

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

**Federal State Autonomous Educational Institution of Higher Education
«National Research Lobachevsky State University of Nizhny Novgorod»**

Институт клинической медицины

УТВЕРЖДЕНО

решением Ученого совета ННГУ

протокол № 10 от 02.12.2024 г.

Working programme of the discipline

Patological physiology

Higher education level

Specialist degree

Area of study / speciality

31.05.01 - General Medicine

Focus /specialization of the study programme

General Medicine

Mode of study

full-time

Nizhny Novgorod

Year of commencement of studies 2025

1. Место дисциплины в структуре ОПОП

Дисциплина Б1.О.24 Патолофизиология относится к обязательной части образовательной программы.

2. Планируемые результаты обучения по дисциплине, соотнесенные с планируемыми результатами освоения образовательной программы (компетенциями и индикаторами достижения компетенций)

Формируемые компетенции (код, содержание компетенции)	Планируемые результаты обучения по дисциплине (модулю), в соответствии с индикатором достижения компетенции		Наименование оценочного средства	
	Индикатор достижения компетенции (код, содержание индикатора)	Результаты обучения по дисциплине	Для текущего контроля успеваемости	Для промежуточной аттестации
УК-6: Способен определять и реализовывать приоритеты собственной деятельности и способы ее совершенствования на основе самооценки и образования в течение всей жизни	<p>УК-6.1: Применяет знание о своих ресурсах и их пределах (личностных, ситуативных, временных и т.д.), для успешного выполнения порученной работы и понимает важность планирования перспективных целей собственной деятельности с учетом условий, средств, личностных возможностей, этапов карьерного роста, временной перспективы развития деятельности и требований рынка труда.</p> <p>УК-6.2: Реализует намеченные цели деятельности с учетом условий, средств, личностных возможностей, этапов карьерного роста, временной перспективы развития деятельности и требований рынка труда и критически оценивает эффективность использования времени и других ресурсов при решении поставленных задач, а также относительно полученного результата.</p> <p>УК-6.3: Демонстрирует интерес к учебе и использует предоставляемые возможности для приобретения новых знаний</p>	<p>УК-6.1: Знает приемы управления своим временем, а также свои ресурсы и их пределы (личностные, психофизиологические, ситуативные временные и т.д.) для успешного выполнения порученной работы; технологию планирования перспективных целей деятельности с учетом условий, средств, личностных возможностей, этапов карьерного роста, временной перспективы развития деятельности и требований рынка труда.</p> <p>УК-6.2: Умеет действовать в условиях неопределенности, корректируя планы и шаги по их реализации с учетом имеющихся ресурсов; выявлять мотивы и стимулы для саморазвития, определяя реалистические цели профессионального роста</p> <p>УК-6.3: Владеет навыками выстраивания траектории саморазвития с учетом собственных ресурсов</p>	<p>Доклад-презентация</p> <p>Задания</p> <p>Коллоквиум</p> <p>Опрос</p>	<p>Зачёт:</p> <p>Контрольные вопросы</p> <p>Экзамен:</p> <p>Контрольные вопросы</p>

	и навыков			
ОПК-10: Способен понимать принципы работы современных информационных технологий и использовать их для решения задач профессиональной деятельности	ОПК-10.1: составляет и планирует решение стандартных профессиональных задач ОПК-10.2: использует информационные, библиографические ресурсы, медико-биологическую терминологию, информационно-коммуникационные технологии ОПК-10.3: знает и учитывает основные требования информационной безопасности	ОПК-10.1: Умеет составлять и планировать решение стандартных профессиональных задач ОПК-10.2: Знает информационные, библиографические ресурсы, медикобиологическую терминологию, информационно-коммуникационные технологии ОПК-10.3: Владеет знаниями и учитывает основные требования информационной безопасности	Кolloквиум Опрос Тест	Зачёт: Контрольные вопросы Экзамен: Контрольные вопросы
ОПК-5: Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач	ОПК-5.1: Готов применить алгоритм клинко-лабораторной, инструментальной и функциональной диагностики при решении профессиональных задач ОПК-5.2: Оценивает морфофункциональные, физиологические состояния и патологические процессы в организме человека для интерпретации результатов клинко-лабораторной, инструментальной и функциональной диагностики при решении профессиональных задач ОПК-5.3: Знает принципы функционирования систем органов.	ОПК-5.1: Знает морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач ОПК-5.2: Уметь оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач ОПК-5.3: Владеть способностью оценки физического развития организма, данных диспансеризации различных контингентов и периодических медицинских осмотров для решения профессиональной задачи	Доклад-презентация Кolloквиум Опрос Тест Отчет по лабораторным работам	Зачёт: Контрольные вопросы Экзамен: Ситуационные задания

3. Структура и содержание дисциплины

3.1 Трудоемкость дисциплины

	очная
Общая трудоемкость, з.е.	6
Часов по учебному плану	216
в том числе	
аудиторные занятия (контактная работа):	
- занятия лекционного типа	30
- занятия семинарского типа (практические занятия / лабораторные работы)	60
- КСР	3
самостоятельная работа	87
Промежуточная аттестация	36 Экзамен, Зачёт

3.2. Содержание дисциплины

(структурированное по темам (разделам) с указанием отведенного на них количества академических часов и виды учебных занятий)

Наименование разделов и тем дисциплины	Всего (часы)	в том числе			
		Контактная работа (работа во взаимодействии с преподавателем), часы из них			Самостоятельная работа обучающегося, часы
		Занятия лекционного типа	Занятия семинарского типа (практические занятия/ лабора- торные работы), часы	Всего	
	о ф о	о ф о	о ф о	о ф о	о ф о
Topic 1. Introduction to pathophysiology. The doctrine of the disease. General principles and mechanisms of adaptation to cell damage. Cell death.	8	2	2	4	4
Topic 2. Disorders of regional blood circulation and microcirculation	10	2	4	6	4
Topic 3. Hypoxia.	8	2	4	6	2
Topic 4. Inflammation. Disorders of thermoregulation	12	2	4	6	6
Topic 5. Pathophysiology of tumor growth	10	2	4	6	4
Topic 6. Immunodeficiency conditions. Allergy	12	2	4	6	6
Topic 7. Metabolic disorders	21	2	6	8	13
Topic 8: Disturbances in Water-Electrolyte and Acid-Base Balance	8	2	2	4	4
Topic 9. Pathophysiology of extreme conditions	10	2	2	4	6
Topic 10. Pathophysiology of hemorrhagic disorders of circulating blood volume. Bleeding. Erythrocytosis. Anemia	10	2	2	4	6
Topic 11. Pathophysiology of leukocytes	10	2	4	6	4
Topic 12. Pathophysiology of platelets. The pathophysiology of hemostasis. Thrombosis	10	2	4	6	4
Topic 13. Pathophysiology of the cardiovascular system	10	2	4	6	4

Topic 14. Pathophysiology of the respiratory system	12	2	4	6	6
Topic 15. Pathophysiology of digestion. Disorders of nutrition, metabolism and energy in the body	14	2	6	8	6
Topic 16. Kidney pathophysiology	4	0	2	2	2
Topic 17. Pathophysiology of the endocrine system	8	0	2	2	6
Аттестация	36				
КСР	3			3	
Итого	216	30	60	93	87

Contents of sections and topics of the discipline

Topic 1. General nosology. A pathological reaction. The pathological process. Pre-pain. Disease. Health. Standard. A pathological condition. Signs and symptoms. Syndromic diagnosis. The concept of etiology. The concept of environmental (external) and internal causes and risk factors of the disease. Monocausality and polycausality. Reactivity. Classification of reactivity. Pathogenesis. A vicious circle. Sanogenesis. Classification of sanogenetic mechanisms. Cell damage as a typical pathological process. Causes of cell damage. General mechanisms of cell damage. Violation of the energy supply of the cell. Damage to membranes and enzymes. The imbalance of ions and water in the cell. Genetic disorders. Violation of the regulation of intracellular processes. Mechanisms of adaptation and compensation of cells in response to cell damage. Hyperplasia. Hypertrophy. Atrophy. Metaplasia. Dysplasia. Reversible mechanisms of cells in response to damage. Cell death. Autolysis. Necrosis. Apoptosis. Gangrene. Types of gangrene.

Topic 2. Microcirculation. Components of the microcirculatory bed. The main causes and forms of typical microcirculation disorders. Mechanisms of development of intravascular microcirculation disorders. Causes, mechanisms of development, manifestations of transmural microcirculation disorders. Causes, mechanisms of development, manifestations of extravascular microcirculation disorders. Arterial hyperemia. Venous hyperemia. Ischemia. Sludge syndrome. Stasis. Ischemia. Embolism. Embolism and their classification. Classification of embolisms. Thrombosis. Stages of thrombogenesis. Classification of blood clots. The structure of a complex thrombus. Favorable and unfavorable outcomes of thrombosis.

Topic 3. Hypoxia. Hypoxemia. Classification of hypoxic conditions. Exogenous hypoxia. Normobaric hypoxia. Hypobaric hypoxia. Endogenous hypoxia. Respiratory hypoxia. Blood hypoxia. Cardiovascular hypoxia. Tissue hypoxia. Substrate hypoxia. Overload hypoxia. Compensatory and adaptive reactions in hypoxia. Mechanisms of emergency and long-term adaptation to hypoxia. Pathophysiological foundations of prevention and therapy of hypoxic conditions.

Topic 4. Inflammation. Phlogogens. Local and systemic manifestations of inflammation. Exogenous and endogenous causes of inflammation. Stages of inflammation (alteration, vascular reactions, exudation and emigration, phagocytosis, proliferation). Primary and secondary alterations. Peculiarities of metabolism during alterations. Physico-chemical changes during alterations. Inflammatory mediators. Features of microcirculation in the focus of inflammation and their mechanisms of development. Exudation. The difference between exudate and transudate. Emigration of leukocytes in the inflammatory zone and their mechanisms. Phagocytosis. The teachings of I. I. Mechnikov on phagocytosis as a protective reaction of the body (the difference between microphages and macrophages). Stages of phagocytosis. The mechanism of phagocytosis. Causes and consequences of phagocytosis disorders. Proliferation and regeneration. Types of regeneration. Classification of inflammation. Chronic inflammation. Acute inflammation. General reactions of acute inflammation. The general biological significance of inflammation. Principles of anti-inflammatory (etiotropic, pathogenetic, symptomatic) therapy. Physiology of thermoregulatory metabolism. Body temperature control. Classification of types of thermoregulatory dysfunction. Fever. Causes and mechanisms of fever development, its biological role,

etiopathogenesis and effects of hyperthermia on the body. Pyrogenes. The mechanism of action of pyrogens. Stages of fever. Classification of fevers. The general biological significance of fever. Fever of unknown origin. The difference between fever and hyperthermia. Hyperthermia. Causes and risk factors. Stages of hyperthermia. Disorders in the body with hyperthermia. The general biological significance of hyperthermia. Heat stroke. Sunstroke. Principles of therapy. Hyperthermic reactions. Hypothermia. Causes and risk factors. Stages of hypothermia. Manifestations of hypothermia. The general biological significance of hypothermia.

