser and UPS.

Instruction of primary principles of optics including:

- Light and its properties, electromagnetic waves.
- Reflexion phenomenon, refraction, dispersion and interference.

Instruction of element, optics and using method of following apparatus:

- Mechanical apparatus (kinds of engine and centrifuge).
- Heating apparatus (oven, water bath, heater and incubator).
- Optical apparatus (spectrophotometer, flame photometer).
- PH meter.
- Electronically blood cell counters.
- Kind of microscopes.
- Biochemical auto analyzer.
- ELISA reader.
- Gamma counters.

References:

1- Principles of apparatus analysis translated by Zhila Azad and etal.

2- Laboratory Instrumentation (Shoeff & Williams) latest ed.

Assessment method of student:

Active attendance in class, asking and answering, final exam.

General physics laboratory

Lesson code: 02

Unit number: 1 unit

Unit type: practical

General purpose: Familiarity with optics and observation of internal element of laboratory apparatus, instruction of fixing and maintenance and exchange of partial elements such as fuse, lamp, charcoal.

Lesson description: carry out of primary examination of electricity and optics, opening laboratory apparatus with student and manner of exchanging small part of them.

Principle subject (34 hours):

- Instruction of using method and instance of using multimeter apparatus (ohm meter, voltmeter and ampermeter).
- Brief familiarity with semiconductor such as diode and half and full wave rectifier circuit.
- Carry out of testes related to lens and inducing current and familiarity with engine.
- Direct and alternative current experiments.
- Instruction of water bath electric circuit as a heating apparatus and drawing electrical maps and familiarity with electrical signs and different element.
- Familiarity with cathode ray lamp and properties for working with oscilloscope.
- Spectrometry and familiarity with spectroscope and spectrophotometer.
- Experiments of reflexion, refraction and measurement of glass index.
- Polarimetry experiment and working with polarimeter.

- Experiment and measurement of magnitude and optical construction of microscope.

References:

- 1- Principles of apparatus analysis: translated by Zhila Azad and etal.
- 2- Laboratory Instrumentation (Shoeff and Williams) (latest ed).

Assessment method of students:

Active attendance in laboratory and doing their homework, theoretical and practical final exam.

General chemistry

Lesson code: 03

Unit number: 2 unites

Unit type: theoretical

Predecessor: _

General purpose: Familiarity with atomic construction and different compounds of organic mineral materials.

Lesson description: contraction of chemical materials, related reaction, mechanism of reaction, speed and degrees of reaction.

Principle subject: (34 hours)

General chemistry: atomic construction, foundation particles, wavy and particle theory of energy and material, atomic orbital, chemical bond (ionic, covalence, Lewis construction, conventional load, resonance, hybridation) molecular orbital theory and other bonds.

Mole and molecules, molar, normal, molale and percentage solution, effect of soluble particle on solvent, titration, thermo chemical, thermodynamic words, brief thermodynamic rules about biogenetic, speed of reactions, degree of reaction 1-2, zero, half-life of reactions, balanced reaction, affective factors on metal balanced state and balanced constant acid, base, PH, weak and strong acid and base, salts, buffer, adding acid and base to buffer, solubility coefficient and briefly about nuclear chemistry.

Organic chemistry, naming molecular and spatial structure, properties of physical and chemical compounds, alkanes, cyclo alkanes, alkenes, alkynes, dienes.

Structural, geometric (Cis and Trans Z, E), optical isomer, aromatic compounds and reason of being aromatic related

reactions, alkyl halide, E, SN reaction, alcohols, phenols, ethers, tioles, aldehyde and ketone.

Organic acides and their derivatives, Amines, briefly about identifying of molecular structure (Atomic absorption, NMR, UV, and IR).

References:

- 1- General chemistry (Mortimer), Publisher: university publication center (Tehran), Publication of Tehran University, Publication of Mashhad University, latest ed.
- 2- Principles of organic chemistry (John Mc Murry): Translated by Eisa yavari, Publisher: Nopardasan, latest ed.
- 3- Organic Chemistry Morrison-Boyd, latest ed.

Assessment method of students:

Active attendance in class, asking answering, midterm and final exams.

General chemistry laboratory

Lesson code: 04

Unit number: 1 unit

Unit type: practical

Prerequisite: Simultaneous with General chemistry.

General purpose: familiarity of students with materials and some of mineral and organic chemical compound properties.

Lesson description: recognition of laboratory instruments, recognition of elements and agents in organic compounds, solution.

Principle subject: (34 hours)

- Recognition and using method of laboratory apparatus which are used in chemistry lab.
- Measurement of melting and boiling point.
- Recognition of elements in organic compound.
- Recognition of organic compound agents (alcohols, aldehydes and ketones, active hydrogen (Acid agent), aromatic cycles, phenolic agent, double-bond (ethylenic)).
- Preparation method of Aspirin.
- Recognition of one organic material and preparation one derivation from it.
- Solution preparation, titration of acid and base, oxidation and reduction, (Chromatometry, Manganometry, Iodometry), preparation of buffer solution.
- Measurement of buffer resistance in front of adding acid and base, recognition of some anions and cations, working with IR, GC, HPLC.
- Complete gases rule, preparation method of oxygen and measurement of mole volume.

References:

- 1- Analytical chemistry (Skoog-West), latest ed.

2- The systematic-identification of organic compound, latest ed.

Assessment method of students:

Regular attendance in laboratory and doing their homework, theoretical and practical final exam.

General biochemistry

Lesson code: 05

Unit number: 3 unites

Unit type: Theoretical

Prerequisite: General chemistry

General purpose: Recognition of vital materials and their chemical properties.

Lesson description: teaching some about general biochemistry up to a point laboratory technician will be able to understand the conception of biochemistry and their importance in body.

Principle subject: (51 hours)

- Acid, base and bufferic systems -water and electrolytes- chemical structure of carbohydrates and their properties.
- Chemical structures of aminoacides and proteins and their properties -structure of fats and their properties- chemical structure of enzymes and their properties and their chemical structure of hem.
- Metabolism of triple-bond compound (carbohydrates, proteins, lipids).

References:

- 1- Textbook of clinical chemistry (Tietz) .latest ed.
- 2- Biochemistry (Harper) .latest ed.

Assessment method of students:

Active attendance in laboratory, doing homework, theoretical and practical.

General biochemistry laboratory

Lesson code: 06

Unit number: 1 unit

Unit type: practical

Prerequisite: Simultaneous with General biochemistry.

Lesson description: teaching preliminaries of practical biochemistry and diagnostic method of some biochemical compound of body liquid.

Principle subject: (34 hours)

- PH determination with different method.
- Preparation of buffer solution.
- Sugar diagnosis method (chemical, chromatography on the paper).
- Diagnosis method of proteins and aminoacides (chemical, chromatography on the paper).
- Studying on enzymes properties and qualities.

References:

- 1- Textbook of clinical chemistry (Tietz) .latest ed.
- 2- Biochemistry (Harper) .latest ed.
- 3- Clinical Diagnosis (Henry) .latest ed.
- 4- Practical general biochemistry, compilation by Dr Shamloo, Dr Kamyab .latest ed.

Assessment method of students:

Active attendance in class, doing homework and theoretical and practical.

Cellular and Molecular biology

Lesson code: 07

Unit number: 3unit

Unit type: theoretical-practical

Perenecessity: _

General purpose: cellular and molecular biology has dramatically progress in two recent decades and has caused great progress in different fields therefore it is necessary that the student of laboratory sciences have enough information about cell structure and cell function and become familiar with different method in the field of cellular and molecular biology.

Lesson description: Teaching of structure and different component of cell and function of each organoles in material synthesis and molecular relationship of cell and genetic engineering and its application in medicine and familiarity with advanced cellular and molecular method.

Principle subject: theoretical: (34 hours)

- General structure of cell and organoles.
- Molecular structure of cell membrane and molecules transmission with it.
- Carrier proteins of cell membrane.
- Molecular structure of membrane.
- Active transport.
- Osmotic (balance and equilibrium).
- Inner membrane system of cell.
- Ionic channels.
- Facilitated and simple diffusion.
- Membrane potential.
- Endoplasmic reticulum.
- Golgi apparatus.

- Peroxisome.
- Nuclear molecular structure and its membrane.
- Structure of eukaryote and prokaryote chromosomes.
- Centromere.
- Telomere.
- Nucleolus.
- DNA replication.
- Lysosome.
- Cell cycle and its regulations.
- Mitosis and meiosis de.

History and relationship cellular and molecular biology. The reason of rapid progress of that and the role of human genome project in treatment of genetic disease.

Genome structure and function:

Genome definition, structure of nuclear genome and comparison it with other organelles genome importance of human genome project, genome replication DNA species, ... Repetition sequences of genome, satellite, minisatellite, microsatellite, STR-VNTR, transposons species and retrotransposons, enzymes that necessary for DNA manipulation, PCR technique and its applications in diagnosis of disease and in legal medicine, Southern blotting technique.

- Determination method of genome sequence.
- Synthesis and editing transcription.

Different steps of RNA synthesis in prokaryote and eukaryote starter complex-RNA polymerase species- RNA polymerase of organelles-RNA splicing- changing in two terminal of RNA –elimination of introns- spliceosome- ribosome- alternative splicing- RNA editing- RNA destruction- regulation of transcription- genetic code- reading frame- monocistronic and polycistronic mRNA construction- mRNA isolating- northern blotting technique.

Synthesis and splicing of proteome in prokaryotes and eukaryotes.

Molecular structure and role of starter tRNA-different steps of synthesis- starter factors- linear and releasing growth-regulation of translation beginning.

Proteins editing:

Changing after translation- chemical changes- folding of proteins and diseases causing from incorrect folding- prion-molecular structure of chaperone species splicing with proteolytic cutting- spontaneously cutting- Intein- important motives type of protein- destruction of proteins- protein isolating methods proteosom- proteomix- western blotting technique- determining method of protein sequences.

Regulation of gene expression in prokaryote and eukaryote.

Regulation in transcription, translation, after translation, splicing and stability of mRNA –Hormones regulation-regulation of operon system in prokaryotes.

Positive and negative regulation of operon lactose.

Regulation in eukaryotes with quantitative and qualitative changing in DNA (DNA alteration) –gene dosage- gene multiplying- DNA rearrangement.

Genetic engineering:

Cloning enzymes- vectors type- restriction map- using of RFLP in diagnosis of genetic diseases- vectors type- cloning with using of genomic treasury and cDNA- cloning with PCR- cloning expression- human and mammals cloning-chromosom walking technique- antisense RNA technique-strategies from gene to protein and from protein to gene-application of genetic engineering in medicine- preparation of pharmaceutical recombinant proteins- Insulin growth hormone- hemophilia factors and etc. generation transgenic animals for medical research and preparation of proper drugs- production of DNA vaccines- production of transgenic products and foods- dangers and ethical problems of genetic engineering.

Practical molecular and cellular biology:

Subjects and experiments related with theoretical subject such as DNA extraction from cell- PCR- restriction enzymes.

