

MINISTRY OF HEALTH OF UKRAINE
ZAPORIZHZHIA STATE MEDICAL UNIVERSITY

DEPARTMENT OF PATHOPHYSIOLOGY
WITH THE COURSE OF NORMAL PHYSIOLOGY

PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS

MANUAL FOR THE STUDENTS OF THE 3RD COURSE

field of study 22 «Health Care» specialty 226 «Pharmacy, Industrial Pharmacy»

**educational qualification «Master of Pharmacy»
professional qualification «Pharmacist»**

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Dear students!

Pathophysiology is the most important subject in basic medical education. Pathophysiology is the study of the changes in body's physiology that result from disease or injury. The professional activity of medical and pharmaceutical staff is aimed at preventing and treating diseases, therefore, comprehensive knowledge about disorders of organs and systems functioning and mechanisms of their diseases development is obligatory.

The purpose of training the discipline "Pathophysiology" is to study general patterns and specific mechanisms of the occurrence, development, course and consequences of pathological processes, diseases themselves and pathological conditions. To do this, students must understand the importance of pathophysiology for medicine and the health care system, its place in the system of medical knowledge. It is important to be able to use knowledge of pathophysiology to analyze and assess the state of the body, disorders of the activity of organs and systems with the aim of further planning diagnostic studies, therapeutic and preventive measures.

This Manual is based on many years of experience in teaching pathophysiology at the Zaporizhzhia State Medical University, as well as methodological materials for studying the subject in the system of higher medical education. The discipline program is structured into sections (logically completed parts of the curriculum), which include thematic sections represented by topics of practical classes.

Wishing you success in Pathophysiology studying and hope that this knowledge will be useful to you in your future professional activities!

Olga Valeriivna Melnikova,
Associate Professor of Pathophysiology
with Course of Normal Physiology Department

6th semester - 75 hours: lectures – 12, practical classes – 30, independent work - 33

LECTURE PLAN (LECTURE PLAN (PART 2, 6th semester)

	TOPIC	Hours
1.	WBC pathology. Leukocytosis, leukopenia, leukemia: etiology, pathogenesis, clinical manifestation, laboratory findings.	2
2.	Heart pathology. Ischemic heart disease, heart failure: etiology, pathogenesis, clinical manifestation, ECG signs, complications and outcomes	2
3.	Blood vessels pathology. Arterial hypertension: classification, etiology, pathogenesis, clinical manifestation. Arterial hypotension. Atherosclerosis.	2
4.	Lung pathology. Respiratory failure: classification, etiology, pathogenesis, clinical manifestation. Shortbreath. GIT and liver pathology	2
5.	Kidney pathology. Glomerulonephritis, nephrotic syndrome, renal failure: classification, etiology, pathogenesis, clinical manifestation.	2
6.	Endocrine system pathology. Clinical manifestation of hypophysis, thyroid and adrenal glands hyper- and hypofunction	2

PRACTICAL CLASSES PLAN (PART 2, 6th semester)

	TOPIC	Hours
1.	Blood pathology. ESR and ORE changes. Pathology of hemostasis.	2
2.	RBC pathology. Anemia and erythrocytosis.	2
3.	WBC pathology. Leukocytosis and leukopenia.	2
4.	WBC pathology. Leukemia and leukemoid reaction.	2
5.	Heart pathology. Ischemic heart disease, heart failure.	2
6.	Blood vessels pathology. Arterial hypertension and hypotension. Atherosclerosis.	2
7.	Section 2 Intermediate Control “Blood and CVS pathology”	2
8.	Lung pathology. Respiratory failure, shortbreath.	2
9.	GIT pathology. Peptic ulcer disease, intestinal obstruction	2
10.	Liver pathology. jaundice, hepatic failure, portal hypertension	2
11.	Kidney pathology. Glomerulonephritis, nephrotic syndrome, renal failure.	2
12.	General principles of endocrine system pathology. Pathology of hypophysis.	2
13.	Pathology of thyroid, parathyroid and adrenal glands. Stress conception	2
14.	Pathology of nervous system. Pathophysiology of extreme states.	2
15.	PART 2 FINAL SEMESTER CONTROL	2

UNIT 1
ALTERATIONS OF BLOOD VOLUME, ESR AND ORE. REGENERATIVE AND DEGENERATIVE FORMS OF RBC. PATHOLOGY OF BLOOD CLOTTING.