Topic 5. The tumor. Tumor growth. Malignant and benign tumors. Stages of cancer. TNM classification. Cancer markers. Concepts of carcinogenesis. The pathogenesis of tumor growth. Stages of carcinogenesis. Oncoviruses, their classification and role. Types of tumor atypism. Systemic effect of the tumor on the body. Paraneoplastic syndrome, its pathogenesis, main manifestations. The pathogenesis of cancerous cachexia. Antitumor resistance of the body. Principles of tumor growth prevention and cancer treatment.

Topic 6. The concept of the structure, function and role of the immunobiological surveillance system. Resistance. Types of resistance. Factors determining reactivity and resistance. Classification of typical immunological disorders. Primary combined immunodeficiency. Secondary (acquired) immunodeficiency and immunosuppressive conditions. HIV infection. Acquired immunodeficiency syndrome (AIDS). Pathological immunotolerance. Allergy. The relationship between immunity and allergies, allergies and inflammation. Exo- and endogenous allergens, their types. Stages of allergic reactions, their characteristics. Types of allergic reactions (immediate and delayed type). Classification of allergic reactions by (Gell, Coombs) Gell and Coombs. Allergic reactions of type I. Allergic reactions of type II. Allergic reactions of type III. Type IV allergic reactions. Pseudoallergia, definition of the concept, etiology, pathogenesis. Autoimmune diseases. The role of external and internal factors in the pathogenesis of autoimmune diseases.

Topic 7. The biological significance of carbohydrates. Biochemical classification of carbohydrates. Biochemical common glucose metabolism pathways. The role of insulin in the regulation of various types of metabolism in the body. Types of insulin antagonist hormones. Impaired digestion and carbohydrate resorption in the gastrointestinal tract. Classification of typical disorders of carbohydrate metabolism. Hypoglycemic conditions. Hypoglycemic reaction. Hypoglycemic syndrome. Hypoglycemic coma. Causes, mechanisms of development, clinical manifestations. Pathogenetic significance and principles of therapy. Malabsorption of monosaccharides. Disaccharidase deficiency syndrome. Lactase deficiency syndrome. Glycogenosis (disease of glycogen accumulation). Hyperglycemic conditions. Causes, mechanisms of development, clinical manifestations. Hyperglycemic syndrome. Hyperglycemic coma. Pathogenetic significance and principles of therapy. Diabetes mellitus. Classification of diabetes mellitus. Risk factors, etiology and pathogenesis of diabetes mellitus. The main metabolic disorders, clinical manifestations and laboratory parameters of diabetes mellitus. Mechanisms of diabetes mellitus development. Complications of diabetes mellitus. Classification and their mechanisms of development. Comparison of insulin-dependent and insulin-independent diabetes mellitus. The physiological role of lipids in the body. Biochemical classification of lipids, types of fatty acids. The causes and consequences of violations of the intake, digestion and absorption of fats in the body. Classification of typical lipid metabolism disorders. The importance of impaired lipid transport in the blood and their transfer to tissues. Dyslipoproteinemia, hypo- and hyperlipoproteinemia: classifications, causes and consequences. Obesity, its types, causes and mechanisms of development. Disorders of lipid metabolism and absorption: hyperketonemia, exhaustion, cachexia, lipodystrophy, lipodosis. Disorders of cholesterol metabolism; hypercholesterolemia. Atherosclerosis. Etiology and pathogenesis of atherosclerosis, its adverse effects. Therapy and prevention of atherosclerosis. The role of proteins in the body. Nitrogen balance. Biochemical classification of proteins and amino acids. Typical disorders of protein metabolism. The consequences of amino acid deficiency. Starvation. Kwashiorkor. Alimentary dystrophy. Disorders of digestion and absorption of proteins. Violations of the protein content in blood plasma. Disorders of protein catabolism (dysproteinoses: amyloidosis and hyalinosis). Disorders of nucleic acid metabolism. Violations of pyrimidine bases. Violations of purine bases. Gout. The role of vitamins in the body. Classification of vitamins, their daily requirement. Anti-vitamins. Typical disorders of

vitamin metabolism (vitamin deficiency, hypovitaminosis, hypervitaminosis, dysvitaminosis). Hypo- and hypervitaminoses of water-soluble vitamins (B1, B2, B3, B5, B6, B7, B9, B12, C).

Topic 8. Hypo- and hypervitaminosis of soluble vitamins (A, D, E, K). The role of hormones in the regulation of water and mineral balance. Classification of water and mineral disorders. Negative water-mineral balance. Hypo-, iso- and hyperosmolar types of dehydration. Causes, symptoms and consequences. Therapy. Positive water-mineral balance. Types of hyperhydration. Water poisoning. Causes, symptoms and consequences. Therapy. Edema, classification. Factors affecting the development of edema. Pathogenesis of cardiac, renal, hepatic, inflammatory, allergic, toxic edema. Disorders of mineral metabolism (Na^+ , K^+ , Ca^{+2}). Acidosis. Alkalosis. The mechanism of development of acid-base disorders in acute heart failure, acute renal failure, acute liver failure and other critical conditions. Principles of correction of violations of the acid-base state.

Topic 9. Stress. Definition. The theory of stress (X. Selye, 1938). The pathophysiology of stress. The role of the sympathoadrenal and hypothalamic-pituitary-adrenal systems in stress. Stages of stress. Distress syndrome. Shock. Definition. The pathophysiology of shocks. Stages of shock and their mechanisms. Types of shock. Mechanisms of decompensation in shock. Collapse, its causes and development. The difference between collapse and shock. Coma. Definition. Causes and types.

Topic 10. Bleeding. Erythrocytosis Blood, its composition and functions. Hematocrit. Stages of erythropoiesis. Classification of disorders of circulating blood volume (hypervolemia, hypovolemic syndrome). Hypervolemia. Types (simple, polycythemic, oligocythemic). Causes and outcomes. Hypovolemia. Types (simple, polycythemic, oligocythemic). Causes and outcomes. Erythrocytosis. True polycythemia or Wakes disease. Bleeding. Types and causes. Pathogenesis and main clinical symptoms of acute bleeding. Compensatory and adaptive reactions in acute bleeding. Parameters of bleeding severity. Factors affecting the outcome of bleeding. Causes and outcomes. Bleeding therapy. Clinical symptoms of anemia and the mechanisms of their development. Classification of anemia by etiopathogenesis, color parameter, severity of anemia, possibility of regeneration, type of hematopoiesis, size of red blood cells. Posthemorrhagic anemia. Iron deficiency anemia. Etiology, pathogenesis. Hemolytic anemia. Types (congenital, autoimmune, for example). The blood pattern. Clinical symptoms. Hemolytic anemia of newborns.

Topic 11. Stages of leukopoiesis. Description of leukocytes at different stages of leukopoiesis. Functions of leukocytes (neutrophils, eosinophils, basophils, monocytes, lymphocytes). Leukocytosis. Classification. Causes of leukocytosis (neutrophilic, eosinophilic, basophilic, monocytic, lymphocytic). Leukopenia. Classification. Causes and outcomes of neutropenia, lymphopenia. Agranulocytosis. The formula of the leukocyte. The nuclear shift of the leukocyte formula to the left, to the right. The clinical significance of calculating the leukocyte formula. Leukemia. Definition. Etiology. The pathogenesis of leukemia. Features of leukemic cells. Classification of leukemias (acute and chronic). Characteristics of the morphological picture of blood in acute and chronic myeloid and lymphoid leukemia. Clinical syndromes of leukemia. Clinical syndromes in leukemia: anemic, hemorrhagic, infectious, metastatic and intoxicating. Leukemic reactions and pathogenesis.

Topic 12. Components of hemostasis, primary and secondary hemostasis. Classification of hemostatic disorders. Outcomes and consequences. The mechanism of development of white and red thrombosis. Causes and conditions of thrombosis. The Virchow triad. Hemorrhagic disorders of hemostasis: disorders of blood vessels, disorders of platelets, disorders of blood clotting. Thrombocytopenia and qualitative disorders of platelets. Causes and features. Autoimmune thrombocytopenic purpura. Congenital disorders of platelet function. Von Willibrand's disease. Blood clotting disorders. Coagulopathy, classification. Reasons. Hemophilia (type A, B). Features. Disseminated intravascular coagulation (DIC). Reasons. Stages and mechanisms of development.

Topic 13. Circulatory insufficiency. General characteristics. Classification of circulatory pathologies. Types of circulatory insufficiency (acute and chronic, left-sided and right-sided). Etiology and pathogenesis, as well as

the main symptoms of acute heart failure. Chronic heart failure. Etiology. Stages. Types and characteristics of overload forms of heart failure. The main hemodynamic parameters characterizing acute and chronic circulatory insufficiency. Compensation mechanisms in chronic heart failure (characteristics of cardiac and non-cardiac mechanisms). The concept of heterometric (isotonic) and homeometric (isometric) compensation mechanisms. Manifestations of decompensation. Myocardial hypertrophy. Stages of hypertrophy according to F. To Meerson. Myocardial infarction. Etiology and pathogenesis. Effects. Causes of non-coronary heart disease. Causes of death in myocardial infarction. Cardiogenic shock and acute pulmonary edema. Etiology and pathogenesis. Clinical symptoms of circulatory insufficiency and substantiation of the mechanisms of their development. Characteristics of changes in hemodynamics of the heart in mitral valve insufficiency and stenosis of the orifices. The general etiology of cardiac arrhythmias. Classification of cardiac arrhythmias. The mechanisms of arrhythmias. Violations of automatism. Kinds. Disorders of the sinus rhythm (sinus tachycardia, bradycardia, arrhythmia). Violation of excitability. Mechanisms of occurrence. Kinds. Extrasystoles. Ectopic atrial contractions, atrial flutter, ectopic ventricular contractions, ventricular fibrillation. Conduction disturbances. Blockages. Kinds. Causes and mechanisms of development. Blockages (atrial, sinus-atrial, atrioventricular, intraventricular). The consequences of cardiac arrhythmias for the body. Factors involved in the regulation of blood pressure. Severity levels of arterial hypertension. Stages. Primary and secondary arterial hypertension. Classification. Risk factors. The role of endothelial dysfunction in the pathogenesis of hypertension. Clinical manifestations of arterial hypertension. Consequences for the body (complications). The pathogenesis of arterial hypertension. Outcomes of arterial hypertension. Experimental arterial hypertension. Primary and secondary arterial hypertension. Classification. Hypertension of the small circulatory system. Arterial hypotension. Reasons.