References:

- 1- Subjects from cellular and molecular biology, Dr Rasool salehi, 1380.
- 2- Molecular biology of the cell (Albert latest ed.)
- 3- The cell, a molecular approach (cooper latest ed.)

Assessment method of students:

Active attendance in class, asking and answering, midterm and final exams.

Theoretical anatomy

Lesson code: 08

Unit number: 2 unites

Unit type: theoretical

Prenecessity: _

General purpose: familiarity with macroscopic anatomy of human body systems.

Lesson description: familiarity with anatomy of body structures so that it is necessary for bachelor students of laboratory sciences.

Principle subject: (34 hours)

- Anatomy (definition, history and importance of learning it), total conception of biological structure consist of cell, tissue, organ, system, body systems (total classification)
- Skeletal system (bony tissue include of tissue type, classification of bones from a form), classification of skeletal system, generalities of cranium, spinal column, thorax and skeletal supplement.
- Joints (joint definition, type of joint)
- Muscles (definition, type of muscle, muscles of different part of body.
- Blood circulation system includes of heart (place, levels, totally heart cavities) artery, renous system especially superficial renous of organs.
- Respiratory system include of: upper respiratory track (nose, larynx, windpipe)
- Lower respiratory track including lungs (surfaces, bellybutton, and lung) and pleura.
- Digestion system: general anatomy of digestive track and supplement glands.

- Urinary system including: kidney, urinary track and bladder.
- Genital system including: general acquaintance with male and female genital system, macroscopic anatomy of spinal cord, kernel stem cerebellum and brain hemisphere and nervous path

References:

- 1- Gray's anatomy for students.
- 2- Clinical Anatomy Snell.
- 3- Anatomy and physiology Ross and Willson.

Assessment method of students:

Questioning and answering, midterm and final exams.

Practical anatomy

Lesson code: 09

Unit number: 1 unit

Unit type: practical

Pre necessity: Simultaneous with theoretical anatomy.

General purpose: familiarity with macroscopic anatomy of human body system.

Lesson description: familiarity with anatomy of body structure up to a point it is necessary for bachelor student of laboratory sciences.

Principle subject: (34 hours)

Working with model proportional with theoretical unit and general observation of crops in some session.

References:

Books of general anatomy and atlas of anatomy.

Assessment method of students:

Questioning and answering, midterm and final exams.

Theoretical physiology

Lesson code: 10

Unit number: 2 unites

Unit type: theoretical

Pre necessity: _

General purpose: familiarity with physiology of respiratory and cardiovascular. System and learning generally about physiology of nervous, urinary, muscles, digestion and internal gland systems.

Lesson description: recognition of natural function of body systems. So that students of laboratory sciences will be able to compare disease condition with normal state and obtain deep understanding about disease and its procedure.

Principle subject: 34 hours

- Physiology of respiratory system: origin of breath rhythm
Chemical control of respiration chemical peripheral and central receptor effective reflection in controlling of breathing, mechanism of pulmonary ventilation, transferring of oxygen and carbon dioxide volumes and capacities of lungs dead respiratory space, influence of sleep and a wakefulness on respiration, The effect of different drugs and anesthesia agent on respiratory center and breathing curve.
- Physiology of cardiovascular: cardiac muscle, Origin of spreading heart contractive wave, cardiac pump, cardiac output, cardiac cycle, cardiac index, electrocardiogram, arterial blood pressure, central venous pressure peripheral blood circulation, vessels resistance, venous return
- Review of physiology of neuroscience system: general recognition of brain and nerve physiology, degree of

consciousness, nervous reflection influence on regulating of pupil of the eye.

- Review of physiology of renal system: urine formation, balance of water and electrolytes and blood by kidney.
- Review of muscles physiology: muscular motor plate and structure and its physiology in detail.
- Review of physiology of digestion system and liver: function of different part and recognition relationship between physiology of digestion system and anesthesia.
- General recognition of endocrine glands.

References:

- 1- Summary of general physiology, Guyton, latest ed.
- 2- Principles of clinical physiology (J.H Green), latest ed.
- 3- Gyton.A.C, and Hall.J.H, (1996), Tex book of medical physiology, latest ed.
- 4- Borne, Levy. Principles of physiology, latest ed.

Assessment method of students:

Active attendance in class and questioning and answering, midterm and final exams.

Laboratory of physiology

Lesson code: 11

Unit number: 1 unit

Unit type: practical

Prerequisite: Simultaneous with theoretical physiology.

General: Acquaintance of students with tests of practical physiology for understanding of physiology failure of human body systems in comparison with health state.

Lesson description: in this lesson, function of cells and different systems of body include of heart, blood circulation, respiration, nervous, urinary, and digestive and endocrine glands systems were discussed with using physiological experiments.

Principle subject: 34 hours

Red blood cells count, counting of white blood cells in rest and exercise conditions. Leukocyte formula packed cell volume, Hemoglobinometry, ESR, spirometry and respiratory tests, measurement of BMR. Measurement of arterial blood pressure in human in different conditions, nervous reflexion, assessment of osmotic fragility of red blood cells, electrocardiography in human Heart sounds measurement of clotting and bleeding time and if there are laboratory facilities doing nerve and muscles tests in frog, frog heart perfusion.

Reference

s:

- 1- Guyton, A.C & Hall J.E. (1996),
Text book of medical physiology, latest ed.
- 2- Other reliable practical references (depends on teacher).

Assessment method of student:

Active attendance in laboratory and doing homework,
theoretical-practical exam and final practical exam.

Biophysics

Lesson code: 12

Unit number: 2 unites

Unit type: theoretical

Prerequisite: general physics

General purpose: familiarity and understanding of principles of living creature's structure and function with using physics knowledge, biology and chemistry.

Lesson description: in this lesson students learn different physical and chemical power and biology reactions existing in construction of different organs of human body.

Principle subject:

- Familiarity with vital physics knowledge
- Application of some powers in construction of human body. (Mechanical, osmotic, electrical, bioelectrical, powers in the middle of molecules hydrogen-bond
- Structure of big molecules and cell membrane.
- Bioenergetics (3 rules of thermodynamic, entropy, free energy, transport electron)
- Speed of action in some biological system reaction (speed of action in chemical reaction, diffusion and osmotic reaction, liquid circulation and thermal and electrical conduction)
- Biological effects of Ionizane rays (dosimetry, biophysical effect in relationship with clotting, changes in action speed of reaction, physical effect)
- Nerve and muscle biophysics.
- Consumed energy of optics.
- Wave shape nature light, photometry.

- Reflection and refraction.
- Application of photometry instrument.

References:

Physics for biology (Alan.H.Kramer) translated by
Mahmood Bahar, Latest ed.

Assessment method of students:

Active attendance in class, question and answering, midterm
and final exam.

Theoretical histology

Lesson code: 13

Unit number: 1 unit

Unit kind: theoretical

Prerequisite: theoretical anatomy

General purpose: Learning of microscopic anatomy of human body structure. In health and disease condition which is necessary for technician of laboratory sciences.

Lesson description: microscopic diagnosis of patient tissues is one of the ways of clinical diagnosis so learning of natural microscopic anatomy provide suitable field for diagnosis of kind of diseases.

Principle subject: 17 hours

a) Histology:

- Preliminary of histology including: definition of histology and studying method in histology.
- Classification of tissues including: quality of tissue formation, types of tissues.
- Epithelial tissue, definition and all types.
- Connective tissue including: general connective tissue (types and structure), special connective tissue (definition)
- Particular connective tissue (cartilage and bone)
- Particular connective tissue (fat)
- Muscular tissue including: type of muscular tissue with emphasis on stratified muscular tissue.
- Tissue of nervous system including: white and grey matter, types of neuron and neuroglia and peripheral nerve.
- Tissue of blood circulation system including: tissue of cardiac muscle arteries and veins

- Tissue of lymphatic system including: lymphatic gland, thymus, spleen.
- Tissue of digestive system including: digestion tract, tongue, pharynx, supplemental gland.
- Tissue of urinary system including: renals, ureter, urinary bladder and urethra.
- Tissue of genital system including: genital glands and external genital system.
- Tissue of respiratory system including: nose, larynx, windpipe, lungs.

References:

- 1- Histology (J.Quira), latest ed. Colored atlas of pathology.
- 2- Text book of Histology, (J.Quira).latest ed.
- 3- Pathology and laboratory medicine (S.RAAB et al).2002.

Assessment method of students:

Active attendance in class, asking and answering, midterm and final exams.

Histology laboratory

Lesson code: 14

Unit number: 1 unit

Unit type: practical

Prerequisite: Simultaneous with theoretical histology

General purpose: preliminary acquaintance with microscopic structure of human body tissue in health and disease condition.

Lesson description: teaching microscopic structure of cells constitutes human body tissue in health and disease state and learning how to prepare a histology slide.

Principle subject:

- Microscopic studying of prepared slides from natural tissues of human body including, bone, cartilage, fat, straight and stratified muscles, cardiac muscle, arteries, veins, lymphatic gland, spleen, tongue, pharynx, salivary gland, renal, bladder, testis, ovary, larynx, lung, spinal cord and brain.
- Recognition of fixative solution for tissues.
- Method of working with apparatus preparing tissue.

References:

- 1- Atlas of Normal Histology, (M.S), latest ed.
- 2- Theory and practice of Histopathological techniques (Bancroft) (latest ed).

Assessment method of student:

Active attendance in laboratory, doing homework, theoretical and practical final exam.

General hygiene and epidemiology

Lesson code: 15

Unit number: 2 unites

Unit type: theoretical

Pre necessity: _

General purpose: familiarity with general hygiene and epidemiology and route of prevention and of facing of common infectious contagious diseases in Iran.

Lesson description: definitions, hygiene and epidemiology, environmental hygiene and education of health, disease and prevention in point of epidemiology.

Principle subject: 34 hours

- Definition of hygiene, epidemiology, concepts and disease models in epidemiology.
- Education of hygiene.
- Necessary rules for prevention of contagious disease.
- Basis of control and prevention.
- Basis of epidemiology and international.
- Carriers of infectious disease and their risk vaccination and hygiene education.
- Roles of laboratory in facing with infectious disease and epidemics incidence.
- Vaccination programming and vaccines safety.
- Types of vaccines.
- Infectious, contagious disease and control of them.
- Nasocomial infectious.
- Food poisoning and disease transmitted by foods.
- Generalities of human ecology.
- Generalities of environment hygiene.

- Occupational health and occupation environmental health.
- Water hygiene and control of water.
- Air hygiene and control of air pollution.
- National and international organization presenting hygiene and remedial services.
- Types of epidemic studies.

References:

- 1- Basis of clinical epidemiology, translated by Ali Sadeghi Hasan abadi, latest ed.
- 2- Basis of epidemiology, translated by Malek Afzali, latest ed.
- 3- Education of hygiene, efficacy and effect of that, (kit tones), translated by Freshteh Farzbanpoor, latest ed.
- 4- Medical epidemiology (Greenberg), latest ed.

