

Thematic plan

Pathophysiology

(«General Medicine», «Dentistry», 2018/19)

Section of Discipline/ Module	Semester	Types and hours of classroom work		
		Lectures	Laboratory work	Self-study
Theme 1. Introduction to pathophysiology.	5	0	4	4
Theme 2. Pathology of cells. Reversible and irreversible cell damage. Types of cell death.	5	2	8	8
Theme 3. Metabolic disorders. Disorders of carbohydrates, lipids and proteins metabolism.	5	2	4	8
Theme 4. Water and electrolytes metabolism disorders.	5	0	4	4
Theme 5. Acid and base disturbances.	5	0	4	6
Theme 6. Hemodynamic disorders.	5	2	4	6
Quiz 1 (Themes 1-6)	5	0	4	0
Theme 7. Inflammation. Acute and chronic inflammation.	5	2	8	8
Theme 8. Disorders of thermoregulation. Fever.	5	0	4	4

Section of Discipline/ Module	Semester	Types and hours of classroom work		
		Lectures	Laboratory work	Self-study
Theme 9. Immunopatologicakie State. The immune system. Immunodeficiencies.	5	2	4	6
Theme 10. Pathological processes: hypersensitivity reactions, autoimmune disease.	5	2	4	6
Theme 11. Neoplasia.	5	4	4	6
Theme 12. Hereditary pathology. Genetic disease. Chromosomal disease.	5	2	2	6
Quiz 2 (Themes 7-12)	5	0	2	0
Control (Themes 1-12)				
Theme 13. Pathophysiology of cardiovascular system.	6	2	8	6
Theme 14. Pathophysiology of blood.	6	2	8	6
Theme 15. Pathophysiology of respiratory system.	6	2	8	6
Quiz 3 (Themes 13-15)	6	0	4	0

Section of Discipline/ Module	Semester	Types and hours of classroom work		
		Lectures	Laboratory work	Self-study
Theme 16. Pathophysiology of digestive system. Pathophysiology of liver.	6	4	8	6
Theme 17. Pathophysiology of urinary system.	6	2	8	8
Theme 18. Pathophysiology of endocrine system.	6	4	8	6
Theme 19. Pathophysiology of nervous system. Pathogenesis of pain.	6	2	4	4
Quiz 4 (Themes 16-19)	6	0	4	0
Exam				

Theme 1. Introduction to pathophysiology.

Laboratory work. Nosology, etiology, pathogenesis. Subject and problems of pathophysiology; pathophysiology as theoretical and methodological base of modern clinical medicine. Pathophysiology methods. Modeling of diseases as main method of pathophysiology. Experimental therapy and pathophysiology. A concept of clinical pathophysiology, its tasks. The main stages in development of the disease. Modern definition of the concept "health" and "disease". Protective and adaptive reactions of an organism. Pathological reaction, pathological process, a pathological state.

The principle of determinism in an etiology. A role of the reasons and conditions in development of diseases, their interaction. Value of social factors in developing of a disease. A role of a mental factor in developing of a disease.

Pathogenesis. Definition of pathogenesis. A role of an etiological factor in pathogenesis. Vicious circle.

Theme 2. Cell pathology.

Lecture. Cell injury mechanisms.

Laboratory work. Reversible and irreversible cell damage. Types of cell death. Causes, types, stages (paranecrosis, necrobiosis and necrosis) of cell injury. Specific and unspecific manifestations of injury. Apoptosis. Defensive and adaptive mechanisms in cell injury. Cellular and subcellular adaptation.

Theme 3. Metabolic disorders.

Lecture. Lipids metabolism disorders.

Laboratory work. Disorders of carbohydrates, lipids and proteins metabolism. Hypoglycemia. Hyperglycemia. Diabetes mellitus. Proteins and nucleic acids metabolism disorders. Purine bases disturbances. Hyperuricemia. Gout. Typical forms of lipids deficiency and lipids exceeding. Dyslipoproteinemia. Atherosclerosis.

Theme 4. Water and electrolytes metabolism disorders.

Laboratory work. Hypohydration. Hyperhydration. Etiology, classification. Pathogenesis. Calcium, phosphates, sodium imbalances.

Theme 5. Acid and base disturbances.

Laboratory work. Normal values of acid and base balance. Classification of acid-base balance disorders. Respiratory acidosis (acute, chronic). Respiratory alkalosis (acute, chronic). Metabolic acidosis (acute, chronic). Metabolic alkalosis (acute, chronic).

Theme 6. Hemodynamic disorders.

Lecture. Pathology of microcirculation. Edema.

Laboratory work. Arterial hyperemia. Venous hyperemia. Stasis. Collateral circulation and its purpose. Thrombosis. Blood clot formation factors, mechanisms of thrombosis. Virchow's triad. Types of the thrombi. Embolism. Hemorrhage, compensatory and adaptive, pathological reactions in hemorrhage. Methods of hemostasis. Edemas. Clinical types of edemas.