Topic 14. Lung volumes and capacity. Respiratory failure (etiology, causes, symptoms). Types of alveolar ventilation disorders. Obstructive and restrictive disorders. Asthma. Emphysema. Etiology. Pathogenesis. Diffusion disorders. Etiopathogenesis. Violation of perfusion. Characteristic. Reasons. Pulmonary hypertension. Pulmonary edema. Pneumothorax. Pathogenesis. The pathogenesis of periodic respiration (Cheyne-Stokes, Biote, Kussmaul).

Topic 15. The role of the digestive organs. Etiology of gastrointestinal disorders. The role of alcohol, smoking and other factors in their occurrence. Appetite disorders (anorexia, hyperrexia, bulimia, polyphagia). The causes of violations. Eating disorders. Digestive disorders in the oral cavity (chewing, salivation, swallowing). Causes and consequences. Dental caries. Etiopathogenesis, prevention. Disorders of the esophagus function. Dysphagia. Achalasia. Gastrointestinal reflux. Pathology of digestion in the stomach. Quantitative and qualitative disorders of the secretory function of the stomach. Pathological types of gastric secretion. Achlorhydria. Achilia. Etiology and pathogenesis. Symptoms of gastritis. Nausea, vomiting. Peptic ulcer disease. Etiology. Pathogenesis. The role of stress factors, *Helicobacter pylori*. Pathology of digestion in the intestine. Syndromes of improper digestion, malabsorption. Causes and mechanisms of violations. Causes of diarrhea. Effects. Dysbiosis. Etiology and pathogenesis. Effects. Pancreatitis. Etiology and pathogenesis. Effects. Hepatitis. Cirrhosis of the liver. The role of alcohol and other factors in the occurrence of liver diseases. Liver failure. Reasons. Stages of development. Their characteristics. Hepatic coma. Symptoms and mechanisms of their occurrence. The concept of hemosorption. Liver transplantation. Portal hypertension. Reasons. Characteristics of portal hypertension. Jaundice. Kinds. Characteristics of pigment metabolism disorders in certain types of jaundice (hemolytic, hepatic, mechanical). Cholemia. The main mechanisms and manifestations of cholemia. Cholestasis. Causes of cholestasis. Disorders in the body with cholestatic syndrome. Cholelithiasis. Etiology. Risk factors.

Topic 16. The role of the kidneys in the body. Etiology and pathogenesis of kidney diseases. Pathogenesis of disorders of urine formation (impaired filtration, reabsorption, secretion and excretion). Causes and mechanisms of diuresis disorders. Quantitative and qualitative disorders of urine formation (oliguria, anuria, polyuria). Hypostenuria, isostenuria, hyperstenuria. Reasons. Violations of the composition of urine. Pathological

components of urine. Pathogenesis of acute glomerulonephritis. Etiology, pathogenesis and main manifestations. Mechanisms of hypertension and edema development in nephritis. The consequences of chronic glomerulonephritis. Pyelonephritis. Etiopathogenesis. Characteristics of violations. Nephrotic syndrome, clinical manifestations. The pathogenesis of edema in nephrotic syndrome. The pathogenesis of nephritis and nephrotic edema. Kidney failure. Uremia. The concept of hemodialysis (artificial kidney). Urolithiasis. Factors and mechanisms contributing to the formation of stones.

Topic 17. Hormones. Hypopituitarism (Hypofunction of the pituitary gland). Pituitary dwarfism. Panhypopituitarism. Hyperpituitarism (Hyperfunction of the pituitary gland). Gigantism and acromegaly. Hyperprolactinemia. Cushing's disease. Typical disorders of the neurohypophysis. Diabetes insipidus. Syndrome of inappropriate antidiuretic hormone (ADH) secretion. Hyperfunction of adrenals. Hyperaldosteronism (Conn's disease). Hypercorticism (Hypercortisolism). Adrenogenital syndrome. Hypercatecholaminemia. Hypofunction of adrenals (Insufficiency of adrenals). Addison's disease. Adrenals' crisis (Waterhausen-Friederiksen's syndrome). Hyperfunction of the thyroid gland (Hyperthyroidism). Hypofunction of the thyroid gland (Hypothyroidism). Hyperparathyroidism. Hypoparathyroidism. Pathophysiology of gender glands. Hypergonadism. Hypogonadism.

4. Учебно-методическое обеспечение самостоятельной работы обучающихся

Самостоятельная работа обучающихся включает в себя подготовку к контрольным вопросам и заданиям для текущего контроля и промежуточной аттестации по итогам освоения дисциплины приведенным в п. 5.

Для обеспечения самостоятельной работы обучающихся используются:

Электронные курсы, созданные в системе электронного обучения ННГУ:

Pathophysiology, <https://e-learning.unn.ru/course/view.php?id=11040>.

Иные учебно-методические материалы:

Independent work is intended to cover all topics covered in lectures and laboratory sessions (as per the Discipline Content Table) and involves working in the library, reading room, and at home with access to internet resources, as well as preparing for laboratory sessions on topics presented in lectures.

Various types of student independent work are provided, including:

- Independent study of literature (textbooks, references, specialized sources, monographs, periodical articles, etc.) relevant to mastering theoretical concepts, preparing for ongoing assessment in the form of oral questioning and testing, and interim assessment through exam questions.

Current assessment of student independent work takes place in seminar-style classes.

During independent study, students prepare for the current class and for seminars in the following subject areas: "General Pathophysiology", "Common Disorders of the Immune System, Metabolism, and Electrolytes", "Physiology of Blood and Blood Circulation", and "Physiology of Respiration, Digestion, and the Endocrine System", which contributes to an increase in knowledge, development of skills, and mastery of the methods and techniques of professional practice. The questions for the seminar are provided in the course syllabus.

When preparing for a seminar, the student should become familiar with the relevant topic that will be discussed in the seminar, study the recommended reading materials and lecture materials on that topic, and prepare responses to oral examination questions related to the topic of the class.

5. Assessment tools for ongoing monitoring of learning progress and interim certification in the discipline (module)

5.1 Model assignments required for assessment of learning outcomes during the ongoing monitoring of learning progress with the criteria for their assessment:

5.1.1 Model assignments (assessment tool - Report-presentation) to assess the development of the competency YK-6:

1. Pathogenesis of type I allergic reactions (according to Gell & Coombs) their role in development of pathology. Etiology and pathogenesis of type I allergic reactions. Mediators. Local and general manifestations. Anaphylactic shock.
2. Pathogenesis of type II allergic reactions (according to Gell & Coombs), their role in development pathology.
3. Pathogenesis of type III allergic reactions (according to Gell & Coombs), their role in development of pathology.
4. Pathogenesis of type IV allergic reactions (according to Gell & Coombs). Etiology and pathogenesis. Lymphokines. Clinical manifestations.
5. Hypo- and hypervitaminosis of water-soluble vitamins (B1, B2, B3).
6. Hypo- and hypervitaminosis of water-soluble vitamins (B5, B6, B7).
7. Hypo- and hypervitaminosis of water-soluble vitamins (B9, B12, C).
8. Hypo- and hypervitaminosis of soluble vitamins (A, D).
9. Hypo and hypervitaminosis of soluble vitamins (E, K).
10. Regulation of water balance: central, afferent and efferent. The role of hormones in the regulation of water balance.
11. Hypohydration syndrome: definition, types, causes, pathogenesis, clinical and pathophysiological manifestations, consequences, pathogenetic principles of correction of each type.
12. Hyperhydration syndrome: definition, types, causes, pathogenesis, clinical and pathophysiological manifestations, consequences, pathogenetic principles of correction of each type.
13. Edema: definition, classification, factors influencing the development of edema, pathogenetic factors of edema development (hydrodynamic, lymphogenic, oncotic, osmotic, membranogenic, mechanical).
14. Pathogenesis of cardiac, pulmonary, renal, inflammatory, allergic, toxic, cachectic (starvation), lymphogenic, neurogenic, idiopathic edema.
15. Pathogenetic and adaptive significance of edema for the body. Principles of edema elimination: etiologic, pathogenetic, symptomatic therapy.
16. Hypopituitarism (Hypofunction of the pituitary gland).
17. Hyperpituitarism (Hyperfunction of the pituitary gland).
18. Cushing's disease
19. Diabetes insipidus.
20. Pyelonephritis.

5.1.2 Model assignments (assessment tool - Report-presentation) to assess the development of the competency OIK-5:

1. Primary combined immunodeficiency.
2. Combined immunological hereditary insufficiency.
3. T-cell immunodeficiency.
4. B-cell immunodeficiency.
5. Di Giorgi syndrome. Nezelof syndrome. Louis-Bar syndrome.
6. Hereditary deficiency of purine nucleoside phosphorylase.
7. Deficiency of myeloid cells.

8. Chronic granulomatosis. Wiskott-Aldrich syndrome. Chediaka-Higashi syndrome. Lazy leukocyte syndrome is a deficiency of the complement system.
9. Secondary (acquired) immunodeficiency and immunosuppressive conditions.
10. Disaccharidase deficiency syndrome.
11. Lactase deficiency syndrome.
12. Glycogenosis (a disease of glycogen accumulation).
13. Obesity, its types, causes and mechanisms of development.
14. Violations of Na⁺. Hyponatremia and hypernatremia (definition of the concept, causes, pathogenesis, clinical manifestations, consequences, pathogenetic principles of correction).
15. Violations of K⁺. Hypokalemia and hyperkalemia (definition of the concept, causes, pathogenesis, clinical manifestations, consequences, pathogenetic principles of correction).
16. Violations of Ca⁺. Hypocalcemia and hypercalcemia (definition of the concept, causes, pathogenesis, clinical manifestations, consequences, pathogenetic principles of correction).
17. Mg²⁺ disorders: Hypomagnesemia and hypermagnesemia (definition, causes, pathogenesis, clinical manifestations, consequences, pathogenetic principles of correction).
18. Hemolytic anemia of the newborn.
19. Jaundices.
20. Gallstone disease (Cholelithiasis).