Assessment method of students:

Active attendance in class, asking and answering, midterm and final exams.

General psychology

Lesson code: 16

Unit number: 2 unites

Unit type: theoretical

Pre necessity: _

General purpose: student with history of psychology, different concept and assessment method in psychology and effective factors in behavior.

Lesson description: this lesson help students to amplify mental abilities and better understanding of other lesson and also basal theoretical concepts have efficiency in future professional environment of students.

Principle subjects:

- Definition of psychology, importance and necessity of that researching method in psychology.
- History and schools of psychology (behaviorism, cognitivism, psycho analysis)
- Effective factors on behavior (inheritance and environment)
- Sensation, perception (Sense of sight, hearing, smell, taste, touch)
- Motivation and emotion (needs and motives)
- Intelligence (definition, intelligence tests)
- Generalities of growth psychology.
- Learning and its theories, types of learning.
- Language and thinking, effective factors on language learning
- Cognition
- Personality and related theories, personality disorders

- General acquaintance with psychological assessment
- Mental and emotional disorder and treatment methods
- Psychology of exceptional children
- Mental retardation, definition, etiology and classification.
- Defense mechanisms, anxiety and coping strategies
- Human communication methods with children and teenager.

References:

- 1- Principles of general psychology (Hamzeh Gangi), latest ed.
- 2- Principles of psychology (Norman Man), latest ed.
- 3- Principles of human communication methods (Ahmad Behpajuh), latest ed with children and teenager.

Assessment method of students:

- Active attendance in class, asking and answering, midterm and final exams.
- Presentation of individual or group project proposed by teacher and instructor

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Computer

Lesson code: 17

Unit number: 2 unites

Unit type: theoretical

Pre necessity: _

General purpose: familiarity of students with general basis of computer hard ware and soft ware and operating system so that students will be able to use computer in laboratory apparatus, searching information sources and scientific research.

Lesson description: Due to developing of computer application in different field, it is necessary that laboratory science expert became familiar enough with using of computer in the field of their job.

Principle subject: 34 hours

- History and evolution of operating system and advantages of Windows operating system compared with Dos.
- Definition of basic concept of Windows including: File folder, window, icon, and menu, desktop.
- Important icons of desktop and important choices in start menu.
- Important parts of windows and familiarity with their arrangement.
- Familiarity with available abilities and facilities in windows including Notepad and WordPad.
- Defragment, Scandisk, clean up, maintenance and performance route of them.
- install and uninstall of applicable program in windows connecting to internet and using of mail box.

- Familiarity with cell concept.
- Drawing of statistical graph with Excel.
- using of formula and simple functions in Excel for counting.

References:

With due attention to variety and rapid change of subject definite references are not recommended but some references related to windows operating system and Excel 2000 soft ware are suitable.

Assessment method of students:

Active attendance in class and doing homework, midterm and final exams.

Biostatistics

Lesson code: 18

Unit number: 2 unites

Unit type: theoretical

Prerequisite: _

General purpose: familiarity of students with different methods of sampling and using of them in medical research. Applying of general distribution of probability, estimate of important parameter in population and doing simple statistics tests, familiarity with important health index and their counting and comparison.

Lesson description: statistics has a great role in research. Thus it is necessary that the student of laboratory sciences learn the base of this science and they can use statistic for collecting laboratory data and apply them for quality control in scientific research.

Principle subject: 34 hours

- Definition of statistics, importance, applications and definition of variable types.
- Concepts of population and sample primary basis of sampling, simple random sampling and acquaintance with other sampling methods.
- Concepts of probability description, binominal and poisson description, sampling description, central limit theorem.
- Estimate of point and interval of mean and proportion
- Testing of mean hypothesis in one and two population
- Testing of proportion hypothesis in one and two population
- Independence test
- Analysis of one side variance

References:

- 1- Basis and methods of biostatics (Daniyel), translated by Ayatollahi, published by Amir Kabir publication.
- 2- Medical statistics, (Dawson, Bet vetrab, Rabert), translated by Sarafraz and Ghaffarzadegan, published by Mashhad Medical Sciences University publications.

Assessment method of students:

Active attendance in class, doing homework, midterm and final exams.

Medical biochemistry 1

Lesson code: 19

Unit number: 3 unites

Unit type: theoretical

Predecessor: general biochemistry

General purpose:

In the end of this course students are able to:

- a) Know the property of biochemical compound in body.
- b) Description changes of compound in health and disease condition.
- c) Explain, the value of these compounds in diagnosis of different disease.

Lesson description: Bachelor of laboratory sciences work in clinical diagnostic laboratory and must important of their job is in clinical biochemistry laboratory; therefore they have to be able to do routine clinical biochemistry testes, useful for diagnosis of different disease.

Principle subject:

- Compounds and chemical changes in urine
- Compounds and chemical changes in blood include of:
 - Serum enzymes and their changes
 - Disorders of fats metabolism
 - Non protein nitrogen compound
 - Manner of formation and metabolism of billirobin
 - Application of vitamins and hormones in biochemical reaction of body
- Proteins
- Electrolytes
- Compounds and chemical changes of other liquids of body

References:

- 1- Textbook of clinical chemistry (Tietz), latest ed.
- 2- Clinical diagnosis (Henry), latest ed.
- 3- Clinical chemistry (Bishop), latest ed.

Assessment method of students:

Active attendance in class.

Medical biochemistry laboratory

Lesson code: 20

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with medical biochemistry

General purpose:

In the end of this course, students have to be able to:

- a) Know the diagnostic value of each compound in diagnosis of different disease.
- b) To do different tests of body liquid with using common and new laboratory method.

Lesson description:

Bachelor of laboratory sciences work in clinical diagnostic laboratory and most important of their job is in clinical biochemistry laboratory, thus they have to be able to do routine clinical biochemistry tests useful for diagnosis of different disease.

Principle subject:

Doing routine clinical biochemistry tests in sample of:

- Urine
- Serum
- Other liquid of body
- Analysis of stone with common and new laboratory method

References:

- 1- Textbook of clinical chemistry (Tietz), latest ed.
- 2- Clinical Diagnosis (Henry), latest ed.
- 3- Clinical chemistry (Bishop), latest ed.

Assessment method of students:

Active attendance in session of laboratory, doing homework theoretical and practical final exam.

General microbiology

Lesson code: 21

Unit number: 2 unites

Unit type: theoretical

Pre necessity: cellular and molecular biology

General purpose: familiarity with classification, morphology, metabolism, growth and genetic of bacteria, types of microscope, method of detection isolation bacteria from each other.

Lesson description: classification and nomenclature of bacteria. Structure of bacteria metabolism and growth and genetic of bacteria, antibacterial compound, influence of physical and chemical agents on bacteria, sterilization techniques, types of microscopes, staining methods and direct study of bacteria, types of culture medium of bacteria, identification of bacteria sensitivity to antibacterial compounds (antibiogram) Relationship between host and pathogen and normal flora of body.

Principle subject: 34 hours

- Introduction of microbiology and microbe world classification of microorganisms
- Comparison of prokaryotes and eukaryotes
- Anatomical structure of bacteria.
- Metabolism and growth of bacteria
- Influence of physical and chemistry agents on bacteria and sterilization
- Familiarity with type of microscope and their application

- Classification of culture medium and necessary conditions for growth of bacteria (PH, temperature, proper atmosphere for growth of aerobic and anaerobic bacteria.
- Method of culture and isolation of bacteria.
- Familiarity with some of enzymatic and biochemical methods for diagnosis of bacteria (catalase, coagulase, oxidase, indol, nuclease)
- Culture techniques for isolation and colony count of bacteria.
- Antimicrobial composition and methods of identification of bacteria sensitivity to antimicrobial compound.
- Relationship between host and pathogen and normal flora of different parts of body.

References:

- 1- Medical microbiology, P.R.Murray (latest ed)
- 2- Medical Microbiology, Jawetz (latest ed)
- 3- Baily and Scoot's Diagnostic Microbiology (latest ed)

Assessment method of students:

Active attendance in theoretical and practical sessions, asking and answering, practical and theoretical midterm and final exam.

General microbiology laboratory

Lesson code: 22

Unit number: 1 unit

Unit type: theoretical

Prerequisite: simultaneous with general microbiology

General purpose: learning of practical microbiology science and its application in medical microbiology.

Lesson description: studying of bacteria shape and morphology, working with type of microscope, bacteria staining, preparation of media culture and sterilization of instrument and microbiological media, bacteria isolation, identification of bacteria sensitivity to antimicrobial compounds.

Principle project:

- Familiarity with instrument of microbiology, types of microscope and methods of sterilization
- Staining of bacteria, observation of gram positive and negative slides
- Microbial direct slides, observation of motility, capsule and spore of bacteria
- Preparation of culture media types (liquid, solid, semisolid)
- The manner of culture and isolation of bacteria in different clinical samples and colony count of bacteria
- Culture on some of common selective and differential media
- Practice some of enzymatic and biochemical methods including catalase coagulase, oxidase and urease
- Practice methods of identification of bacteria sensitivity to antimicrobial compounds

References:

- 1- Bailey and Scott's Diagnostic Microbiology (latest ed)
- 2- Koneman's Microbiology (latest ed)
- 3- Text book Diagnostic Microbiology, CR. Mahon, DC. Lehmand and GM, Anuselis (latest ed)

Assessment method of students:

Active attendance in laboratory and doing homework, theoretical and practical final exams.

Parasitology 1 (worms)

Lesson code: 23

Unit number: 2 unites

Unit type: theoretical

Pre necessity: cellular and molecular biology

General purpose: familiarity with parasites definition and classification of intestinal and cutaneous parasites, studying of life cycle, infections, diagnosis, treatment and transmission routes of parasitic diseases.

Lesson description: Teaching of biology and morphologic property of different intestinal and tissue parasites which are infectious for human.

Principle subject:

Introduction: generalities of parasitology, division of parasites and generalities of helminthology

Nematode: ascaris, visceral larva migrans, Enterobius vermicularis, Trichuris Trichiura, hook worms, cutaneous larva migrans, strongyloides stercoralis Trichostrongylus, Dracunculus medinensis, Capillaria hepatica and philipiensis Trichinella spiralis, microfilariae

Cestoda: Taenia saginata, Echinococcus granulosus, Hymenolepis nana.

Trematoda: generalities of trematoda, fasciola, Dicrocoelium, Schistosoma haematobium.

References:

1- Basic clinical parasitology by/ brown, latest ed.

2- Worms and Human disease by/ Muller, latest ed.

3- Medical parasitology by/ Markell, latest ed.

4- Medical protozoology by/ Gharavi, Teimoor zadeh publication, latest ed.

Assessment method of students:

Active attendance in class and midterm and final exams.

Parasitology 1 laboratory

Lesson code: 24

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with parasitology 1(worms)

General purpose: familiarity with different diagnostic method of human infectious parasites and diagnosis of vectors.