1. Changes of blood circulating volume: hyper- and hypovolemia. Types and causes of appearance.
2. Qualitative changes of RBC. Regenerative and degenerative forms of RBC.
3. Osmotic resistance of erythrocytes: defining factors, normal indices, changes in pathology.
4. Definition of erythrocyte sedimentation rate (ESR), ESR mechanisms. Causes and mechanisms of ESR changes.
5. Vascular-thrombocytic hemostasis in norm. Pathology of vessels and platelets hemostasis.
6. Disturbances of blood coagulation.
7. Syndrome of disseminated intravascular coagulation (DIC-syndrome).

Task 1. Complete the table “Causes of total blood volume alterations”

type	hematocrit,%	hypovolemia	normovolemia	hypervolemia

Task 2. Name the causes and explain the mechanism of alteration of erythrocytes regenerative forms percentage

increase of % _____

decrease of % _____

Task.3 Name the main types of RBC degenerative forms, give examples of degenerative forms of erythrocytes.

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Task 4. Complete the table “Factors influencing erythrocytes sedimentation rate”

	Increase of ESR	Decrease of ESR
RBC		
WBC		
Blood substances		
Diseases and clinical conditions		

Task 5. Name the causes and mechanism of alterations of osmotic resistance of erythrocytes.

increase of ORE _____

decrease of ORE _____

Task 6. Name the stages of blood coagulation and list the factors participating at each stage

Stage 1 _____

Stage 2 _____

Stage 3 _____

Task 7. Give the definition, causes, clinical manifestation and examples of blood coagulation disturbances:

Coagulopathy _____

Pathology of thrombocytes _____

Pathology of blood vessels _____

Teacher's signature _____

UNIT 2

RBC PATHOLOGY. ANEMIA AND ERYTHROCYTOSIS.

1. Anemia definition, pathogenetic classification (blood loss, premature destruction of RBC, disorders of erythropoiesis).
2. Common and specific clinical features and blood count at anemia.
3. Acute posthemorrhagic anemia. Stages of development, blood count at different stages.
4. Chronic posthemorrhagic anemia. Stages of development, blood count at different stages.
5. Hemolytic anemias principles of classification. Mechanisms of erythrocytes hemolysis.
6. Acute hemolytic anemia: causes and mechanisms of development, clinical manifestation, blood count.
7. Chronic hemolytic anemias: classification, causes and mechanisms of development, clinical manifestation, blood count.
8. Anemias caused by disturbed erythropoiesis:
 - a. iron deficiency anemia;
 - b. B12 and folic acid deficiency;
 - c. iron refractory anemia;
 - d. hypoplastic and metaplastic anemia.
9. Erythrocytosis definition, principles of classification. Clinical features and blood count at erythrocytosis. Mechanism of primary and secondary erythrocytosis development.

Normal indices of blood count

Index	Unit	Reference interval	
		Male	Female
Blood volume	ml/kg	75-80	70-75
RBC	*10 ¹² /L	4,5-5	3,9-4,7
hemoglobin	g/L	130-160	120-140
color index		0,85-1	0,85-1
reticulocytes	%	0,5-2	0,5-2
hematocrit	%	40-48	36-42
ORE (osmotic fragility test)	%	minimal 0,44-0,48; maximal 0,28-0,32	
ESR	mm/hour	1-10	2-15
iron in blood serum	μmol/L	10-28	7-25

Task 1.

Complete the table describing the stages of acute blood loss.