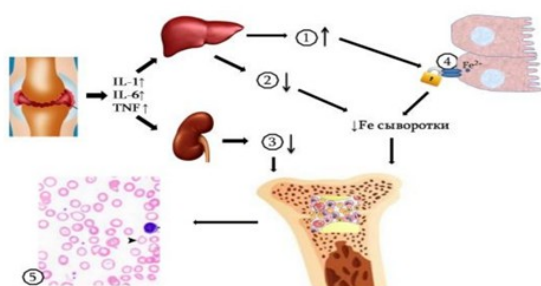
Assessment criteria (assessment tool — Report-presentation)

Grade	Assessment criteria
outstanding	The report provides comprehensive information on the presented topic, based on compulsory literature sources and current publications, with the addition of other information sources. The presentation is supported by high-quality visual materials (slide presentation and handout). The student is well-versed in the subject matter, clearly and expertly presenting the material derived from literature sources. He or she responds freely and accurately to questions and comments from the audience, and stays within the allotted time limit (7-10 minutes).
excellent	The report provides a comprehensive overview of the topic, drawing on a range of relevant literature and contemporary publications. The presentation is supported by high-quality visual aids (slide deck and handout), and the speaker demonstrates a thorough understanding of the subject matter. The student presents the material clearly and effectively, and responds to questions from the audience with confidence and accuracy. The duration of the presentation falls within the specified time frame (7-10 minutes).
very good	The topic presented was adequately covered, but the report contained incomplete information regarding the presented topic. The presentation was accompanied by visual aids (slide deck, handout). The speaker clearly and competently presented the material, and responded to questions and comments from the audience in a reasonable manner. However, minor errors were made by the speakers during the presentation of material and answering questions.
good	The presented topic was disclosed, but the report contained incomplete information on the subject. The presentation did not fully reflect all the information from the report, but it did contain demonstration material such as slide presentations and handouts. The speaker presented the material clearly and competently, and answered questions and comments from the audience reasonably. However, the speaker made minor errors while presenting the

Grade	Assessment criteria
	material and answering questions.
satisfactory	The speaker has a limited understanding of the chosen subject, struggles to apply the scientific and theoretical concepts and terminology relevant to the course, and does not provide any supporting visual or other materials.
unsatisfactory	The report contains significant gaps in its presentation of topics and is based on unreliable sources. The speakers made fundamental errors in their presentation of material.
poor	The report has not been completed

5.1.3 Model assignments (assessment tool - Assignments) to assess the development of the competency YK-6:

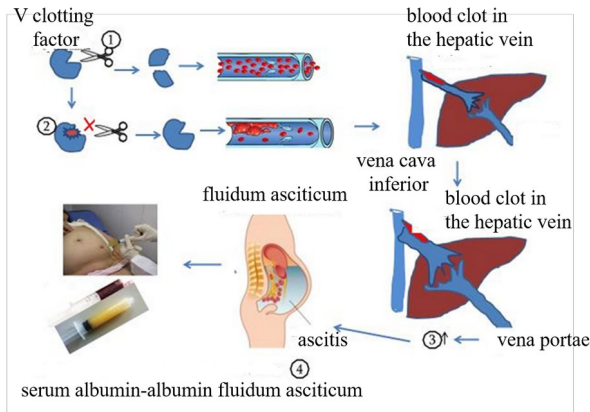
1. What methods are used to stop bleeding?
2. How does blood circulation in various organs change under stress conditions?
3. What measures should be taken in case of violation of water metabolism in the body?
4. What blood counts should be examined when modeling traumatic injuries?
5. What changes in blood parameters indicate the development of the inflammatory process?
6. What specific signs indicate a violation of venous circulation?
7. What indicators are examined in the correction of metabolic disorders (at the student's choice the metabolism of lipids, proteins or carbohydrates)?
8. What pharmacological agents are used to treat burn disease?
9. What pharmacological agents are used to prevent atherosclerosis?
10. What experimental methods do you know for modeling cardiac disorders?
11. What are the advantages of traditional and non-traditional methods of therapy for hematopoiesis disorders?
12. What pharmacological agents have an antihypoxic effect?
13. Write a diagram pathogenesis of posthemorrhagic conditions.
14. Sign the drawing by numbers (1, 2, 3, 4, 5).



15. Identify the possible mechanisms underlying leukocytosis and leukopenia.
16. Calculate the minute volume of the heart based on the given information: stroke volume 60 mL and heart rate 80 bpm. Does this value correspond to the normal range?
17. Which of the two ventricles exhibits superior systolic performance: ventricle A with a stroke volume of 60 mL and a final diastolic volume of 90 mL of blood, or ventricle B with a stroke volume of 70 mL and a final diastolic volume of 140 mL? Please provide an explanation for your answer.

18. In the figure below, the numbers are indicated:

1. ____ 2. ____ 3. ____ 4. ____.



19. Which cells are mostly responsible for the fibrosis in cirrhosis?

20. Hereditary defect of which factor can lead to the development of suprahepatic jaundice?

Assessment criteria (assessment tool — Assignments)

Grade	Assessment criteria
pass	the percentage of correct answers is at least 51%.
fail	the percentage of correct answers is less than 50%.

5.1.4 Model assignments (assessment tool - Colloquium) to assess the development of the competency YK-6:

1. Pathophysiology. Subject and tasks. Research methods. The place of pathophysiology in the system of higher medical education, its connection with other sciences. The importance of pathophysiology for the clinic.
2. General nosology: definition, components, tasks.
3. The basic concepts of nosology (pre-illness, disease, norm, health, pathological reaction, pathological process and pathological condition).
4. Definition of the concept of disease. Stages of the disease. Outcomes of the disease. General mechanisms of recovery (sanogenesis).
5. Arterial and venous hyperemia. Causes, mechanisms of development, consequences. Features of microcirculation.
6. Hypoxia. Classification of hypoxia. Compensatory-adaptive reactions in hypoxia in relation to various organ systems. Mechanisms of urgent and long-term adaptation to hypoxia.

7. Inflammation. Its causes and external signs. Alterations (primary and secondary). Metabolism and physico-chemical changes in the focus of inflammation. Inflammatory mediators.
8. Fever, definition of the concept. Etiology of fevers. Pyrogenes. Pathogenesis of fever. Pathophysiological principles of antipyretic therapy.
9. Tumors. Benign and malignant tumors. Etiology of tumors.
10. HIV infection: etiology, epidemiology, pathogenesis, clinical manifestations, consequences, therapy. AIDS.
11. Autoimmune diseases: etiology, pathogenesis, clinical forms. The role of external and internal factors in the pathogenesis of autoimmune diseases
12. The concept of allergies. Allergens. Classification of allergic reactions. Stages of pathogenesis of allergic reactions. Classification of allergic reactions according to Gell & Coombs. The role of heredity and external factors environment in the development of allergies. Pseudoallergic reactions.
13. Diabetes mellitus. Modern ideas about etiology insulin-dependent and non-insulindependent diabetes mellitus. Pathogenesis diabetes mellitus Principles of therapy. Complications of diabetes. Diabetic comas.
14. Atherosclerosis. Stages of the disease. Risk factors. Pathogenesis. Therapy and prevention of atherosclerosis.
15. Starvation. Stages of complete fasting. Changes in metabolism and body functions during complete fasting. Incomplete fasting. Kwashiorkor. Alimentary dystrophy.
16. Typical disorders of vitamin metabolism (avitaminosis, hypovitaminosis, hypervitaminosis, dysvitaminosis).
17. Bleeding: the definition of the notion, types, causes and factors, pathogenesis, main clinical symptoms, stages of bleeding compensation (reflex, hydremic, bone-marrow), parameters of severity of bleeding, compensatory-adaptative reactions.
18. Anemia: the definition of the notion, clinical symptoms of anemia and mechanisms of their development, classification of anemias by etiology, by pathogenesis, by G.A.Alekseev, Methods of study of anemia.
19. Leukemia. Clinical syndromes in leukemia. Characteristic of morphological picture of blood in acute and chronic myeloid and lymphoid leukemia. Leukemoid reactions. Comparison between leukemoid reactions and leukemia.
20. Ischemic heart disease: the definition of the notion; causes and mechanisms of development of IHD; classification if IHD; ECG-manifestations of IHD; pathogenesis of ischemic and reperfusion syndromes in coronary insufficiency, their manifestations.

5.1.5 Model assignments (assessment tool - Colloquium) to assess the development of the competency OIHK-10:

1. Mechanisms of adaptation and compensation of cells in response to damage (hyperplasia, hypertrophy, atrophy, metaplasia, dysplasia).
2. Mechanisms of reversible cell damage (intracellular edema, fatty changes, hyaline changes, glycogen accumulation, pathological pigments, amyloidosis).
3. Mechanisms of irreversible cell damage and cell death. Types of cell death. General mechanisms of cell death. Comparison of necrosis and apoptosis.

4. Features of microcirculation in the focus of inflammation. Exudation, emigration of leukocytes, their mechanisms.
5. Stages of fever. Changes in metabolism and physiological functions of the body in various stages of fever. Damaging and protective-adaptive value of fever.
6. Immunological reactivity: innate and adaptive factors immunity. Nonspecific defense of the body.
7. Disorders of the mechanisms of regulation of blood sugar levels. Hyper- and hypoglycemia.
8. Disorders of digestion and absorption of lipids: hyperketonemia, exhaustion, cachexia, lipodystrophy, lipidosis.
9. Disorders of digestion and absorption of proteins.
10. Disorders of the content of proteins in the blood plasma (hyperproteinemia, hypoproteinemia and paraproteinemia).
11. Disorders of nucleic acids metabolism: Disturbances of pyrimidine bases; Disturbances of purine bases – gout (etiology, pathogenesis, symptoms, treatment, complications).
12. Disorders of water balance. Hypo- and hyperhydration. Compensatory mechanisms of hypohydration: thirst, activation of the renin-angiotensin aldosterone system (RAAS). Principles of therapy.
13. Main forms of violations of main forms of acid-base imbalance. The role of blood buffer systems and physiological systems (lungs, kidneys and other organs) in compensation disorders of acid-base balance.
13. Primary erythrocytoses: the definition of the notion, etiopathogenesis, manifestations and outcomes.
14. Secondary erythrocytoses: the definition of the notion, etiopathogenesis, manifestations and outcomes.
15. Leukocytosis and leukopenia. Definition of concepts, principles of classification. Nuclear shifts in the leukocyte formula.
16. Thrombocytoses: the definition of the notion, categorization of thrombocytosis, absolute (true, proliferative) thrombocytosis, relative (false, non-proliferative) thrombocytosis, compensatory-adaptive and pathogenic significance of thrombocytosis.
17. Thrombocytopenias: the definition of the notion, categorization of thrombocytopenias, causes and mechanisms of development of thrombocytopenias, clinical manifestations of thrombocytopenias, general principles of treatment (etiotropic, pathogenetic, symptomatic) of thrombocytopenias.
18. Valvular heart diseases: types, etiopathogenesis, manifestations, treatment for each type.
19. Arterial hypertension: the definition of the notion, primary (hypertension) and secondary (symptomatic) hypertension. Etiology, etiopathogenesis of general (systemic) types of arterial hypertension (neurogenic, endocrine, metabolic, hemic, mixed). Arterial hypertension associated with pregnancy (preeclampsia, eclampsia). Outcomes of arterial hypertension. Principles of treatment of arterial hypertension.
20. Arterial hypotension: the definition of the notion, classification of arterial hypotension, causes and mechanisms of development of neurogenic, endocrine and metabolic arterial hypotension, clinical manifestations of arterial hypotension, outcomes of arterial hypotension.