Quiz 1 (Themes 1-6)

Theme 7. Inflammation. Acute and chronic inflammation.

Lecture. Inflammation. Mediators of inflammation. Their types, derivation.

Laboratory work. Components of inflammatory process. Systemic and local signs of inflammation. Stages. Primary and secondary alteration in inflammation. Metabolism changes, pathochemical and physicochemical changes in the focus of inflammation. Role in the secondary alteration's development and dynamics of inflammatory process. Leukocytes migration in inflammation, mechanisms, chemotaxis factors. Vascular reactions in acute inflammation. Blood flow changes, phases and mechanisms. Exudation. Mechanisms of inflammatory edema's development. Types and contents of exudates. Acute phase response. Interrelation of local and systemic reactions on injury. Manifestations of acute phase response. Acute phase proteins and mediators; their derivation and biological effects.

Theme 8. Disorders of thermoregulation. Fever

Laboratory work. Hypothermia. Hyperthermia. Heat stroke, sunstroke. Phases, clinical aspects. Fever, stages. Pyrogens: derivation, types and mechanisms. Thermoregulation at the different stages of fever. Metabolism and physiological functions' changes in the fever. Types of fever. Fever curves. Biological purpose of fever. Purpose of fever. Differences between fever and hyperthermia.

Theme 9. Immune system.

Lecture. Immune system. Antigens and antibodies.

Laboratory work. Immunodeficiency. Primary immunodeficiency. Secondary immunodeficiency.

Theme 10. Immune system.

Lecture. Autoimmune diseases.

Laboratory work. Hypersensitivity reactions. Correlation between hypersensitivity and immune system. Allergens. Autoimmune diseases. Systemic lupus erythematosus, rheumatoid arthritis.

Theme 11. Neoplasia.

Lecture (4 hours). Neoplasia. Tumor growth. Pathogenesis of carcinogenesis.

Laboratory work. Carcinogens. Atypia. Clinical aspects of tumor growth. Metastasis. Routes of metastasis. Malignant transformation. Proto-oncogenes, oncogenes, tumor suppressor genes. Stages of initiation, promotion, progression.

Theme 12. Genetic diseases.

Lecture. Genetic diseases. Mutation mechanism in formation of genetic disease.

Laboratory work. Gene and chromosome mutations. Monogenic and polygenic disorders. Autosomal dominant disorders. Autosomal recessive disorders. X-linked disorders. Lysosomal storage diseases. Tay-Sachs Disease, Niemann-Pick Disease, Gaucher Disease, mucopolysaccharidoses. Glycogen storage diseases. Diseases caused by mutations in genes encoding structural proteins. Marfan syndrome. Ehlers-Danlos syndrome. Diseases caused by mutations in genes encoding receptor proteins or channels. Familial hypercholesterolemia. Cystic fibrosis. Diseases caused by mutations in genes encoding enzyme proteins. Phenylketonuria. Galactosemia.

Quiz 2 (Themes 7-12)

Control (Themes 1-12)

Theme 13. Pathophysiology of cardiovascular system.

Lecture. Hypertensive heart disease. Hypertension. Blood pressure regulatory mechanisms. Primary hypertension. Secondary hypertension.

Laboratory work. Circulatory failure and collapse. Coronary artery disease (CAD). Cardiomyocytes damage mechanisms during ischemia (energy, ions imbalance, membrane damage, enzymes deficiency). Arrhythmias. Heart failure. Regulatory compensative mechanisms in heart failure. Left-sided heart failure. Right-sided heart failure. Lipoproteins metabolism.

Theme 14. Pathophysiology of blood.

Lecture. Leukocytes pathophysiology. Leucopenia. Leucocytosis. Leukemoid reactions.

Laboratory work. CBC test referent values. Erythropoiesis. Main features, organs of erythropoiesis. Regulation. Erythrocytes disorders. Qualitative and quantitative changes. Primary erythrocythaemia. Secondary erythrocythaemia. Anemias of blood loss. Hemolytic anemias: hereditary spherocytosis, sickle cell anemia, thalassemia, glucose-6-phosphate dehydrogenase deficiency. Hemolytic anemias: paroxysmal nocturnal hemoglobinuria, immunohemolytic anemias, hemolytic anemias resulting from mechanical trauma to red cells, malaria. Anemias of diminished erythropoiesis: iron deficiency anemia, anemia of chronic disease, megaloblastic anemias, aplastic anemia, myelophthisic anemia. Coagulopathies investigation tests: PT, PTT, plt count, tests of platelet functions. Disseminated intravascular coagulation (DIC). Thrombocytopenia. Coagulation disorders: von Willebrand Disease, Hemophilia A—Factor VIII Deficiency, Hemophilia B—Factor IX Deficiency.