Lesson description: teaching how to take sampling, preparation slides for diagnosis kind of parasites and studying about morphologic property of kind of worms.

Principle subjects: (34 hours)

- Worms demonstration related to each theoretical session.
- Familiarity with fixatives which are used in parasitology.
- Examination of direct smear and sealing of parasitic samples.
- Examination of animals contaminated live by hydatid cyst and microscopic studying of protoscolex.
- Examination of parasites in preserved sample.
- Practicing flotation method and educating of scotch tape diagnosis.
- Practicing hidden blood method in stool and doing precipitation method.
- Sampling and route of thin and thick slide preparation method.
- Examination of parasites egg in preserved sample.

Examination: Demonstrating and showing slides according to the presented.

Subject in each theoretical sessions, also presented practical plan is generally and divided base on theoretical sessions of worms.

References:

- 1- Basic clinical parasitology by Brown, Latest ed.
- 2- Worm and human disease by/Muller, Latest ed.
- 3- Medical parasitology by/Markell, Latest ed.

Assessment method of students:

Active attendance in class, doing homework and theoretical and practical final exams.

Medical immunology

Lesson code: 25

Unit number: 3 unites

Unit type: theoretical

Prerequisite: theoretical physiology

General purpose: familiarity of bachelor students of laboratory sciences with do immunologic.

Lesson description: teaching and introduction of immunology, organs of immune system, immune responses.

Principle subject: (51 hours)

Introduction of immunology, related definition, history.

- Cells, organs and tissues of immune system.

Hematopoiesis: growth factors in hematopoiesis, genes, regulation of hematopoiesis, apoptosis.

- Cells of immune system: T lymphocytes, B Lymphocytes, NK cells, phagocyte cell, granulocytes, mast cell, antigen presenting cell.

- Organs and tissues: primary lymphatic organs: thymus, bone marrow, and bursa.

Secondary lymphatic organs: lymphatic tissues related to mucus, lymphatic tissues related to skin.

- Antigen: definitions related to immunogen, antigen, haptens, effective agents in immunization, agents to antigen, host, dependent and independent antigen from thymus, antigenic epitopes, types of epitopes-hidden antigen.

- Immune globulin: structure of immunoglobulin, types of immunoglobulin classes and sub classes, structural characteristic and biologic role of classes and sub classes. Antigenic determination in immunoglobulin, isotype, allotype, idiotype, organization of immunoglobulin gene effective organization in generation of immunoglobulin diversity and specificity.
- Complement system, definition and component of complement system: ways of complement activation, classic way, alternative way, and lectin way, the complement role in inflammation and phagocytosis phenomenon
Regulation ways in complement system activation
evaluation of complement system complement system deficiency.
- Antigen and antibody reaction: binding of Ag and Ab molecules affinity and avidity of antibody, effective forces in reaction between antigen and antibody.
Precipitation reaction in liquid and gel phase (double gel diffusion, single radial diffusion, counter immunoelectrophoresis, immunoelectrophoresis)
agglutination reaction, immunofluorescence method, immunoassay enzyme and radio immunoassay, immunoblotting, flowcytometry, Rosset technique, CH 50 skin testes.
- Major Histocompatibility complex:
 - The place and function of MHC gene, structure of class I, II molecules, the role of MHC in presenting of antigen and immune response, regulation of MHC expression.
 - MHC and graft, methods of HLA typing, association between HLA and diseases, immunologic reaction in graft rejection, graft versus host reaction.
 - Natural immunity, physiologic and physical barrier, inflammation response phagocytosis, acquired immunity, relationship between natural immunity and acquired immunity, reactions and vaccination.

- Humeral immune response, Ag dependent and independent generation and differentiation of B lymphocytes, primary immune response, Ab production, regulation of humeral response, monoclonal antibody, super family of immunoglobulin genes.
- Cell mediated immune response, generation and differentiation of T lymphocytes in thymus, T lymphocyte receptor, genetic structure of T.CR, types of T lymphocyte, positive and negative selection in thymus, T lymphocyte response role of antigen presenting cells and MHC.
- Cytokines, definition, structure and function of cytokines, production of cytokines relationship between cytokines and diseases treatable application of cytokines.
- Tolerance and autoimmunity, autoimmune disease.
- Hyper sensitivity, allergy, hypersensitivity of type I, II, III, IV.
- Immune response to infectious agents: immune generalities against viruses, bacterial infection, protozoa, worm infections, fungi infections.
- Deficiencies of immune system: primary deficiencies of immune system. Deficiencies of humeral and cell mediated immune systems, deficiencies of phagocytosis system, secondary deficiencies of immune system, AIDS and other disorders.
- Cancer and immune system: oncogenes and generation of cancer, immune response to tumors, scape of tumors from immune response cancers immunotherapy.

References:

- 1- Zan HD, Immunology, theoretical and practical in laboratory medicine, latest ed.
- 2- Cellular and molecular immunology (Abol Abbas) translated by Reza Farid hoseini, latest ed.

Assessment method of students:

Active attendance in class, asking and answering, midterm and final exams.

Medical immunology laboratory

Lesson code: 26

Unit number: 2 units

Unit type: practical

Prerequisite: simultaneous with medical immunology

General purpose: familiarity of students with different immunologic test therefore students of laboratory science will be able to do properly routine tests of immunology.

Lesson description: teaching different methods of immunology including electrophoresis, immunofluorescence, gel diffusion, flowcytometry,

Principle subject: (68 hours)

- Generalities about regarding laboratory safety.
- Precipitation tests, SRID, counter immunoelectrophoresis, immunoelectrophoresis.
- Agglutination tests include of; direct and indirect hem agglutination, Wright test, 2ME combs Wright, widal, hem agglutination inhibition.
- Latex agglutination test (RF, CRP, and Pregnancy test).
- Complement system assessment test, phagocytosis, and RIA tests.
- Direct and indirect immunofluorescence, EIA tests.
- Lymphocyte isolation method, Rossett tests, HLA typing.

- Flowcytometry, PCR, immunoblotting, turbidometry, chemiluminescence, skin test such as Schick test, PPD, acquaintance with cell culture methods.

References:

1- Zane HD, Immunology, Theoretical and practical concept in laboratory medicine, latest ed.

Assessment method of students:

Active attendance in laboratory, doing homework, theoretical and practical final exams.

Medical virology

Lesson code: 27

Unit number: 2 units

Unit type: theoretical

Prerequisite: general microbiology

General purpose: familiarity with classification of many types of infectious viruses, pathogenesis mechanism of prevalent viral disease in Iran and current method which used for diagnosis of these diseases.

Lesson description: in this course students learn the classification of different groups of infectious viruses and their related disease such as cancers and pathogenesis and diagnosis and treatment of viral diseases.

Principle subject: (34 hours)

- Introduction and history of virology.
- General characteristics of viruses: structure, chemical compound and classification of viruses.
- Replication of viruses.
- Pathogenesis mechanism of viral diseases.
- Relationship between viruses and cancers tumor viruses.
- Retroviruses and AIDS
- Hepatitis viruses

- Orthomyxo viruses
- Paramyxo viruses
- Picorna viruses
- Reoviruses
- Rabdo viruses
- Toga viruses and Fla viruses
- Papova viruses
- Adeno viruses
- Herpes viruses
- Pox viruses
- Parvo viruses
- Miscella viruses
- Periones

References:

- 1- Medical microbiology (Jawetz.et al), latest ed.
- 2- Medical microbiology (Murray.et al)

Assessment method of students:

Active attendance and answering and questioning in class and quizzes in during term and final exam.

Laboratory of medical virology

Lesson code: 28

Unit number: 1 unit

Unit type: practical

Preneccessity: simultaneous with medical virology

General purpose: acquaintance with laboratory of virology and current method in laboratory diagnosis of viruses.

Lesson description: in this curse students learn the primary principle of in laboratory of virology and they are taught different method including: cell culture, serologic immunologic, cytopathologic and PCR.

Principle subject: (34 hours)

- Acquaintance with laboratory of virology
- Acquaintance with laboratory diagnosis method of viral infections
- Preparation of cell culture media, culture of viruses and observation of cytopathologic effect.
- Serologic and PCR in diagnosis of viral infections
- Using of PCR in diagnosis of viral infections
- Acquaintance with electronically microscope

References:

- 1- Medical microbiology (Jawetz), latest ed.

2- Medical microbiology (Murray et al), latest ed.

Assessment method of student:

Regular attendance in laboratory session, doing homework, theoretical and practical final exams.

Parasitology 2 (Protozoa, Arthropoda)

Lesson code: 29

Unit number: 2 unites

Unit type: theoretical

Predecessor: parasitology 1 (worms)

General purpose: Learning all infectious parasites which involved in human disease including parasites with high, limited and rare spreading, familiarity with biologic properties, pathogenesis, diagnosis, prevention, control and epidemiology of them.

Lesson description: teaching parasites including intestinal and luminal protozoa, blood and tissue protozoa and arthropods injurious to human beings.

Principle subject: protozoology: mastigophora (Trichomonas, Giardia, Chilomastix, Dientamoeba, Trypanosoma, and Leishmania), amoeba, types of plasmodium, cryptosporidium, Isospora, Toxoplasma, Sarcocystis, Cyclospora, Pneumocystis, Blastocystis hominis.

Generalities of entomology: Sand fly, Anopheles, Sarcoptes scabiei, Fleas, Cimex, Pediculoides, Tick

References:

1- Basic clinical parasitology by/Brown, latest ed.

2- Worm and human disease by/Muller, latest ed.

3- Medical parasitology by/Markel, latest ed.

Assessment method of students:

Active attendance, asking and answering in class, midterm and final exams.

Parasitology (2) laboratory (Protozoa, Arthropoda)

Lesson code: 30

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with parasitology 2 (Protozoa, Arthropoda)

General purpose: Acquaintance students with diagnosis of human pathogenic protozoa agents and arthropoda.

Lesson description: Teaching sampling methods, isolation, slide preparation and staining of different parasite types, learning morphologic properties of parasites types and pathogenic insect.

Principle subject:

- Demonstration of all worms, parasitic protozoa and arthropoda slides simultaneously with theoretical class.
- Examination of intermediate host snails.
- Preparation of direct smear and method of sealing stool slides types of conservative solution and application of them.
- Dissection of mouth intestine for observation of intestinal parasites.
- Examination of sedimentation methods for observation of parasites egg and protozoa cyst.

- Examination of stool culture methods and quantitative methods of stool samples (Bayer stool Kato).
- Preparation of thick and thin slides and acquaintance with blood staining methods.
- Acquaintance with laboratory animals and maintenance site of them.
- Sampling methods of Leishmania sores
- Acquaintance with serologic methods and application of them in laboratory of parasitology.
- Trichrom staining methods parasitic protozoa.

References:

- 1- Basic clinical parasitology by/Brown, latest ed.
- 2- Worms and human disease by/Muller, latest ed.
- 3- Medical parasitology by/Markell, latest ed.