5.1.6 Model assignments (assessment tool - Colloquium) to assess the development of the competency ОПК-5:

1. Sludge syndrome. Stasis. Ischemia. Causes, mechanisms of development, consequences. Features of microcirculation.
2. Thrombosis. Causes, stages of thrombosis, types of blood clots, consequences.
3. Embolism. Classification of embolisms, ways of spreading emboli. The significance, outcomes and consequences of embolism for the body. Prevention of embolism.
4. Respiratory hypoxia, blood hypoxia, cardiovascular hypoxia: causes, pathogenesis, mechanisms of changes in blood gas parameters and blood pH.
5. Tissue hypoxia, substrate hypoxia, overload hypoxia: causes, pathogenesis, mechanisms of changes in blood gas parameters and blood pH.
6. Systemic effect of the tumor on the body. Pathways and stages of metastasis. Tumor markers. Cancer cachexia. Paraneoplastic syndrome. Antitumor resistance of the body.
7. Primary immunodeficiency conditions. Their types and mechanisms.
8. Secondary immunodeficiency conditions (the role of infections, radiation, hypoxia, starvation, etc.). "Physiological" immunodeficiency condition.
9. Disorders of water balance. Hypo- and hyperhydration. Compensatory mechanisms of hypohydration: thirst, activation of the renin-angiotensin aldosterone system (RAAS). Principles of therapy.
10. Edema, its types. Pathogenetic factors of edema: the significance of gradients hydrodynamic, colloid-osmotic pressure of blood and tissue, permeability of vascular membranes.
11. Main forms of violations of main forms of acid-base imbalance. The role of blood buffer systems and physiological systems (lungs, kidneys and other organs) in compensation disorders of acid-base balance.
12. Shock. Definition of the concept. Kinds. General pathogenesis of shock states. Features of traumatic and anaphylactic shock.
13. Collapse. Definition of the concept. General pathogenesis of collapse. Types of collapse depending on its origin. General principles of collapse therapy.
14. Coma. Definition of the concept. General pathogenesis. Types of collapse in depending on its origin. General principles of coma therapy.
15. Disturbances of electrolyte homeostasis: pathology of sodium, potassium metabolism, calcium, magnesium, phosphates.
16. Alkalosis. Classification. Causes. Developmental mechanisms, clinical manifestations, compensatory mechanisms, laboratory criteria for them assessments. Principles of correction of violations.
17. Acidosis. Classification. Their causes and mechanisms of development. Compensatory reactions, laboratory criteria for their assessment. Principles correction of violations.
18. Arrhythmia: the definition of the notion, types. Causes and mechanisms of development. Disorders of automatism (kinds, sinus rhythm pacemaker abnormalities (sinus tachycardia, bradycardia, sinus arrhythmia)). Depict ECG changes.

19. Arrhythmia: disorders of excitability (kinds: extrasystolic arrhythmia, tachycardia (paroxysmal and no paroxysmal), atrial flutter and fibrillation, ventricular flutter and fibrillation)). Depict ECG changes.

20. Arrhythmia: disorders of conductivity (kinds of blocks: intraatrial, sinoatrial, atrioventricular, intraventricular)). Disorders of myocardial contractility (alternating pulse, paradoxical pulse). Depict ECG changes.

Assessment criteria (assessment tool — Colloquium)

Grade	Assessment criteria
outstanding	High level of training, impeccable command of theoretical material. The student gave a complete and detailed answer to the theoretical questions, confirming the theoretical material with practical examples.
excellent	High level of training with minor flaws. The student gave a complete and detailed answer to all the theoretical questions.
very good	Good preparation. The student provides answers to theoretical questions, but there are minor errors in definitions of concepts, processes, etc.
good	Overall, good preparation with noticeable mistakes or shortcomings. The student gives a complete answer to the theoretical questions, but there are errors in the definitions of concepts, processes, etc.
satisfactory	Minimum sufficient level of training. The student shows a minimum level of theoretical knowledge, makes significant mistakes, but when answering leading questions, he can orient himself correctly and give the correct answer in general terms.
unsatisfactory	The training is insufficient and requires additional study of the material. The student gives erroneous answers to theoretical questions
poor	The preparation is absolutely insufficient. The student does not answer the questions asked.

5.1.7 Model assignments (assessment tool - Interview) to assess the development of the competency YK-6:

Control questions on the topic of the lesson №1. Experiment and its role in the study of pathological processes

1. The definition of the notion «pathophysiology». Place of pathophysiology in the system of the higher medical education. Pathological physiology as a theoretical basis of modern clinical medicine.
2. The subject, tasks, methods and of pathological physiology.
3. General nosology: definition, components, tasks.
4. Basic concepts of nosology (pre-illness, disease, norm, health, pathological reaction, pathological process and pathological condition).
5. Signs and symptoms. Syndromic diagnosis.

6. The concept of etiology. The concept of environmental (external) and internal causes and risk factors of the disease. Monocausality and political science.
7. Definition of the concepts of "reactivity" and "resistance". The relationship between these terms. Classification of reactivity.
8. The concept of pathogenesis. Vicious circle: general characteristics and examples.
9. The concept of sanogenesis. Classification of sanogenetic mechanisms.

Control questions on the topic of the lesson №2. Cell injury, cell death

1. The definition of the notion «cell injury». Exo- and endogenous causes of cell damage.
2. General mechanisms of cell injury (derangements in the energy supply and utilization; loss of the integrity of cell membranes, free radical processes and reactions in the cell; ionic and water imbalance; changes in the genome and/or its abnormal realization; disorders of intracellular regulatory mechanisms).
3. Mechanisms of cell adaptation and compensation in response to damage (hyperplasia, hypertrophy, atrophy, metaplasia, dysplasia).
4. Mechanisms of reversible injury of cells (intracellular edema, fatty change, hyaline change, glycogen accumulation, pathologic pigments, amyloidosis).
5. Irreversible injury and cell death. Autolysis, necrosis, apoptosis. Comparison between necrosis and apoptosis.
6. Types of gangrene: dry, moist, gas.

5.1.8 Model assignments (assessment tool - Interview) to assess the development of the competency OIHK-10:

Lesson №3. Typical disorders of microcirculation

Control questions on the topic of the lesson

1. The definition of the notion «microcirculation». Components of the microcirculatory system (description of basic vessels of the microcirculatory bed). Principal causes and forms of typical impairments of microcirculation.
2. Arterial hyperemia: definition of the notion, causes, mechanisms, types, symptoms and consequences. Microcirculation in the area of arterial hyperemia.
3. Venous hyperemia: definition of the notion, causes, mechanisms, types, symptoms and consequences. Microcirculation in the area of venous hyperemia.

Control questions on the topic of the lesson №4. Hypoxia

1. The definition of the notion «hypoxia». The definition of the notion «hypoxemia». Principles of classification of hypoxic conditions.
2. Exogenous hypoxia: causes and changes of blood gas parameters at normobaric and hypobaric (altitude disease, mountain disease, decompression disease) hypoxia; pathogenesis of exogenous hypoxia.
3. Compensatory-adaptive reactions in hypoxia in relation to different systems of organs. Mechanisms of urgent and long-term adaptation to hypoxia.
4. Pathophysiological bases of prevention and therapy of hypoxic conditions.

Control questions on the topic of the lesson № 5. Pathophysiology of inflammation

1. Vascular changes in the area of inflammation (and mechanisms of their development).

2. Exudation: the definition on the notion, mechanisms of formation and biological significance of the process; types of exudates, their distinctions from transudate.
3. Exudation: mechanism of development. Types of exudates and their difference from transudate.
4. Pathogenetic features of acute and chronic inflammation: causes, mechanisms of development, manifestations. Principles of therapy.

5.1.9 Model assignments (assessment tool - Interview) to assess the development of the competency OIHK-5:

Control questions on the topic of the lesson "Tumor growth"

1. The definition of the notion «tumor», «tumor growth», «tumor progression». Malignant and nonmalignant (benign) tumors.
2. Cancer stages. TNM classification. Tumor markers.
3. Concepts of cancerogenesis.
4. Pathogenesis of tumor growth. Stages of carcinogenesis.
5. Kinds of tumor atypism: morphological, biochemical, physicochemical, antigenic, functional.
6. Systemic effect of the tumor on the body. Paraneoplastic syndrome, its pathogenesis, main manifestations.
7. The pathogenesis of cancer cachexia.
8. Principles prevention of tumor growth and cancer treatment.

Control questions on the topic of the lesson "Disorders of the immune system. Allergy"

1. Typical immunological disorders.
2. Primary combined immunodeficiencies.
3. Secondary (acquired) immunodeficiencies and immunosuppressive conditions.
4. HIV infection. Acquired immunodeficiency syndrome (AIDS).
5. Allergy: definition of the notion, general characteristics of allergies. Relationships between immunity and allergy, allergy and inflammation.
6. Allergens: definition, types (exo- and endogenous allergens).
7. Types of allergic reactions (immediate and delayed type).
8. Classification of allergic reactions according to Gell and Coombs.
9. Stages of allergic reactions, their characteristics.
10. Pseudoallergy, definition of the concept, etiology, pathogenesis.
11. Autoimmune diseases. Role of external and internal factors in the pathogenesis of autoimmune diseases.

Assessment criteria (assessment tool — Interview)

Grade	Assessment criteria
pass	The student demonstrates knowledge of the material on the section and modern publications; provides logical, reasoned answers to the questions posed. The grade "credited" is also given if the student makes minor inaccuracies in the answers.
fail	there are significant gaps in the knowledge of the main material in the section, as well as fundamental errors in the presentation of the material.