	Stages of acute blood loss		
	1	2	3
Name of the stage			
Time of duration			
Blood circulating volume			
RBC and HB quantity			
Color index			
Reticulocytes quantity			

Situational Problem 1

Patient A, 54 years, 7th day after surgical operation. **Blood count:** RBC $3,6 \cdot 10^{12}/L$, Hb 95 g/L, Color index 0,78 Leukocytes $16 \cdot 10^9/L$, Platelets $450 \cdot 10^9/L$

Blood smear: single anisocytes, poikilocytosis, reticulocytes- 3,8%.

1. Define RBC state and diagnose the disease.
 2. What stage of disease is diagnosed? How can you prove it?
-
-

Situational Problem 2

Patient D., 54 years, complains about general weakness, headache, giddiness, troubled sleep, frequent bloody stools.

Blood count: RBC $3,8 \cdot 10^{12}/L$, Hb 68 g/L, Color index 0,54 Leukocytes $6,1 \cdot 10^9/L$.

Blood smear: hypochromic erythrocytes, microcytes, single polychromatophilic normocytes, reticulocytes – 0,8%.

1. Define RBC state and diagnose the disease and its stage.
 2. Explain the mechanism of its development
 3. Explain the mechanism of low erythrocyte's color index.
-
-
-

Situational Problem 3

Patient R., 54 years, arrived at clinic with complains about weakness, short breath after minimal physical loading, pain in tongue and fingers. **Blood count:** RBC $1,44 \cdot 10^{12}/L$, Hemoglobin 66 g/L, Leukocytes $2,8 \cdot 10^9/L$, Platelets $100 \cdot 10^9/L$. **Blood smear:** expressed anisocytosis, poikilocytosis, megaloblasts, megalocytes, erythrocytes with basophilic granularity, hypersegmented neutrophils, reticulocytes - 0,4%.

1. Calculate color index of RBC

The degree of saturation of each erythrocyte with hemoglobin is determined by color index. It is calculated by formula: $CI = (\text{content of Hb in g/L} \times 0,03) / \text{three first figures of RBC quantity}$.

Color index=

2. Define RBC state and diagnose the disease. Explain the mechanism of its development.
 3. Explain the mechanism of high color index of erythrocytes.
 4. Why neutrophils have hypersegmented nuclei?
-
-
-

Situational Problem 4

Patient E., 32 years old, was admitted to the hospital with complaints of increased fatigue, hair loss, brittle nails, and a perversion of taste. Decreased appetite, epigastric pain, worse on an empty stomach. The patient for 10 years suffers from gastric ulcer with frequent exacerbations. Repeatedly observed black tarry stool. Blood test: HB - 70 g/L, RBC - $3,5 \cdot 10^{12}/L$, reticulocytes - 1.4% platelets - $380 \cdot 10^9/L$, ESR – 16 mm / h, pronounced anisocytosis (microcytes), moderate poikilocytosis;

erythrocytes with basophilic granularity, megaloblasts are absent, Jolly bodies and Kebo rings are absent, a single polychromatophilia in the field of view. Serum iron - 5.2 $\mu\text{mol} / \text{L}$, indirect bilirubin - 10 $\mu\text{mol} / \text{L}$, transferrin saturation with iron 8%.

1. What form of anemia is present in the patient? What are the possible reasons?
 2. Justify your conclusion and explain the pathogenesis of the symptoms of the disease: increased fatigue, hair loss, brittle nails, perversion of taste, decreased appetite
 3. Give a classification of anemia.
-
-
-
-

Situational Problem 5

Patient W arrived at clinic to define diagnosis. Complains about weakness, dizziness, loss appetite. Clinical examination of the patient revealed the thickening of skull bones. **Blood count:** RBC $2,7 \cdot 10^{12} / \text{L}$, Hemoglobin 81 g/L, Color index 1,0; Leukocytes $7,5 \cdot 10^9 / \text{L}$, Platelets $230 \cdot 10^9 / \text{L}$. **Blood smear:** normochromic RBCs, microspherocytes, reticulocytes - 12%.