Theme 15. Pathophysiology of respiratory system.

Lecture. Chronic obstructive pulmonary disease (COPD).

Laboratory work. Lung volumes, capacities, and the normal spirogram. Hemoglobin saturation. Matching of ventilation to perfusion. Pathophysiologic classification of external breathing disturbances. Ventilation disorders. Characteristics of restrictive and obstructive disorders in respiratory function of lungs. Obstructive disorders. Mechanisms of compensation for obstruction of upper airways. Restrictive disorders. Disorders of diffusion of gases across the alveolar-capillary membrane. Disturbances of blood perfusion through the pulmonary vessels. Mismatch between ventilation and perfusion. Pulmonary embolism. Bronchial asthma.

Quiz 3 (Themes 13-15)

Theme 16. Pathophysiology of digestive system. Pathophysiology of liver.

Lecture. Pathophysiology of stomach and gallbladder diseases. Liver diseases. Clinical syndromes.

Laboratory work. Oral inflammatory lesions. Diseases of salivary glands. Taste disorders. Esophageal disorders. Esophagitis. Obstructive and vascular diseases. Inflammatory disease of the stomach. Gastritis and ulcer. Small and large intestines disorders. Diarrheal disease. Vascular disorders of bowel. Celiac disease. Infectious enterocolitis. Inflammatory intestinal disease. Sigmoid Diverticulitis. Inflammatory Bowel Disease. Crohn Disease. Ulcerative Colitis. Liver disorders. Main clinical syndromes: hepatic failure, jaundice, cholestasis. Hepatic encephalopathy. Cirrhosis. Liver hypertension. Portosystemic shunt. Acute and chronic hepatitis. Viral hepatitis. Alcoholic and nonalcoholic fatty liver disease. Gallbladder diseases. Cholelithiasis. Cholecystitis. Choledocholithiasis and cholangitis. Acute and chronic pancreatitis.

Theme 17. Pathophysiology of urinary system.

Lecture. Pathophysiology of kidneys disorders. Urinalysis, normal values, their interpretation. Urinary syndrome.

Laboratory work. Proteinuria, hematuria, leukocyturia, cylindruria. Nephrotic syndrome. Acute nephritic syndrome. Acute kidney failure. Acute kidney injury. Kidneys' dysfunction in AKI. Metabolic disorders and outcomes of acute kidney injury. Chronic renal insufficiency (CRI). Chronic kidney disease (CKD). Kidneys' function in CKD. Uremia.

Theme 18. Pathophysiology of endocrine system.

Lecture. Pathophysiology of endocrine system. Pathophysiology of thyroid gland disorders. Hypothyroidism. Endemic cretinism (congenital hypothyroidism). Myxedema. Hyperthyroidism. Hashimoto's disease. Thyroid nodules.

Laboratory work. Hyperpituitarism. Hypopituitarism. Hypocorticism. Acute Adrenocortical Insufficiency. Chronic Adrenocortical Insufficiency. Addison disease. Hypoaldosteronism. Hyperadrenalism. Primary and secondary hyperaldosteronism. Cushing's disease. Cushing's syndrome. Adrenogenital syndrome. Pheochromocytoma, "rule of 10s". Normal insulin physiology and glucose homeostasis. Diabetes mellitus.

Theme 19. Pathophysiology of nervous system. Pathogenesis of pain.

Lecture. Pathophysiology of nervous system. Damage of neurons. Disturbances of interneuronal interactions. Disorders of integrative activity of the nervous system.

Laboratory work. Pathological enhancement of nervous control on tissues and organs. Pathological attenuation. Phase states. Disorders of movement. Sensitivity disorders. Trophic disorders. Changes in higher nervous activity. Alterations in peripheral nervous system and motor function. Disorders of afferent fibers. Disorders of efferent fibres. Mononeuropathies. Polyneuropathies. Guillain-Barré syndrome (GBS). Disorders of neuromuscular junction. Myasthenia gravis. Lambert-Eaton Myasthenic Syndrome. Myopathies. Duchenne-Becker's muscle dystrophy. Cerebrovascular accidents: TIA, stroke. Brain edema. Intracranial hypertension. Cerebrospinal fluid disorders. Neurodegenerative diseases. Protein inclusions in degenerative diseases. Degenerative diseases affecting the cerebral cortex. Degenerative diseases of basal ganglia and brain stem. Dementia. Alzheimer disease. Dementia with Lewy bodies. Pick's disease. Vascular dementia. Parkinson's disease. Spinocerebellar degenerations. Spinocerebellar ataxia. Friedrich ataxia. Ataxia telangiectasia. Degenerative diseases affecting motor neurons. Amyotrophic lateral sclerosis. Bulbosplinal atrophy.

Quiz 4 (Themes 16-19)

Exam