5.1.10 Model assignments (assessment tool - Test) to assess the development of the competency ОПК-10:

Instructions: in tasks choose one correct and most complete answer, in your opinion.

1. The swelling of the cell in case of damage is promoted:

1. Increasing the concentration of intracellular sodium
2. Increasing the concentration of intracellular potassium
3. Inhibition of anaerobic glycolysis
4. Reduction of cytoplasmic hydrophilicity

2. Antioxidant systems include:

1. superoxide anion radical and α -tocopherol 2. α -tocopherol and superoxide dismutase
3. hydroxyl radical and catalase 4. catalase and superoxide anion

3. Activation of phospholipase in the cell during damage occurs under the influence of:

1. Reducing the sensitivity of cell receptors to thyrocalcitonin
2. Reducing the intensity of free radical oxidation
3. Increasing the concentration of Ca^{2+} ions in the cytoplasm
4. Increasing the synthesis of biogenic amines in the cell

4. Markers of oxidant damage to cell membranes are:

1. Glucose and galactose 2. Malondialdehyde

- 3. Superoxide dismutase
- 4. Beta-carotene

5. The protective mechanisms of cells in case of damage include:

- 1. Complement system and antioxidant system
- 2. Complement system and kinin system
- 3. Kinin system and hypertrophy
- 4. hypertrophy and antioxidant system

6. Specify the consequences of severe acidosis in ischemic damage to cardiomyocytes:

- 1. Activation of Na^+/K^+ -ATPase
- 2. activation of enzymes of the creatine kinase system
- 3. $\downarrow \text{Ca}^{2+}$ - transporting function of the sarcoplasmic reticulum
- 4. inactivation of lysosomal proteases and phospholipases

7. Arterial hyperemia is:

- 1. organ augmented blood flow due to increase of blood supply from the arterial vessels
- 2. organ augmented blood flow as a result of impaired venous return from a tissue
- 3. increased amount of blood in the organism
- 4. hematocrit increase

8. Clinical signs of arterial hyperemia are:

- 1. redness and skin temperature increase
- 2. skin temperature increase and cyanosis
- 3. cyanosis and skin temperature decrease
- 4. skin temperature decrease and redness

9. The causes of neuromyolytic arterial hyperemia are:

- 1. transection of vasoconstrictive vegetative nerves
- 2. temporal stagnation of the circulation
- 3. action of vacuum

10. How does microcirculation change in arterial hyperemia?

1. dilation of arterioles
2. constriction of venes
3. opening of nonoperation capillarie

11. The causes of capillary stasis are:

1. erythrocyte aggregation (sludge)
2. venous thrombosis
3. reduced blood flow to capillaries
4. decreased hematocrit

12. Ischemia is the decreasing of blood flow due to:

1. decreasing blood flow in arteries
2. Anemia
3. low count of erythrocytes in blood
4. decreased hematocrit

13. Following vasoconstrictors (A) and vasodilators (B) are synthesized in endothelium

A. vasoconstrictor	1. prostacyclin
B. vasodilator	2. prostaglandin
	3. acetylcholine
	4. endothelin

- 1- AABB
- 2 – ABAB
3. BBAB
4. AABA

14. Specify the mechanisms that underlie the development of arterial hyperemia:

A. neurotonic type of arterial hyperemia	1. increased activity of the parasympathetic system
B. neuromparalytic type of arterial hyperemia	2. the excitation of the cholinergic system
	3. blockade of the adrenergic system
	4. activation of the histaminergic and serotonergic systems
	5. activation of the autonomic system

- 1- AABBA
- 2 – AABAB
- 3 – BBAAB
- 4 - BBABAB

15. What types of embolism are distinguished:

20. Phospholipids of cell membranes form:

1. bradykinin 2. Prostaglandins 3. Leukotrienes 4. anaphylatoxins

Answers

1 – 1	11 – 1
2 – 2	12 – 1
3 – 3	13 – 1
4 – 2	14 – 2
5 – 4	15 – 1
6 – 3	16 – 3
7 – 1	17 – 4
8 – 1	18 – 1
9 – 1	19 – 4
10 – 1	20 – 1

5.1.11 Model assignments (assessment tool - Test) to assess the development of the competency OIK-5:

1. List the sequence of microcirculation disorders in inflammation:

1 → 2 → 3 → 4 →

2. Thermogenesis in fever is enhanced by:

1. thyroxine release and shift of the oxyhemoglobin dissociation curve to the right
2. shift of the oxyhemoglobin dissociation curve to the right and reducing sweating
3. reducing sweating and shift of the oxyhemoglobin dissociation curve to the left
4. shift of the oxyhemoglobin dissociation curve to the left and release of adrenaline

3. With moderate fever , the core temperature of the body rises within:

1. 37-39°C 2. 37.5-39°C 3. 37-38°C 4. 38-39°C

4. For primary pyrogens , the statement is true:

- 1. Always protein structure 2. Always of exogenous origin 3. May be of exo- and endogenous origin
- 4. Always of endogenous origin 5. Produced by phagocytes

5. Which of the mediators most stimulates the synthesis of acute phase proteins in the liver?

- 1. IL-1 2. IL-6 3. IL-8 4. TNF α

6. Indicate the metabolic changes observed in the second stage of fever:

- 1. activation of glycogenolysis 2. negative nitrogen balance
- 3. decrease in the content of ketone bodies in the blood 4. increased lipogenesis

7. Compensatory reactions in humans with general cooling are:

- 1. reduced gas exchange and muscle relaxation
- 2. dilation of peripheral vessels and reduced gas exchange
- 3. vasoconstriction of internal organs and muscle relaxation
- 4. constriction of peripheral vessels and muscle trembling

8. At what minimum body temperature is it still possible for a person to fully restore vital activity?

- 1. 22°C 2. 24°C 3. 26°C 4. 28°C

9. Exogenous hypoxia is caused by:

- 1. lung diseases 2. by reducing the partial pressure of oxygen in the inhaled air
- 3. heart diseases 4. decrease in the amount of hemoglobin in the blood

10. Hypoxia in mountain sickness develops by ... type

- 1. respiratory 2. blood 3. tissue 4. hypoxic

11. Where are chemoreceptors located that react to changes in the partial pressure of oxygen and carbon dioxide?

1. aortic arch 2. carotid sinuses 3. medulla oblongata 4. in the interstitial of the alveoli

12. The cardiovascular type of hypoxia occurs when:

1. collapse 2. myocardial infarction 3. Hypertension 4. blood loss

13. Choose the most correct definition: blood oxygen capacity

1. this is the maximum amount of oxygen dissolved in the blood
2. this is the maximum amount of oxygen associated with the volume of blood at full saturation of hemoglobin with oxygen

14. Name the tissue most sensitive to hypoxia:

- 1.bone 2.cartilaginous 3.nervous 4.connective tissue

15. Allergic reactions developing according to the IV type of immune damage include:

1. Bacterial allergy 2. Quincke's edema 3. Contact dermatitis 4. Bronchial asthma

16. Atopic reactions include:

1. anaphylaxis and Quincke's edema 2. Quincke's edema and urticarial
3. urticarialb and bacterial allergy 4. bacterial allergy and anaphylaxis

17. Specify which blood cells are involved in the implementation of allergic reactions developing according to type IV immune damage:

1. platelets and lymphocytes 2. lymphocytes and red blood cells
3. eosinophils and neutrophils 4. lymphocytes and macrophages

18. The main factors of the pathogenesis of type I diabetes mellitus are:

1. insulin insufficiency and increased contrinsular hormones
2. insulin resistance and destruction of beta cells
3. destruction of beta cells and insulin insufficiency
4. fatness

19. What kidney structure is affected by diabetic nephropathy?

1. the medulla of the kidney
2. the Henle loop
3. the renal glomerulus
4. the collecting tube

20. Which indicator is the most reliable criterion for the degree of compensation for diabetes mellitus during a dynamic examination?

1. C-peptide
2. glycated hemoglobin
3. average daily glycemia
4. fructosamine

Answers:

1	11 – 3
1 approximation;	12 – 4
2 sticking;	13 – 2
3 immersion;	14 – 4
4 degradation/ digestion	15 – 3 16 – 2
2 – 1	17 – 4
3 - 4	18 – 3
4 – 3	19 – 4
5 – 2	20 – 2
6 – 3	
7 – 3	
8 – 2	

9 – 4	
10 – 3	

Assessment criteria (assessment tool — Test)

Grade	Assessment criteria
pass	the percentage of correct answers is at least 51%.
fail	the percentage of correct answers is less than 50%.

5.1.12 Model assignments (assessment tool - Report on laboratory works) to assess the development of the competency OIK-5:

Study of the role of osmotic factor

Study of the reaction of cardiomyocytes to their damage

Study of microscopic signs of venous hyperemia

Study of changes in blood circulation in fat embolism

Study of RBC properties in rats with acute massive blood loss

Vascular reactions in the inflamed mesentery of the frog's small intestine (Conheim's experience)

Assessment criteria (assessment tool — Report on laboratory works)

Grade	Assessment criteria
pass	The laboratory work has been fully documented, and the conclusions presented in the report correspond to the practical findings and have a sound theoretical basis. The student attended all practical sessions. The report on the practical exercises is structured into sections, including "Introduction", "Materials and Methods", "Results", "Discussion", and "Conclusions". The introduction provides a concise overview of the background to the study and outlines the objectives of the investigation. The "Materials and Methods" section provides a detailed description of the study subject, materials, techniques, equipment, and substances or reagents used, as well as the specific experimental approach employed. The doses and concentrations of drugs used in the study must be clearly stated. The results of the experiment are presented in the "Results" section of the report, either separately or in conjunction with the "Discussion" section. The results may be presented in the form of original recordings from a tape recorder, cardiogram, or electroencephalogram. Experimental data must be included in the report along with units of measurement. Where possible, it is advisable to identify major patterns in the data to help understand the studied phenomenon. The data has been plotted. It should be presented in a neat and clear manner. Graphs must include a title (label), axis

Grade	Assessment criteria
	labels with units of measurement, and a legend explaining the symbols used. All experimental points and calculated values should be included. The results should be interpreted in terms of current scientific understanding, with explanations of mechanisms. The “Conclusions” section should briefly summarize the main findings and patterns observed in the experiment.
fail	The laboratory work has not been conducted in accordance with the required standards, and no conclusions have been drawn from the practical exercises.