ORE (osmotic fragility test): minimal -0,56%, maximal 0,42%

1. Define RBC state and diagnose the disease.
 2. Explain the mechanism of its development.
 3. Explain the result of osmotic fragility test.
 3. What type of hemolysis is activated in this case and what is the reason of its activation?
-
-
-
-

Situational Problem 6

A 12-year-old boy presents in the emergency room with severe chest pain. His mother reports he was doing well until he came down with a respiratory tract infection. **Blood count:** Erythrocytes $3,4 \cdot 10^{12} / \text{L}$, Hemoglobin 85 g/L, Color index 0,79; Leukocytes $5,6 \cdot 10^9 / \text{L}$, Platelets $210 \cdot 10^9 / \text{L}$, Reticulocytes 16%. **Blood smear:** anisocytosis, poikilocytosis, sickle cells.

1. Define RBC state and diagnose the disease.
 2. What is the most likely cause of pain in this boy?
 3. The patients with the disease usually experience anemia but not iron deficiency. Can you explain it?
-
-
-
-

Situational Problem 7

A 19-year-old female patient has had low haemoglobin rate of 90-95 g/L since childhood. Blood count results obtained after hospitalisation are as follows: erythrocytes - $3,1 \cdot 10^{12} / \text{L}$, Hb- 85 g/L, colour index - 0,78; leukocytes - $5,6 \cdot 10^9 / \text{L}$, platelets - $210 \cdot 10^9 / \text{L}$. Blood smear examination

revealed anisocytosis, poikilocytosis and target cells. Reticulocyte rate is 9%. Therapy with iron-containing medicines was ineffective.

1. Define RBC state and diagnose the disease.
2. Explain the mechanism of target-like erythrocytes appearance in patient's blood.
3. Evaluate the number of reticulocytes and explain if it's different from the normal.
4. Why treatment with iron was ineffective?

Situational Problem 8

Patient G is ill with chronic obstructive pulmonary disease for 12 years. He presented with the symptoms of chronic respiratory insufficiency. Blood count: Erythrocytes $6,0 \cdot 10^{12}/L$, Hemoglobin 180 g/L, Color index 0,9 Leukocytes $7 \cdot 10^9/L$, Platelets $200 \cdot 10^9/L$. Blood smear: non-expressed anisocytosis, reticulocytes - 3,4%.

1. Define RBC state and diagnose the disease.
2. What is the leading reason of RBC quantity change?

Situational Problem 9

Patient F., 56 years arrived at clinic with stenocardia attack and suspicion of myocardial infarction. **Blood count:** RBC $8,5 \cdot 10^{12}/L$; Hemoglobin 170 g/L; Color index 0,6; WBC $23 \cdot 10^9/L$; Platelets $550 \cdot 10^9/L$. **Blood smear:** hypochromic and polychromatophilic erythrocytes, anisocytosis, poikilocytosis, reticulocytes - 2,5%.

1. Define RBC state and diagnose the disease.
2. Define the state of bone marrow regeneration.
3. How can you explain the changes in WBC and platelets number?
4. Is stenocardia somehow related to blood count changes? Explain it.

Teacher's signature _____

UNIT 3

WBC PATHOLOGY. LEUKOCYTOSIS AND LEUKOPENIA

1. Definition of leukocytic formula. Regenerative and degenerative forms of leukocytes.
2. Leukopenia definition. Causes, mechanisms of development, importance for the organism
3. Neutropenia and agranulocytosis (myelotoxic and autoimmune). Criteria of agranulocytosis
4. Lymphopenia causes, mechanisms of development. The consequences of lymphopenia for immunity.
5. Leukocytosis definition. Classification of leukocytosis. Physiological leukocytosis causes and mechanisms of development.
6. Neutrophilia causes, mechanisms of development. Definition of neutrophils nuclear shift in the leukocytic formula. Types of neutrophils nuclear shift.
7. Pathological leukocytosis different forms. Explain the mechanism of eosinophilia, basophilia, lymphocytosis and monocytosis development.