Assessment method of students:

Active attendance in laboratory, doing homework, midterm and final exams.

General pathology

Lesson code: 31

Unit number: 2 unites

Unit type: theoretical

Pre necessity: theoretical history

General purpose: Learning microscopic anatomy of human body structure in disease condition so that it is necessary for bachelor students of laboratory sciences.

Lesson description: regarding the importance of microscope in tissue injuries, for clinical diagnosis, learning microscopic anatomy in abnormal cases help students to understand lesson better.

Principle subject:

- Definition, history and importance of pathology.
- Damage and cell death.
- Reparation phenomenon, inflammation and renovation of cells.
- Inflammation, types of inflammation, description of some bacterial inflammation (tuberculosis, syphilis, ...)
- Disorders of blood and liquids distribution in body.
- Thrombosis, infarction
- Disorders of cellular growth and differentiation.
- Definition of neoplasia and reasons of that.
- Generalities of tumors and briefly about types of them.

- The manner of cancerous cells metastasizes in body.

References:

Pathology and laboratory medicine (S. RAAB et al), latest ed.

Assessment method of students:

Active attendance in class, asking and answering, midterm and final exams.

General pathology laboratory

Lesson code: 32

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with general pathology

General purpose: familiarity with techniques of pathology and learning slide preparation from aspiration liquids and tissues.

Lesson description: learning working methods in laboratory of pathology include of: preparation of cytologic slides, tissue section, and fixation, routine and specific are staining, immunohistochemical staining.

Principle subject:

- Methods of tissue section
- Methods of tissue freezing
- Fixation and types of fixatives
- Decalcification
- Tissue passage
- Method of tissue section
- Requirement instruments and equipment
- Staining theories
- Type of staining methods
- Preparation methods of stains
- Ordinary staining and requirement instrument for it

- Staining of freezing tissue
 - Specific staining for different tissues
 - Cytologic staining
 - Specific methods and requirement instruments in laboratory of pathology
 - Tissue conservation and museum techniques.
- Immunohistochemistry techniques.

References:

- 1- Primer of Histopathologic technique, Brown, latest ed.
- 2- Atlas of diagnosis immunohistopathology (True) Gower Medical, latest ed
- 3- Theory and practice of histological techniques (Bancroft), latest ed

Assessment method of student:

Active attendance in class practical and theoretical final exams.

Medical biochemistry 1

Lesson code: 33

Unit number: 2 unites

Unit type: theoretical

Predecessor: medical biochemistry 1

General purpose:

In the end of this course, students are able to

A) Know biochemical compounds of body and their properties.

B) Describe change of compounds in health and disease condition

C) Explain, the value of each compound for diagnosis of different disease

Lesson description: Teaching clinical biochemistry according to the following headline so bachelor laboratory science will be able to understand the concept of biochemistry and also to do and interpret the tests.

Principle subject: (34 hours)

- Disorders of pentose phosphate pathway and glycogen storage disease- methods of diabetes diagnosis and control, cholesterol metabolism and disorders. Metabolism of aminoacides and disorders of them- cardiac risk factors specific proteins and isoenzymes of cardiac tissue in diagnosis of acute myocardial infarction, biosynthesis of

hem. The reasons of porphyria. Haemoglobinopathies and thalassaemia. Liver disorder and laboratory examination- Renal disorders and laboratory examination- Examination of biochemical changes in other liquid of body. Trace elements diagnosis of methods of urinary, billiary and salivary stones. Teaching basis of citrate and oxalate measurement in urine.

References:

- 1- Textbook of clinical chemistry (Tietz), latest ed
- 2- Clinical diagnosis (Henry), latest ed
- 3- Textbook of biochemistry (Devlin), latest ed

Assessment of method students:

Active attendance in class, asking and answering, midterm and final exams.

Medical biochemistry 2 laboratory

Lesson code: 34

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with medical biochemistry 2

General purpose: in the end of this course, students have to be able to:

A) Explain measurement value of every compound in diagnosis of different disease.

B) Do different biochemical tests of body liquid by using common and new laboratory methods.

Lesson description: teaching different methods of chromatography, types of electrophoresis, measurement of trace element with atomic absorption method, generally specific biochemical tests (ionic exchange chromatography- thin layer)

Principle subject: 34 hours

- Familiarity with basis of chromatography (ionic exchange chromatography- thin layer)
- Diagnosis of aminoaciduria
- Basis of electrophoresis (proteins, lipoproteins, hemoglobin)

- Laboratory examination of haemoglobinopathies and thalassaemia.
- Measurement of HDL-C.
- Familiarity with isoenzymes isolation methods.
- Measurement of cardiac and hepatic enzymes with kinetic method.
- Measurement of HbA1C.
- Measurement of some trace elements and acquaintance with basis of atomic absorption.

References:

- 1- Textbook of clinical chemistry (Tietz), latest ed.
- 2- Clinical diagnosis (Henry), latest ed.
- 3- Textbook of biochemistry (Devlin), latest ed.

Assessment method of students:

Active attendance in laboratory, doing homework, theoretical and practical final exams in the end of term.

Pharmacology

Lesson code: 35

Unit number: 2 unites

Unit type: theoretical

Predecessor: medical biochemistry 1 and theoretical physiology

General purpose: familiarity with function and end of drugs in human body

Lesson description: in this lesson generalities of pharmacology and brief description of using drugs in treatment of different disease are thought and their interference with laboratory tests.

Principle subject: (34 hours)

- Generalities of pharmacodynamics, pharmacokinetic, absorption, metabolism and half-life of drug.
- Effective drugs on pathogenic alive agents such as type of antibiotics and antifungi, antiparasites and antiviral drugs.
- Cardiovascular drugs
- Hemetopoiesis drug
- Nervous system drugs.
- Drugs against pain, fever and inflammation
- Eatable drugs for diabetes and insulin
- Antihypertensive and hyperuresemia drugs
- Diuretic

- Antihistamines
- Adrenocorticosteroids
- Drug interfering with laboratory tests

References:

1- Medical pharmacology (Gutt), latest ed

Assessment method of student:

Active attendance and asking and answering in class, final exams.

Toxicology

Lesson code: 36

Unit number: 1 unit

Unit type: theoretical

Prerequisite: pharmacology

General purpose: familiarity with route of absorption, spreading, application and metabolism of toxic materials.

Lesson description: in this lesson generalities of toxicology and toxic level of drugs and toxic chemical materials are thought.

Principle subject:

- Generalities of toxicokinetic, toxicopharmacodynamics, absorption, spreading metabolism and half-life of poisons drugs.
- Poisoning of organic compound of phosphate and chlorate
- poisoning of mercury, lead, iron, arsenic, cyanide, alcohols
- poisoning of different drugs

References:

- 1- Principle of Biochemical Toxicology (J.Timbrell), latest ed
- 2- Clinical laboratory Medicine. Chapter toxicology (Mc Clathey), latest ed

Assessment method of students:

Active attendance and asking and answering in class, final exam.

Toxicology laboratory

Lesson code: 37

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with toxicology

General purpose: familiarity with recognition and diagnosis of drugs and different toxic materials in liquid of human body.

Description lesson: Teaching measurement methods of elements, poisons, gases, drugs and materials result in poisoning in human.

Principle subject:

- Generalities and basis of working in laboratory of toxicology
- Recognition and measurement methods of poisons and compound of phosphate and chlorate in poisoning
- Recognition and measurement of cyanide, carbon monoxide, alcohols, glycol, arsenic, mercury and lead in body liquids
- Immunochemical and chromatography methods of narcotic drugs
- Familiarity with measurement of blood level of drugs such as Digoxin Lithium, antispasm, immunosuppressive.

References:

- 1- Principles of biochemical toxicology (J. Timbrell), latest ed

2- Clinical laboratory medicine, Chapter Toxicology (Mc Clather), latest ed.

Assessment method of students:

Active attendance in laboratory and doing homework, theoretical and practical final exams.

English text and medical terminology

Lesson code: 38

Unit number: 2 unites

Unit kind: theoretical

Prerequisite: _

General purpose: familiarity with medical terminology in scientific texts of laboratory sciences and learning English language in order to study scientific books and instruction of tests and apply it by graduated students in their job.

Lesson description: in this lesson students learn subjects which thought by teacher and solve their problem in understanding of English texts.

Principle subject: (34 hours)

Teacher chooses different parts of Clinical Diagnosis and Management by laboratory methods book as a reference will be discuss and gives copy of them to students: so in this course students will be familiarity with medical terminology in different fields.

References:

Clinical diagnostic and management (Henry), latest ed.

Assessment method of students:

Active attendance in class, asking and answering, final exam.

Basis of safety and protection in laboratory

Lesson code: 39

Unit number: 1 unit

Unit kind: theoretical

Prerequisite: medical virology, medical immunology

General purpose: familiarity with basis of safety and protection in laboratory in order to during of tests processing, no hazardous threat patients and colleagues.

Lesson description: definition of protection and safety, teaching rules and executive of protection and safety including physical environment, working with apparatus, infectious agents, chemical agents, radioactive agents, inflammable materials and basis of repelling waste materials and rubbish.

Principle subject: (17 hours)

References:

- Definition of protection and safety, safety and hygiene.
- Construction of laboratory related with basis of safety, biologic protective rooms.
- Protection rules in laboratory, safety committee in hospital, executive directions and responsibility of employer against personal and society.
- Rules of working in microbiology laboratory, classification infectious agents.
- Teaching correct working with syringe and needle and prevention from skin piercing of personnel with needle.

- Maintenance ways of chemical materials in laboratory and teaching abbreviation signs, S and R safety alarms.
- Basis of prevention of fire and comforting ways with fire if happened.
- Protection principles against radioactive materials, standards and related rules.
- Principles of protections against electric events and confronting ways with them.
- Principles of repelling laboratory waste materials and rubbish and regard of bioenvironmental problems.
- Principle of transport of package containing pathologic samples

References:

- 1- Clinical diagnosis and management (Henry), latest ed.
- 2- Clinical laboratory medicine (Mc Clathey), latest ed.

Assessment method of students:

Active attendance in class, asking and answering, final exam.

Hematology 1

Lesson code: 40

Unit number: 3 unites

Unit kind: theoretical

Prerequisite: theoretical physiology

General purpose: Recognition of hematology science so bachelors of laboratory sciences will be able to do ordinary diagnostic tests of hematology.

Lesson description: familiarity with formation and differentiation of blood cells and morphologic changes in blood diseases, haemostatic, hereditary and acquired disease of coagulation.

Principle subject: (51 hours)

- Introduction and formation process blood tissue structure of blood cells.
- Introduction of hematopoietic tissue include of: structure and function mechanism of bone marrow, spleen, lymphatic gland and liver.
- Stem cells, cell cycle, growth, development and differentiation lines of blood cells, growth factors and control of hematopoiesis.