5.2. Description of scales for assessing learning outcomes in the discipline during interim certification

Шкала оценивания сформированности компетенций

Уровень сформированности компетенций (индикатора достижения компетенций)	плохо	неудовлетворительно	удовлетворительно	хорошо	очень хорошо	отлично	превосходно
	не зачтено		зачтено				
<u>Знания</u>	Отсутствие знаний теоретического материала. Невозможность оценить полноту знаний вследствие отказа обучающегося от ответа	Уровень знаний ниже минимальных требований. Имели место грубые ошибки	Минимально допустимый уровень знаний. Допущено много негрубых ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Допущено несколько негрубых ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Допущено несколько несущественных ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Ошибок нет.	Уровень знаний в объеме, превышающем программу подготовки.
<u>Умения</u>	Отсутствие минимальных умений. Невозможность оценить наличие умений вследствие отказа обучающегося от ответа	При решении стандартных задач не продемонстрированы основные умения. Имели место грубые ошибки	Продemonстрированы основные умения. Решены типовые задачи с негрубыми ошибками. Выполнены все задания, но не в полном объеме	Продemonстрированы все основные умения. Решены все основные задачи с негрубыми ошибками. Выполнены все задания в полном объеме, но некоторые с недочетами	Продemonстрированы все основные умения. Решены все основные задачи. Выполнены все задания в полном объеме, но некоторые с недочетами.	Продemonстрированы все основные умения. Решены все основные задачи с отдельными и несущественными недочетами, выполнены все задания в полном объеме	Продemonстрированы все основные умения. Решены все основные задачи. Выполнены все задания, в полном объеме без недочетов
<u>Навыки</u>	Отсутствие базовых навыков.	При решении стандартных задач не	Имеется минимальный набор	Продemonстрированы базовые	Продemonстрированы базовые	Продemonстрированы навыки	Продemonстрирован творческий

	Невозможность оценить наличие навыков вследствие отказа обучающегося от ответа	продемонстрированы базовые навыки. Имели место грубые ошибки	навыков для решения стандартных задач с некоторым и недочетами	навыки при решении стандартных задач с некоторым и недочетами	навыки при решении стандартных задач без ошибок и недочетов	при решении нестандартных задач без ошибок и недочетов	подход к решению нестандартных задач
--	--	--	--	---	---	--	--------------------------------------

Scale of assessment for interim certification

Grade		Assessment criteria
pass	outstanding	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "outstanding", the knowledge and skills for the relevant competencies have been demonstrated at a level higher than the one set out in the programme.
	excellent	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "excellent",
	very good	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "very good",
	good	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "good",
	satisfactory	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "satisfactory", with at least one competency developed at the "satisfactory" level.
fail	unsatisfactory	At least one competency has been developed at the "unsatisfactory" level.
	poor	At least one competency has been developed at the "poor" level.

5.3 Model control assignments or other materials required to assess learning outcomes during the interim certification with the criteria for their assessment:

5.3.1 Model assignments (assessment tool - Control questions) to assess the development of the competency УК-6

1. Gangrene. Types of gangrene: dry, wet, gas.
2. Respiratory hypoxia: causes, pathogenesis and mechanisms of changes in blood gas parameters and blood pH.
3. Tissue hypoxia: causes, pathogenesis and mechanisms of changes in blood gas parameters and blood pH.
4. Compensatory and adaptive reactions in hypoxia in relation to various organ systems. Mechanisms of urgent and long-term adaptation to hypoxia.
5. Primary immunodeficiency conditions. Their types and mechanisms.

5.3.2 Model assignments (assessment tool - Control questions) to assess the development of the competency ОПК-10

1. Pathophysiology. Subject and tasks. Research methods. The place of pathophysiology in the system of higher medical education, its connection with other sciences. The importance of pathophysiology for the clinic.
2. Arterial and venous hyperemia. Causes, mechanisms of development, consequences. Features of microcirculation.
3. Fever, definition of the concept. Pyrogens. Pathogenesis of fever. Pathophysiological principles of antipyretic therapy.
4. Stages of fever. Changes in metabolism and physiological functions of the body in various stages of fever. The damaging and protective-adaptive value of fever.

5.3.3 Model assignments (assessment tool - Control questions) to assess the development of the competency ОПК-5

1. Basic concepts of general pathology: norm, health, pre-disease, disease, pathological process, pathological condition.
2. Definition of the concept of disease. Stages of the disease. Outcomes of the disease. General mechanisms of recovery (sanogenesis).
3. The concept of pathogenesis. The main types of causal relationships in pathogenesis. "Vicious circles."
4. The concept of reactivity of the body. Types of reactivity. Pathological reactivity, its difference from physiological reactivity. The influence of anatomical and physiological systems (nervous, endocrine, etc.) and environmental factors on reactivity. Features of human reactivity, the role of social factors.

Assessment criteria (assessment tool — Control questions)

Grade	Assessment criteria
pass	Minimum sufficient level of training. The student showed a minimum level of theoretical knowledge, made significant mistakes when answering the exam question, but when answering leading questions, he was able to orient himself correctly and give the correct answer in general. The student attended practical classes, but has a low average score for current academic performance.
fail	The training is insufficient and requires additional study of the material. The student gave erroneous answers, both to the theoretical questions of the ticket, as well as to the leading and additional questions of the examiner. The student attended practical classes, but has a very low average score for current academic performance.

5.3.4 Model assignments (assessment tool - Control questions) to assess the development of the competency YK-6

1. Basic concepts of general nosology. A pathological reaction. The pathological process. Pre-illness. Disease. Health. Standard. A pathological condition.
2. Definition of the concept of disease. Stages of the disease. Outcomes of the disease. General mechanisms of recovery (sanogenesis).
3. The concept of pathogenesis. The main types of causal relationships in pathogenesis. "Vicious circles."
4. Cell death. Causes of cell death. General mechanisms of cell death.
5. Mechanisms of adaptation and compensation of cells in response to damage.
6. Mechanisms of reversible cell damage.
7. Types of cell death. Comparative characteristics of cell death types.
8. Gangrene. Types of gangrene: dry, wet, gas.
9. Hypoxia. Classification of hypoxia. Compensatory and adaptive reactions in hypoxia in relation to various organ systems. Mechanisms of urgent and long-term adaptation to hypoxia.
10. Exogenous hypoxia: causes, pathogenesis, mechanisms of changes in blood gas parameters and blood pH.
11. Respiratory hypoxia. Blood hypoxia. Cardiovascular hypoxia.
12. Tissue hypoxia. Substans hypoxia. Overload hypoxia
13. Inflammation. Its causes and external signs. Alterations (primary and secondary). Metabolism and physico-chemical changes in the focus of inflammation. Inflammatory mediators.
14. Features of microcirculation in the focus of inflammation. Exudation, emigration of leukocytes, their mechanisms.
15. Proliferation and its mechanisms. Outcomes of inflammation. General manifestations of inflammation (acute phase response).
16. Immunological tolerance and mechanisms of its violation. Autoimmune diseases, their types.
17. Immunological reactivity: factors of innate and adaptive immunity. Types of immunopathological conditions.
18. Primary immunodeficiency conditions. Their types and mechanisms.
19. Secondary immunodeficiency states (the role of infections, radiation, hypoxia, starvation, etc.). "Physiological" immunodeficiency states.
20. HIV infection: etiology, epidemiology, pathogenesis, clinical manifestations, consequences, therapy. AIDS.

5.3.5 Model assignments (assessment tool - Control questions) to assess the development of the competency ОПК-10

1. General etiology. The concept of environmental (external) and internal causes and risk factors of the disease. Monocausalism and polyethology. Reactivity. Classification of reactivity.
2. Arterial hyperemia. Causes, mechanisms of development, consequences. Features of microcirculation.
3. Venous hyperemia. Causes, mechanisms of development, consequences. Features of microcirculation.
4. Sludge syndrome. Stasis. Ischemia. Causes, mechanisms of development, consequences. Features of microcirculation.
5. Thrombosis. Causes, stages of thrombosis, types of blood clots, consequences.
6. Embolisms. Classification of embolisms, ways of spreading emboli. Effects.
7. Classification of inflammation. Chronic inflammation. Acute inflammation. General reactions of acute inflammation. The general biological significance of inflammation. Principles of anti-inflammatory (etiotropic, pathogenetic, symptomatic) therapy.
8. Fever, definition of the concept. Pyrogens. Pathogenesis of fever. Pathophysiological principles of antipyretic therapy.

Stages of fever. Changes in metabolism and physiological functions of the body in various stages of fever. The damaging and protective-adaptive value of fever.

9. Hyperthermia. Causes and risk factors. Stages of hyperthermia. Disorders in the body with hyperthermia. The general biological significance of hyperthermia.
10. Heat stroke. Sunstroke. Principles of therapy. Hyperthermic reactions.
11. Hypothermia. Definition of the concept. Causes and risk factors. The mechanism of development. Stages. Clinical manifestations. Outcomes.
12. Tumors. Benign and malignant tumors. Etiology of tumors
13. Pathogenesis of tumor growth. Stages of tumor growth. TNM classification. Systemic effects of the tumor on the body. Paraneoplastic syndrome. Cancerous cachexia.
14. Pathogenesis of type I allergic reactions (according to Gell & Coombs) and their role in the development of pathology. Etiology and pathogenesis of type I allergic reactions. Mediators. Local and general manifestations. Anaphylactic shock.
15. Pathogenesis of allergic reactions II (according to Gell & Coombs), their role in the development of pathology.
16. Pathogenesis of type III allergic reactions (according to Gell & Coombs), their role in the development of pathology.
17. Delayed-onset hypersensitivity (type IV). Etiology and pathogenesis. Lymphokines. Clinical manifestations.
18. Diabetes mellitus. Modern concepts of the etiology of insulin-dependent and non-insulin-dependent diabetes mellitus. The pathogenesis of diabetes mellitus. Principles of therapy. Complications of diabetes mellitus. Diabetic comas.
19. Disaccharidase deficiency syndrome. Lactase deficiency syndrome. Glycogenosis (a disease of glycogen accumulation).
20. Atherosclerosis. Stages of the disease. Risk factors. Pathogenesis. Therapy and prevention of atherosclerosis.
21. Violations of the protein content in blood plasma.
22. Disorders of protein catabolism (dysproteinosis: amyloidosis and hyalinosis).
23. Violations of nucleic acid metabolism: violations of pyrimidine bases, violations of purine bases. Gout.