Task 1

List the main functions of different types of leukocytes and their normal absolute count:

- Eosinophil** _____
- Basophil** _____
- Neutrophil** _____
- Lymphocyte** _____
- Monocyte** _____

Task 2

Fill the table with the most common causes of leukocytosis and leukopenia

	Eosinophils	Basophils	Neutrophils	Lymphocytes	Monocytes
Increased number					
Decreased number					

Situational Problem 1

Patient T., 27 years, works as a laboratory assistant of radiological department. His usual work is to do the roentgenography. Last month complains about weakness and frequent bleedings. Blood count: Erythrocytes $1,46 \cdot 10^{12}/L$, Hemoglobin 42 g/L, Color index 0,85; Erythrocyte's sedimentation rate 23 mm/hour, Leukocytes $3,1 \cdot 10^9/L$, Platelets $97 \cdot 10^9/L$

Leukocyte's count:

	Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
			myelo-cytes	juvenile cells	bands cells	segmented cells		
Absolute Count	1	0	0	0	2	18	68	11

Blood smear: normochromic RBCs, reticulocytes - 0,1%.

1. Define the state of WBC and diagnose the disease. What is the cause of it?
2. Define the type of anemia that is present in the patient?
3. What is the mechanism of RBC and platelets number change?

Situational Problem 2

Patient A, 54 years, is admitted to the cardiological ward with acute myocardial infarction. Blood count: Erythrocytes $3,9 \cdot 10^{12}/L$, Hemoglobin 110 g/L, Color index 0,85 Leukocytes $23 \cdot 10^9/L$, Platelets $250 \cdot 10^9/L$

Leukocyte's count

	Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
			myelo-cytes	juvenile cells	bands cells	segmented cells		
Absolute Count	3	1	1	2	8	64	18	3

Blood smear: normochromic RBC, reticulocytes- 1,3%.

1. Which pathology of WBC is described?
2. Does this pathology have an attitude to acute myocardial infarction? Explain.
3. Define the type of neutrophils nuclear shift in the patient. Describe the mechanism of it.

Situational Problem 3

A 32-year-old man presents in the allergy clinic with complaints of those of nasal pruritus (itching), nasal congestion with profuse watery drainage, sneezing, and eye irritation. The physical examination reveals edematous and inflamed nasal mucosa and redness of the ocular conjunctiva. He relates that this happens every autumn during "ragweed season."

Blood count: Erythrocytes $3,8 \cdot 10^{12}/L$, Hemoglobin 120 g/L, Color index 0,86 Leukocytes $10,7 \cdot 10^9/L$, Platelets $195 \cdot 10^9/L$

Leukocyte's count:

Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
		myelo-cytes	juvenile cells	bands cells	segmented cells		
12	1	0	0	5	55	22	5

1. Which pathology of WBC is described?
2. What is the cause and mechanism of its development?
3. Explain the role of eosinophils in allergy pathogenesis/

Situational Problem 4

A 40-year-old man presents in the therapeutic ward with the tuberculous inflammation of the lungs. His complaints now are cough with bloody phlegm, pain in the chest, general malaise.

Blood count: Erythrocytes $4 \cdot 10^{12}/L$, Hemoglobin 125 g/L, Color index 0,85 Leukocytes $11.5 \cdot 10^9/L$

Leukocyte's count:

Absolute Count	Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
			myelo-cytes	juvenile cells	bands cells	segmented cells		
	3	0	0	0	1	35	53	8

1. Which pathology of WBC is described?
2. What is the cause and mechanism of its development?
3. Describe the role of lymphocytes in tuberculous inflammation.

Situational Problem 5

A child 2-year-old was taken to the regular medical examination. His mother says that the child has frequent respiratory infections. Now of examination there are no signs of infection.