Lineage and development process of red blood cell:

- Red blood cell membrane and mechanism of their function.
- Hemoglobin, hem and globin synthesis, control and mechanism of their function.
- Types of hemoglobin (hereditary and acquired changes).
- Intra and extra vascular, degradation of red blood cells.

- Mechanism of action, blood component and metabolism of granulocytes types.
- Mechanism of action and metabolism of monocytes.
- Mechanism of action and metabolism of lymphocytes.
- Anemia resulting from hem synthesis defect such as iron deficiency anemia, anemia in chronic disease, syndroblastic anemia, path physiologic subjects, iron metabolism and storage, clinical sign and hemetologic changes.
- Anemia resulting from abnormal biosynthesis of globin such as: sickle cell anemia, hemoglobin C disease and thalassemia, ... path physiologic subjects, structural defect of hemoglobin, hemotologic changes and differential diagnosis.
- Macrocytic, megaloblastic and nonmegaloblastic anemia such as folic acid and B12 deficiency anemia and anemia resulting from hepatic disease, path physiology subjects, metabolism, clinical symptoms and hematologic changes.

Hemolytic anemia, classification:

- Internal defection of red blood cells (membrane, hemoglobin structure and enzyme)
- External defection of red blood cells (plasma factors, external factors, physical and mechanical injuries path physiologic subjects, clinical sigma, hematologic changes and laboratory finding in each case.

Origin and development process of white blood cell.

Non malignant disease of granulocytes include of:

- Quantitative disease of granulocytes (such as Nutrophilia, eosinophilia, basophilia, eutropenia.
- Aquired qualitative changes of granulocytes such as: Pseudo- Pelger- Huet dohle bodies and granulation.
- Hereditary qualitative changes of neutrophiles such as Alder- Reilly anomaly chediak- higashi and May- Hegglin anomaly.
- Quantitative disease of monocytes.

- Disease due to from lipid collection in cells such as Gaucher Nieman- picks.

References:

1- Rodak B.F, Hematology. Clinical principle and application, latest ed.

2- Text book of Hematology (Mekenzie), latest ed.

3- Essential Hematology (Hoffbrand), latest ed.

Assessment method of students:

Active attendance in class, asking and answering, theoretical final exam.

Laboratory of hematology 1

Lesson code: 41

Unit number: 2 unites

Unit kind: practical

Pre necessity: simultaneous with hematology 1

General purpose: familiarity of students with ordinary hematologic tests.

Lesson description: Teaching principle of sampling, blood cells count preparation of staining smear and studying normal blood cells and morphologic changes of them in blood disease.

Principle subject: (68 hours)

- Principles of blood sampling, anticoagulants and acquaintance with normal blood cells.
- Principles of blood cells staining, preparation blood smear and staining procedure and studying with microscope.
- Hematocrit and hemoglobin measurement and drawing procedures of hemoglobin curve and doing ESR test.
- White blood cell count with manual hemocytometer method and teaching correcting method of leukocytes count after counting NRBC in smear.
- Red blood cells count and manual calculating of MCV, MCH and MCHC indexes and comparison with cell counter results.
- Manual method for platelet counting and comparison it with estimated counting in blood smear and studying of platelet morphology.

- Reticulocyte count, preparation of blood smear and studying of red blood cells morphology especially in polychromasia condition.
- Preparation of normal blood smear, staining and doing differential count minimum consecutive 3 times and comparison dates with each others.
- studying of peripheral blood and bone marrow smears for educating lineage of red blood cells.
- studying of hypo chromic microcytic anemia slides and training of reporting method of red blood cell morphology.
- Studying of macrocytic and normocytic, normochromic and hemolytic anemia smear.
- Studying of blood film of cellular anomalies and preparation method LE cell smear.
- Principle of blood cell counters and data interpretation and calibration methods and control of blood cells count apparatus.
- Hemoglobin electrophoresis Cellulose acetate and citrate agar gel method and interpretation of that.
Sick ling test, sickle solubility, Hb-H.
- studying method of unstable hemoglobines and Heinz bodies.
- Ordinary test of hemolytic anemia, osmotic fragility, autohemolysis, Ham's test, ...
- Studying of bone marrow smear for teaching white blood cells lineage.

References:

- 1- Laboratory hematology (Chanarin), latest ed.
- 2- Practical Hematology (Dacie and Lewis), latest ed.
- 3- Atlas of hematology (Wolff), latest ed.

Assessment method of students:

Active attendance in laboratory, doing homework, practical midterm exam and theoretical and practical final exams.

Technical principle and maintenance of laboratory equipment

Lesson code: 42

Unit number: 1 unit

Unit type: theoretical

Prerequisite: Biophysics and medical biochemistry 2

General purpose: Recognition of different components, function mechanism and application of laboratory apparatus, correct protection maintenance of these instruments.

Lesson description: Technical principle and proper working method and keeping of laboratory apparatus include of: microscope, centrifuge, PH meter spectrophotometer, flame photometer, cell counter, flowcytometer, biochemical autoanalyzer.

Principle subject: (17 hours)

- Principle of working properly with microscope, types of immersion oil and their application, microscope maintenance, dark field microscope, polarized microscope, electronic microscope
- Principle of types of centrifuge, methods of their maintenance and keeping way of them
- Different types of pipettes, samplers and methods of maintenance.
- Technical principle of spectrophotometer and flame photometer and taking care of them.
- Technical principle of PH meter, maintenance and keeping methods of them.
- principle of cell counter, apparatus based on electric resistance and light dispersion, restrictions and interferential

elements and agents in counting blood cells, calibration of cell counter, keeping and maintenance of cell counter.

- Principle of flowcytometry, main parts of it, procedure of cell analysis, method of sample preparation and data evaluation.

- Technical principle of gamacounter and beta counter keeping and maintenance of them.

- Technical principle of biochemical auto analyzer, calibration methods, interferential agents and elements in accuracy and precision of result. Keeping and their maintenance methods of it.

References:

- 1- Hematology RODAK 2002, latest ed

- 2- Flowcytometry and cell sorting. Radbruch, latest ed

- 3- Electronics and instrumentation for clinical laboratory (Eggert) Wiley Medical, latest ed.

Immunohematology

Lesson code: 43

Unit number: 2 unites

Unit type: theoretical

Prerequisite: medical immunology

General purpose: Acquaintance with types of minor and major blood groups and also principle and rules of donation, types of cellular and plasmatic production.

Lesson description: Biochemical principle, genetic and inheritance of minor and major blood groups, preparation and take care of cellular and plasmatic production types, problem of transfusion.

Principle subject: (34 hours)

1) Serology of blood groups

Types of antigen (soluble antigen, microbial antigen, antigen of red blood cells)

Types of antibodies (IgM, IgG)- antigen and antibody reaction, types of red blood cell reaction with specific antibodies (Hem agglutination and hemolysis and HI), definition of hem agglutination reaction, different steps and effective agents in hem agglutination reaction, scoring of hem agglutination reaction (W.P $\pm$, +, ++, +++, +++++)-Flase hem agglutination (Rouleaux formation)

2) Immunohematology:

- ABH blood system, ABH specific antigens in red blood cells surface, leukocytes, platelets and other body tissues and liquid.

Similarity of ABH blood groups antigens in surface of red blood cells and bacteria.

- Specific antigens of platelets and clinical importance of them.

- Specific antigens of granulocytes and clinical importance of them.

- Percentage and frequency of ABH blood group types in world and in Iran. Chemical compound of ABH blood groups, principle of genetic and inheritance ABH blood groups. Minor blood groups of A, B, AB, Bomboy and presentation of new subject about it.

- Antibodies of ABH system, development and formation of ABH blood group antibodies.
- Types of blood group antibodies, antibodies of natural IgM class (NRCSAb), Immune antibody from IgG class, hem agglutination and nonhemagglutination antibodies (Blocking Ab), and hemolytic antibodies hemolyzing with helping. Complement system (hemolysin A, B), Rh blood group system, and Rh specific antigen in surface of red blood cells. Percentage and frequency of Rh⁺ and Rh⁻ members.
- Existence theories about Rh system antigen nomenclature existence, theory about formation of Rh system antigen. Chemical compound and genetic and inheritance principle of Rh system antigens. Types of Rh system antigen and presentation new subjects about it, Du antigen and the reasons of its outbreak.
- Rh system antibodies and importance of them (IgG1, G3).
- Secretor and nonsecretor system about antigen of ABH system searching antigens of ABH system in body liquid (salivary grouping).
- System of minor blood groups, chemical compound and genetic and inheritance principle of minor blood groups.
- Antibodies of minor blood group system and role of them in HDN, HTR
- Hemolytic disease of the newborn resulting from incompatibility of ABH system and Rh in mother and her foetus clinical symptoms diagnosis, treatment and prevention.

3) Blood transfusion

- Introduction, history of blood transfusion and recent development in blood banking.
- Principles, purpose and rules of blood donation and protection of recipient blood system, necessary tests on donor blood.
- Types of blood bags and consumed anticoagulant.

- Characteristic of whole blood, preparation, keeping and application of it.
- Preparation, maintenance and application of cellular products.
- Principle of pheresis (cytopheresis, plasma pheresis, leuko pheresis, thrompo cyto pheresis, lymphocytopheresis, erythrocytopheresis), clinical application of each of them.
- Problems of blood transfusion (early and late problems)
- Transfusion of specific blood (auto transfusion, emergency blood transfusion, massive transfusion, blood transfusion in infants, transfusion in HDN)
- Transfusion transmitted disease TTD

References:

- 1- Hematology and blood transfusion medicine (Davidson and Henry), Translated by Dr Rakhshan, latest ed.
- 2- Immunohematology (Principle and practices) Eva D.Quinly, latest ed.
- 3- Text book of blood banking and transfusion Medicine, (Rudman, Sally V), latest ed.
- 4- Modern book banking and transfusion practices, Denise M. Harmening, latest ed
- 5- Clinical practice of transfusion medicine L.D.Pet Z.S.N.Swisher, third edition (1998)

Assessment method of students:

Active attendance in class with asking and answering and final exam.

Laboratory of immunohematology

Lesson code: 44

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with immunohematology

General purpose: Acquaintance with direct and indirect diagnosis method of minor and major blood groups also compatibility tests before blood transfusion, so that bachelors of laboratory sciences can identify minor and major blood groups and proper, compatible blood for patients and remove problem in this field.

Lesson description: principle of practical methods in identifying minor and major blood group types and compatibility tests before blood transfusion and application of them in clinical and medical diagnosis laboratory.

Principle subject: (34 hours)

- Quality control in blood banking, theoretical principles, practical tests include of commercial antiserum titration, avidity test, and unexpected antibody detection by cross matching method with three tubes, types of screening red blood cells (O/cell- P/cell- Pane/cell)
- Identification of ABH blood groups on cells directly (cell type = Forward grouping) and on the serum indirectly (Back type = Reverse grouping)
- Grouping errors by two above methods and removing related problems.
- Genotype and phenotype identification of Rh system, errors and removal related problems.
- Du test, application of Rh system genotype identification in medicine.
- Titration of natural antibodies (Anti A, Anti B) from IgM class and examination of immune antibodies from IgM class- application of blood groups antibodies titration in medicine.
- Direct comb's test, indirect comb's test, Anti D titration and clinical application of that.