Assessment criteria (assessment tool — Control questions)

Grade	Assessment criteria
outstanding	High level of training, impeccable mastery of theoretical material, the student demonstrates a creative approach to solving non-standard situations. The student gave a complete and detailed answer to all the theoretical questions of the ticket. The student actively worked in practical classes, which is confirmed by the high average score for current academic performance.
excellent	High level of training with minor mistakes. The student gave a complete and detailed answer to all the theoretical questions of the ticket. The student actively worked in practical classes, which is confirmed by the high average score for current academic performance.
very good	Good preparation. The student gave a complete answer to all the theoretical questions of the ticket, but made minor inaccuracies in the definitions of concepts, processes, etc. The student actively worked in practical classes, has a high average score for current academic performance.
good	Overall, good preparation with noticeable mistakes or shortcomings. The student answered all the theoretical questions of the ticket, but made inaccuracies in the definitions of concepts, processes, etc. There are errors in answering additional and clarifying questions from the examiner. The student has worked in practical classes and has a good average score for current academic performance.
satisfactory	Minimum sufficient level of training. The student showed a minimum level of theoretical knowledge, made significant mistakes when answering the exam question, but when answering leading questions, he was able to orient himself correctly and give the correct answer in general. The student attended practical classes, but has a low average score for current academic performance.
unsatisfactory	The training is insufficient and requires additional study of the material. The student gave erroneous answers, both to the theoretical questions of the ticket, as well as to the leading and additional questions of the examiner. The student attended practical classes, but has a very low average score for current academic performance.
poor	The student refused to complete the exam paper.

5.3.6 Model assignments (assessment tool - Situational tasks) to assess the development of the competency ОПК-5

1. Patient O., aged 60, an employee at a worsted dyeing plant, presented to the district physician with complaints of general malaise, fatigue, decreased appetite, weight loss, nausea, and increasing weight loss. He also reported skin itching and was concerned about his condition. The patient had a history of hepatitis and alcohol abuse and smoked heavily. Clinical and laboratory investigations revealed an enlarged liver, compression of adjacent organs, moderate ascites, jaundice, and paleness of the skin and mucous membranes. Bilirubin and bile acid levels in the blood were elevated, and urine was dark in color. The stool was pale. A computed tomography (CT) scan was performed to diagnose a tumor and liver cancer. What pathogenetic

factors might have contributed to the development of liver cancer in this patient? What diagnostic techniques should be employed to detect liver cancer in such cases?

2. A 10-year-old patient, P., with a leg injury was given tetanus serum as a preventive measure. On the 8th day after the administration of the serum, the child experienced severe pain, swelling of the shoulders and knees, and a generalized rash. At the same time, they also experienced fever, severe general weakness, muffled heart sounds, and decreased blood pressure. The child was admitted to the hospital with a diagnosis of serum sickness. Serum sickness is a type of immune-mediated reaction that occurs after the administration of certain drugs or biological products. It is classified as a type III hypersensitivity reaction according to the Jell and Coombs classification system. The pathogenesis of serum sickness involves the formation of immune complexes that deposit in tissues, leading to inflammation and tissue damage. The symptoms of serum sickness typically develop within 1-3 weeks after the exposure to the offending agent. In this case, the symptoms developed on the 8th day, which is unusual. This may be due to the fact that the child's immune system was already primed to react to the serum due to previous exposure to tetanus. To prevent anaphylactic shock, it is important to administer the serum in a controlled environment, under the supervision of medical professionals, and to monitor the patient closely for any signs of allergic reaction. It is also important to have a plan in place for managing any potential adverse reactions, such as serum sickness, and to have the necessary medications and equipment available in case of emergency.

3. After leaving the home, the individual lost consciousness. Upon examination, the ambulance physician found a diabetic individual's medical record in the subject's pocket. Objectively, the patient exhibited increased muscle tone, moist skin, rapid pulse, and periodic seizures. The physician noted increased tone in the eyeballs and a blood pressure reading of 80/40 millimeters of mercury (mmHg). The physician administered a prescribed dose of insulin to the patient, but the individual's condition deteriorated. What pathology has the patient developed? What error did the physician make? What tests are necessary to clarify the diagnosis? What therapeutic interventions should be implemented in this instance?

4. A 62-year-old man complains of headache, dizziness, tinnitus. The examination revealed a bright red face, neck, palms, blood pressure – 170/100 mmHg, splenomegaly. The patient has no signs of dehydration.

Laboratory analysis data:

hemoglobin - 18.5g/dl,

red blood cells – $6,9 \cdot 10^{12}/l$,

leukocytes - 13,000/ml,

platelets - 450,000/ml,

the level of erythropoietin in the blood is reduced.

5. A 44-year-old patient received a full course of antibiotic therapy for infectious endocarditis. Electrocardiographic examination of the patient revealed aortic regurgitation (reverse blood flow). Specify the main hemodynamic compensation for this valve defect.

Assessment criteria (assessment tool — Situational tasks)

Grade	Assessment criteria
outstanding	Correct creative assessment of the nature of the situation. A high level of proficiency in methods for assessing the functional state of the human body, analyzing and interpreting the results of modern diagnostic technologies and pathophysiological analysis of clinical syndromes of non-standard tasks without errors and shortcomings is demonstrated.
excellent	Correct assessment of the nature of the situation. The level of knowledge in the volume corresponding to the training program, without errors. A high level of proficiency in methods for assessing the functional state of the human body, analyzing and interpreting the results of modern diagnostic technologies and pathophysiological analysis of clinical syndromes of non-standard tasks without errors and shortcomings is demonstrated.
very good	A correct assessment of the nature of the situation is a complete, consistent enumeration of actions, with minor errors in argumentation. The basic level of proficiency in methods of assessing the functional state of the human body, analyzing and interpreting the results of modern diagnostic technologies and pathophysiological analysis of clinical syndromes with minor errors is demonstrated.
good	Overall, good preparation with noticeable mistakes or shortcomings. The student answered all the theoretical questions of the ticket, but made inaccuracies in the definitions of concepts, processes, etc. There are errors in answering additional and clarifying questions from the examiner. A correct assessment of the nature of the situation is a complete, consistent enumeration of actions, difficulty in argumentation. The basic level of proficiency in methods of assessing the functional state of the human body, analyzing and interpreting the results of modern diagnostic technologies and pathophysiological analysis of clinical syndromes with some shortcomings is demonstrated.
satisfactory	A correct assessment of the nature of the situation, incomplete enumeration or violation of the sequence of actions, difficulty in argumentation. The minimum level of knowledge of terminology, methods of assessing the functional state of the human body, analysis and interpretation of the results of modern diagnostic technologies and pathophysiological analysis of clinical syndromes is demonstrated, based on ethical standards, educational and scientific literature, but with a large number of blunders.
unsatisfactory	Incorrect assessment of the situation or incorrectly chosen tactics of action, leading to a deterioration in the patient's condition. There were gross mistakes. Demonstrated below-average proficiency in terminology, methods of assessing the functional state of the human body, analysis and interpretation of the results of modern diagnostic technologies and pathophysiological analysis of clinical syndromes, based on ethical standards, educational and scientific literature with gross shortcomings.
poor	There is a complete lack of assessment of the situation or tactics of action when choosing tactics for assessing the patient's condition. Skills are completely missing. Inability to assess the completeness of knowledge due to the student's refusal to answer.

6. Учебно-методическое и информационное обеспечение дисциплины (модуля)

Основная литература:

1. Литвицкий П.Ф. Патология физиологии : учебник / Литвицкий П.Ф. - Москва : ГЭОТАР-Медиа, 2020. - 624 с. - ISBN ISBN 978-5-9704-5567-8., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=735464&idb=0>.
2. Патология физиологии. Том 1 : учебник. - Москва : ГЭОТАР-Медиа, 2009. - 848 с. - ISBN ISBN 978-5-9704-1044-8., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=772366&idb=0>.
3. Патология физиологии. Том 2 : учебник. - Москва : ГЭОТАР-Медиа, 2009. - 640 с. - ISBN ISBN 978-5-9704-1045-5., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=772363&idb=0>.

Дополнительная литература:

1. Красников В. Е. Патология физиологии микроциркуляции и периферического кровообращения : учеб. пособие / Красников В. Е. - Владивосток : ТГМУ, 2013. - 126 с. - Книга из коллекции ТГМУ - Медицина., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=860961&idb=0>.
2. Литвинова Л. С. Патология физиологии обмена веществ : учебно-методическое пособие / Литвинова Л. С. - Калининград : БФУ им. И.Канта, 2021. - 111 с. - Утверждено и рекомендовано к печати Ученым советом Медицинского института Балтийского федерального университета им. И. Канта, протокол № 11 от 19.11.2020 года. - Книга из коллекции БФУ им. И.Канта - Медицина. - ISBN 978-5-9971-0642-3., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=802271&idb=0>.
3. Литвицкий П.Ф. Патология физиологии. Ситуационные задачи к образовательным модулям (профессиональные задачи) : учебное пособие / Литвицкий П.Ф.; Морозова О.Л. - Москва : ГЭОТАР-Медиа, 2022. - 328 с. - ISBN 978-5-9704-7228-6., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=809555&idb=0>.

Программное обеспечение и Интернет-ресурсы (в соответствии с содержанием дисциплины):

1. Электронные библиотеки (Znaniy.com, «ЭБС Консультант студента», «Лань»)
2. Научная российская электронная библиотека elibrary.ru
3. Научные базы данных Scopus, Web of Science, BioMed Central
4. Периодика онлайн (Elsevier, Springer)
5. DOAJ-Direktory of Open Access Journals
6. PLOS-Publik Library of Science

7. Материально-техническое обеспечение дисциплины (модуля)

Учебные аудитории для проведения учебных занятий, предусмотренных образовательной программой, оснащены мультимедийным оборудованием (проектор, экран), техническими средствами обучения, компьютерами, специализированным оборудованием: Classrooms for conducting training sessions provided for in the educational program are equipped with multimedia equipment (projector, screen), technical training facilities, computers, specialized equipment: Classrooms for conducting training sessions provided for in the educational program are equipped with multimedia equipment (projector, screen), technical training facilities, computers.

The premises for independent work of students are equipped with computer equipment with the ability to connect to the Internet and are provided with access to an electronic information and educational environment.

The premises for independent work of students are equipped with computer equipment with the ability

to connect to the Internet and are provided with access to an electronic information and educational environment.

Помещения для самостоятельной работы обучающихся оснащены компьютерной техникой с возможностью подключения к сети "Интернет" и обеспечены доступом в электронную информационно-образовательную среду.

Программа составлена в соответствии с требованиями ФГОС ВО по направлению подготовки/специальности 31.05.01 - General Medicine.

Авторы: Полозова Анастасия Владимировна, кандидат биологических наук.

Заведующий кафедрой: Дерюгина Анна Вячеславовна, доктор биологических наук.

Программа одобрена на заседании методической комиссии от 28 ноября 2024, протокол № №9.