- The test before blood transfusion, cross matching test and its type, examination of errors and removal related problems.
- Irregular antibody detection and irregular antibody identification.
- Grouping of minor blood groups and its application.
- Salivary grouping and identification of secretor and nonsecretor by salivary grouping method.
- Cold hem agglutination test and their application (Cold Agglutinin disease = CDA)

References:

- 1- Modern method in immunohematology (Panahi Mahdi), latest ed.
- 2- Principle and laboratory method in blood banking (Dr.Golafshan), latest ed.

Endocrinology

Lesson code: 45

Unit number: 1 unit

Unit type: theoretical

Pre necessity: medical biochemistry 2

General purpose: in the end of this course students are able to:

- A) Know harmonic compound of body and their properties.
- B) Describe changes of these compounds in health and disease condition.
- C) Express measurement value of these compounds in diagnosis of different disease.

Lesson description: Teaching endocrinology subjects according to following headlines so that bachelor of laboratory sciences can do endocrinology test and know points related to clinical

Principle subject: (17 hours)

- Hypothalamus hypophys- thyroid axis and their disorders.
- Hypothalamus hypophys- gonads axis and their disorders.
- Chemistry of pregnancy and placenta
- Parathyroid and phosphate and calcium and their disorders.
- Hormones of digestion system and pancreatic hormones
- Insulin, diabetes

-
Catecholamine

References:

- 1- Text book of clinical chemistry (Tietz), latest ed.
- 2- Clinical diagnosis (Henry), latest ed.
- 3- Text book biochemistry (Devlin), latest ed.

Assessment method of students:

Active attendance in class, asking and answering, midterm and final exams.

Endocrinology laboratory

Lesson code: 46

Unit number: 1 unit

Unit type: practical

Pre necessity: simultaneous with endocrinology

General purpose: in the end of this course students are able to:

- A) Know measurement value of each compound in diagnosis of different disease
- B) Do different endocrinology tests of body liquid using of modern and ordinary laboratory methods

Lesson description: (34 hours)

- Sampling method and hormones keeping-principles of ELISA-RIA and chemical methods in hormones measurement.

- Doing some of endocrinology tests include of:

T4- T3- TSH, T3 up take- FT3- FT4

Prolactin- LH- FSH- Testosterone- Estradiol

17 keto steroids

VMA

β HCG

References:

1- Text book of clinical chemistry, (Tietz), latest ed.

2- Clinical Diagnosis (Henry), latest ed.

3- Text book of biochemistry (Devlin), latest ed.

Assessment method of students:

Active attendance in laboratory, doing homework, midterm and final exams.

Medical mycology

Lesson code: 47

Unit number: 2 unites

Unit type: theoretical

Pre necessity: general microbiology

General purpose: classification and recognition of saprophyte and pathogen fungi, laboratory diagnosis method of them, researching methods in order to prove opportunist and pathogen fungal diseases.

Lesson description: pathogenic fungi agents for human and clinical features of them, macroscopic and microscopic

properties and their characteristic on culture medium and isolation methods and recognition in environment (atmosphere, soil, instrument and equipment) and differentiation of them are introduced in this lesson.

Principle subject:

- Generalities of mycology, cellular structure and classification of fungi sexual and asexual and sexual like reproduction.
- Properties of like-moulds, yeast, types and shapes of mycelium, homothallic and heterothallic.
- Preparation of nutritious needs of fungi, nutritious needs and essential elements and materials for fungi growth.
- Essential physical agent are influenced on fungi growth (PH, light, temperature, moisture, oxygen and co2 concentration, osmotic pressure)
- Saprophyte fungi and their role in nature and decaying materials.
- Role of fungi in preparation of chemical, pharmaceuticals and nutritious materials.
- Familiarity with macroscopic and microscopic properties of saprophyte fungi (25 species)
- Familiarity with eatable and poisonous mushrooms and their resultant disease, type of mycotoxin
- Classification of fungal disease
- Description of superficial fungal disease
- Description of cutaneous mycoses and dermatophytosis types and their properties important and ordinary species
- Subcutaneous mycoses (clinical symptoms pathogenic agent, laboratory diagnosis method)
- Systemic fungous disease which caused by opportunistic fungi
- Fungous like disease (Pitted karatolysis- erythrasma, Dematophilosis, Trichomycosis axillaries, Nocardiosis-actinomycosis)

- Disease caused by yeast and yeast like (Geotrichosis, Cryptococcosis, Candidacies, Rhodotorulosis)
- Description of labomycosis- Prothecosis- Rinosporidiosis.
- Sampling method of patients and body liquids, homogenization and concentration of specimen and transmission of them
- Sampling methods of soil, air, environment, instrument and tools in order to fungi isolation.
- Keeping and maintenance methods of fungous culture and slides in short and long time-fighting with mites.

References:

- 1- Medical mycology, (Rippon), latest ed.
- 2- Medical mecology, (Evans), latest ed.
- 3- Fungal biology.D.H.Jennings, latest ed.
- 4- Mycology (Shahla Shadzy)

Assessment method of students:

Active attendance in class, doing homework, final exam.

Medical mycology laboratory

Lesson code: 48

Unit number: 1 unit

Unit type: practical

Preneccessity: simultaneous with medical mycology

General purpose: in the end of this course students have to be able to do sampling from patients and environment correctly and do mycologic examination and isolate pathogen and saprophyte fungi and repot them.

Lesson description: mentioned in practical subject principles

Principle subject: (34 hours)

- Familiarity with instrument, laboratory environment and safety points.
- Preparation of clearing solution, stains, fungous culture media.
- Culture of direct slide-slide culture- subculture and teased mount
- Culture of saprophyte fungi specimens which have been thought in theoretical class
- Preparation of teased mount and slide culture and giving slides to laboratory responsible
- Candida albicans culture with three line method in cornmeal agar with tween 80-germ tube test, hallow phenomena in candida, fermentation and assimilation of carbohydrates.
- Generation of ascospore in yeasts-staining method and observation them and delivering slides to laboratory responsible.

Conservation of moulds phase of *sporothrix schenckii* to yeast from in culture medium and its injection to laboratory animal if it is possible, preparation autopsy and slides and delivering them to laboratory

- Dermatophyte culture, preparation of slide culture and delivering slides to laboratory responsible.
- Methods of penetration of hair by dermatophytes and slide delivery to laboratory manager and observation kind of hair infection
- Observation methods of complete stage of dermatophytes and isolation way of dermatophytes from soil
- Dermatophyte culture on rice seeds and cornmeal agar in order to observe pigmentation

References:

- 1- Medical Mycology, Rippon, latest ed.

- 2- Medical Mycology, Evans, latest ed.
- 3- Fungal biology.D.H.Jennings, latest ed.
- 4- Medical Mycology (Shahla Shadzy)

Assessment method of students:

Active attendance in laboratory, doing homework and final exam.

Hematology 2

Lesson code: 49

Unit number: 2 unites

Unit type: theoretical

Predecessor: hematology 1

General purpose: teaching hematology science so that bachelor of laboratory sciences is able to do diagnostic test of hematology with emphasis on scientific principles and also help to diagnose blood diseases.

Lesson description: familiarity with formation, evolution, differentiation of blood cells and structure and mechanism of hematopoietic tissues.

Maturation, kinetic, function mechanism and metabolism of blood cells, etiology pathogenesis and morphologic changes of blood diseases.

Principle subject: (34 hours)

Leukemia, definition, classification, pathogenesis

- Acute lymphoblastic leukemia

- Chronic lymphocytic leukemia
- Lymphoproliferative disease
- Flowcytometry and its application in hematology
- Acute myeloblastic leukemia
- Myeloproliferative disease
- Myelodysplastic syndromes
- Cell counting of body liquid (spinal cord liquid, sinewial and mucosal liquid) and morphologic examination of these cells.

Definition of homeostasis and elements interfered in this process.

- Primary and secondary homeostasis.
- Origin and formation process of platelet and their structure.
- Morphologic and biochemical properties and function of platelet
- Properties of coagulation factors include of biosynthesis, biochemical and life duration, their property
- Role of blood vessel in homeostasis
- Coagulation path way and control system of coagulation and fibrinolysis
- Qualitative disease of platelet include of inherited and acquired disorders
- Quantitative disease of platelet include of inherited and acquired disorders
- Pathogenesis of thrombosis and tests related to thrombosis risk
- Inherited and acquired thrombotic diseases

References:

- 1- Rodak B.F.Hematology. Clinical principles and application 2, latest ed
- 2- Text book of Hematology (Mckenzie), latest ed
- 3- Essential Hematology (Hoffbrand), latest ed

Assessment method of students:

Active attendance in class, asking and answering, midterm and final exams.

Hematology 2 laboratory

Lesson code: 50

Unit number: 1 unit

Unit type: practical

Predecessor: simultaneous with hematology 2

General purpose: Teaching different methods of laboratory of hematology, so that bachelor of laboratory sciences can diagnose blood cells and do different hematologies test by themselves.

Lesson description: familiarity with principles of examination and morphologic diagnosis of blood cells in pathologic condition, blood cells counting by automatic and manual methods and earning produced data assurance and doing coagulation and hemolytic tests.

Principle subjects: (34 hours)

- Cytochemical staining (Sudan black β – Acid and alkaline phosphates PAS, ...)

- Application of cellular markers in diagnosis of blood disease and educating. Flowcytometry methods and immunoenzymatic and studying related slides.
- Studying of acute myeloblastic leukemia slides
- Studying of acute lymphoblastic leukemia slides
- Studying of chronic myelocytic leukemia slides
- Studying of chronic lymphocytic leukemia slides
- Studying of other leukemia and blood disease
- Doing CT, BT, PT and PTT
- Examination ways and doing supplementary tests of PT, PTT and long TT
- Measurement of fibrinogen, FDP and or D-Dimer

References:

- 1- Practical hematology (Dacie & Lewis), latest ed
- 2- Laboratory hematology (Chanarin), latest ed
- 3- Atlas of hematology (Wolff), latest ed

Assessment method of students:

Active attendance in laboratory, asking and answering, midterm and final exams.

Principle of management and laboratory laws

Lesson code: 51

Unit number: 1 unit

Unit type: theoretical

Pre necessity: basis of safety and protection in laboratory

General purpose: familiarity of bachelor of laboratory sciences with principles of management and laboratory laws

Lesson description: in this lesson student get acquainted with generalities elements and responsible of management and professional laws in clinical laboratory.

Principle subjects: (17 hours)

- History of management generalities of management
- Acquaintance with concept and management theories
- Elements and duties of management (planning, organizing, leading and direction controlling and monitoring, making decision, communicating, employment
- Principle of clinical laboratory management

- Management of human resource and organization treatment
- Management by objective (MBO)
- Financial management (budgeting, ...)
- Marketing
- Management of information system and informing in laboratory
- Crisis management
- Professional law in laboratory
- Medical ethics in laboratory
- Quality management in laboratory
- Management of efficiency and effectiveness
- Management of waste products

References:

- 1- Clinical diagnosis and management (Henry), latest ed.
- 2- Common problems in cline lab, management (Judith and Brier), latest ed

Assessment method of students:

Active attendance and asking and answering, midterm and final exams.

Quality control methods in clinical laboratory

Lesson code: 52

Unit number: 1 unit

Unit type: theoretical

Prerequisite: medical biochemistry 2- hematology 2

General purpose: in the end of this course bachelor of clinical laboratory have to be able to use different quality control methods in controlling and monitoring and to be sure about precision and accuracy of clinical laboratory results.

Lesson description: familiarity with definitions, terms, errors and different internal and external quality control methods.

Lesson description:

- General definition and terms of quality control include of accuracy precision, sensitivity and specificity
- Types of errors include of: random and systematic errors
- Directions of quality confidence in related with controlling of preanalytical analytical and post analytical errors.

- Internal quality control exertion methods include of: educating of curve drawing such as Levey-Jenning and Westgard analysis laws.

External quality control (References laboratory, continuous education, international committee and organization of clinical laboratories.

- Quality control of sampling, apparatus, equipment and biochemistry laboratory methods.

- Quality control of sampling, apparatus, equipment and hematology and blood banking laboratory methods.

- Quality control of sampling, apparatus, equipment and microbiology laboratory methods.

- Quality control of sampling, apparatus, equipment and immunology and serology laboratory methods.

References:

1- Clinical diagnosis and management (Henry), latest ed.

2- Basis quality assurance practices for clinical laboratory (Stewart). Lippincott, latest ed.

3- Text book of clinical biochemistry (Tieiz), latest ed.

Assessment method of students:

Active attendance in class, doing homework and final exam.

Medical bacteriology

Lesson code: 53

Unit number: 3 unites

Unit type: theoretical

Prerequisite: general microbiology

General microbiology: familiarity of students with pathogenic bacteria and learning isolation methods and identification of them from different body samples.

Lesson description: studying pathogen bacteria types and normal flora of body human including morphological, antigenic and biochemistry properties and effective factors in pathogenesis, clinical features, and epidemiology and laboratory diagnosis.

Principle subjects:

- Generalities, mechanism of microorganism pathogenesis and immune response to infection.
- Micrococci (staphylococcus, micrococcus and planococcus, ...)
- Streptococci (streptococcus, pneumococcus, ...)

- Neisseriaceae (neisseria, moraxella, acintobacter, kingella, ...)
- Entrobacteriaceae (salmonella, shigella, escherichia, klebsiella, proteus yersinia)
- Pseudomonadaceae (pseudomonas, acinetobacters, ...)
- Legionellae
- Brucellae, Haemophilus, Bordetellae
- Vibrios, Aeromonas, Plesiomonas, Campylobacters, Helicobacter
- Bacillus
- Clostridium
- Corynebacteriums, Listeria, Erysipelothrix
- Actinomyces, Nocardia, Streptomyces
- Mycobacteria
- Spirochetes (borrelia, treponema, leptospirae)
- Chlamydia
- Rickttesia
- Mycoplasmas
- Anaerobic bacteria (anaerobic gram positive and negative cocci and non-spore bacilli)

References:

- 1- Medical Microbiology.P.R.Murray.K.S.Rosenthal and M.A.P.fatter, latest ed.
- 2- Bailey and Scott's Diagnostic Microbiology, latest ed.
- 3- Medical Microbiology, Jawetz, latest ed.

Assessment method of students:

Regular attendance and asking and answering in class, midterm and final exams.

Medical bacteriology laboratory

Lesson code: 54

Unit number: 1 unit

Unit type: practical

Prerequisite: simultaneous with medical bacteriology

General purpose: isolation and diagnosis of bacteria from clinical specimen.

Lesson description: collection methods of clinical samples (urine, blood, spinal fluid, throat secretion, genital track secretion and sore microscopic direct examination methods of clinical specimen. Culture of clinical samples using nutrient and selective and differential media with due attention to types of sore and site of sampling and examination of serologic and biochemistry properties for isolation and identification bacteria types and species in clinical samples. Identification of bacteria sensitivity to antimicrobial compounds.

Principle subject: (34 hours)

- Culture of clinical samples
- Method of doing urine culture and colony count

- Micrococci: diagnosis methods of staphylococcus, micrococcus, culture of unknown bacteria and examination of results.
- β hemolytic streptococcus, culture of throat secretion and examination of results.
- Diagnosis methods of α hemolytic and no hemolytic streptococcus (except pneumococcus)
- Diagnosis methods of Pneumococcus, sputum culture and examination of results.
- Diagnosis methods of Neisseriaceae, observation of genital secretion slides.
- Diagnosis methods of Enterobacteria (lactose positive).
- Diagnosis methods of Enterobacteriaceae (lactose negative)
- Stool culture methods, examination of results and final report.
- Diagnosis methods of vibrios.
- Diagnosis methods of Campylobacters and Helicobacter.
- Diagnosis methods of nonfermentation, gram-negative Bacilli and examination of results.
- Diagnosis methods of Haemophilus, Brucellae and Legionellae.
- Diagnosis methods of corynebacteriums and Listeria
- Diagnosis methods of Mycobacteriums and Nocardia
- Diagnosis methods of Bacillus.
- Diagnosis methods of anaerobic bacteria.
- Familiarity with diagnosis methods of spirochetes, Chlamydia, Mycoplasma and Rickettsia.

References:

- 1- Bailey and Scott's Diagnostic Microbiology, latest ed.
- 2- Koneman's color atlas and text book of Diagnostic Microbiology, latest ed.
- 3- Text book of Diagnostic Microbiology, C.R.Mahon, D.C.Lehman and G.Manuselis, latest ed.

Assessment method of student:

Regular attendance in laboratory, doing homework, theoretical and practical final exams.

Familiarity with internal diseases

Lesson code: 55

Unit number: 2 unites

Unit type: theoretical

Prerequisite: medical biochemistry 1- hematology 1

general purpose: Acquaintance of bachelor students of laboratory sciences with generalities of internal medicine so that after graduating they have better understanding about diseases and help physician in presenting required laboratory services.

Lesson description: in this lesson bachelor of laboratory sciences learning some about generalities of internal medicine so that it is necessary for them in interpretation of tests for coordinating with physician.

Principle subject:

- Essential of internal medicine and somewhat that is necessary for bachelor of laboratory sciences in facing of patient in emergency conditions.

- Brief description of common muscular, bony and connective tissue diseases.
- Generalities about renal glomerular and nonglomerular diseases.
- Ordinary and important lung diseases and way of facing for patients with pulmonary diseases.
- Ordinary digestion diseases and role of laboratory in diagnosis these disorders.
- Hepatic and billiary ducts diseases such as: Hepatitis, Cirrhosis, ... and interpretation of related tests.
- Generalities of metabolic diseases and interpretation of related tests.
- Endocrine diseases and interpretation of related tests with each diseases.
- Important cardiovascular diseases and interpretation of related tests.
- Generalities of infectious diseases and diagnosis ways of these diseases with laboratory methods.
- Generalities of ordinary nervous diseases.

References:

Cecil essentials of internal medicine, latest ed.

Assessment method of student:

Regular attendance in class, asking and questioning, midterm and final exams.

Medical genetics

Lesson code: 56

Unit number: 1 unit

Unit type: theoretical

Prerequisite: cellular and molecular biology

General purpose: familiarity of students with inheritance pattern, ordinary genetic disease in Iran and prevention ways of these diseases.

Lesson description: learning of genes and chromosomes structure and function human genome project, cytogenetic and molecular and biochemistry of sexual and asexual genetic diseases.

Principle subject: (17 hours)

- Introduction, chromosomal principles of inheritance.
- Structure and function of genes and chromosomes
- Genetic variation, polymorphism and mutation
- Gene in population
- Generalities of human genome project
- Clinical cytogenetic
- Sex chromosomes and abnormalities of them

- Molecular and biochemical principles of genetic diseases.
- Preparturition diagnosis and treatment of genetic diseases.

References:

- 1- Thompson and Thompson Genetics in Medicine: (R.Nussbaum, H.Willard, R.McInnes). Translated by Farhad Hemat khah, Manoochehr shariati, 1377.
- 2- Emery, s elements of medical genetics, latest ed.
- 3- Essentials of medical genetics (Ferguson), latest ed.
- 4- Medical Genetics (G.H.SACK), latest ed.

Assessment method of student:

Active attendance in class, asking and answering in class, theoretical final exam.

Seminar

Lesson code: 57

Unit number: 1 unit

Unit type: theoretical

Pre necessity: medical biochemistry 2 and hematology 2

General purpose: Acquaintance of students with method of collecting scientific subjects, way of writing article and presentation of that in conference hall.

Lesson description: in this lesson student select special subject in one of laboratory sciences branches with due attention to their interest with consulting one of scientific council members and collect scientific information from books and articles and prepare article and deliver it to guidance master for studying then present improved article oral in session that other students are present.

References:

Reference book and published articles in reliable scientific journals

Assessment method of student:

Guidance master and referee council give mark them with due attention to methods of collecting information, codifying and presenting seminar.

Training in laboratory field

Lesson code: 58

Unit number: 16 unites

Unit type: عرضة training in

Number of hours: 816 hours

Students have to pass flowing clinical laboratory departments:

- Sampling
- Uring analysis
- Parasitology and mycology
- Biochemistry
- Hematology
- Blood banking
- Immunology and serology
- Microbiology

Students have to spend 6 hours daily in 17 weeks in different department of training hospital laboratory

Assessment method of student:

Student assessment is accomplished in two stages include of:

A) Hospital laboratory, 60% of mark

Assessment criteria and agents in hospital are according to flowing. Cases evaluated by responsible of laboratory departments and technical responsible of laboratory that are one of scientific council members.

Maximum of training mark is 60 and technical responsible of laboratory send students marks to training group of faculty.

- 1- Responsibility feeling about attending on time in laboratory
- 2- Speed in doing works and having proper reaction in encountering with problem.
- 3- Regarding discipline in profession environment, economy and surveillance on instrument, equipment and apparatus.
- 4- Attention and accuracy and trying to acquire professional skills.
- 5- Behavior method with colleagues, clients and responsible.
- 6- Practical exam in bachelor level in every department.

B) Training group of faculty, 40% of mark

Training committee of faculty perform interview exam for evaluating of students skill assessment acquired in during this course in different department. 40 mark related to interview exam include of: biochemistry (12 mark), hematology (7), parasitology and mycology (6), immunology and serology (6), microbiology (6), blood banking (3), in the end, total mark calculated and responsible of training committee send marks with him/her signature to training group of laboratory sciences and then marks are registered in students report card.