Blood count: Erythrocytes $3.7 \cdot 10^{12}/L$, Hemoglobin 115 g/L, Color index 0,87, Leukocytes $9 \cdot 10^9/L$

Leukocyte's count:

Absolute Count	Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
			myelo-cytes	juvenile cells	bands cells	segmented cells		
	2	0	0	0	2	33	55	7

1. Describe blood indices and evaluate them. Is there any pathology in the child?
2. Explain the mechanism of the revealed changes.

Teacher's signature _____

UNIT 4

WBC PATHOLOGY. LEUKEMIA AND LEUKEMOID REACTION.

1. Leukemoid reaction: definition, causes of development. Types of leukemoid reactions.
2. Leukemia: definition, the difference between leukemia and leukemoid reaction. Principles of leukemia classification by:
 - maturation degree
 - type of the blood cell involves
 - total WBC count
3. Etiology of leukemia, stages of leukemia pathogenesis.
4. Common symptoms and signs of leukemia manifestation, mechanisms of their development.

5. Acute leukemia (AML, ALL, undifferentiated type) – clinical and hematological characteristic.
6. Chronic leukemia (CML, CLL) – clinical and hematological characteristic.

Task. 1

Briefly describe the stages of leukemia pathogenesis.

1. _____
2. _____
3. _____

Task 2.

Fill the table «Comparison of leukemia and leukemoid reaction»

Sign	Leukemia	Leukemoid reaction
WBC count		
cause		
leukocytic formula		
total blood count		
reversibility		

Task 3.

Fill the table «Common signs of leukemia and their mechanisms of development»

Sign	Manifestation	Mechanism of development
anemia syndrome		
immunodeficiency syndrome		
hemorrhagic syndrome		
intoxication		
leukemic infiltration		

Define the pathology of blood in the given clinical Situational Problems and give the answers for the following questions.

- 1. Put the diagnosis according to all classifications.**
- 2. Explain the mechanism of development of underlined symptoms and signs.**

Situational Problem 1

Woman C., 38 years is in a hard state after abortion. Blood count: RBC $4.1 \cdot 10^{12}/L$ Hemoglobin 129 g/L ; Color index 0,94 WBC $36 \cdot 10^9/L$,

Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
		myelocytes	juvenile cells	bands cells	segmented cells		
3	1	4	7	9	51	20	5

Blood smear: single promyelocytes, **toxic grain in neutrophile's cytoplasm**, reticulocytes - 0,9%.
Define type of neutrophils nuclear shift

Situational Problem 2

Patient K., 55 years, arrived to clinic with complains about general weakness, fever, enlarged regional lymph nodes. Blood count: RBC $2,8 \cdot 10^{12}/L$, Hemoglobin 84 g/L, Color index 0,9; ESR 30 mm/hour **WBC $22 \cdot 10^9/L$** , Platelets $142 \cdot 10^9/L$

Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
		myelocytes	juvenile cells	bands cells	segmented cells		
1	0	0		1	22	61	3

Lymphoblasts – 3%, prolymphocytes – 9%
Blood smear: normochromic RBC, anisocytosis, poikilocytosis, reticulocytes- 0,4%, many **“lymphocyte’s shadows” (Gumprecht cells)**

Situational Problem 3

Patient M., 17 years complains of plural **subcutaneous hemorrhages**. Blood count: RBC $3,6 \cdot 10^{12}/L$, Hemoglobin 100 g/L, Color index 0,83 ESR 50 mm/hour, WBC $6,5 \cdot 10^9/L$, Platelets $60 \cdot 10^9/L$

Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
		myelocytes	juvenile cells	bands cells	segmented cells		
0	0	0	0	1	19	12	2

Lymphoblasts - 63%, prolymphocytes - 4%
Blood smear: normochromic RBCs, anisocytosis, poikilocytosis, reticulocytes - 0,2%.

Situational Problem 4

Patient A., 42 years, arrived to clinic with complains of general weakness, fever, **pains in bones and joints**. Blood count: RBC $2,8 \cdot 10^{12}/L$, Hemoglobin 84 g/L, Color index 0,9; ESR 50 mm/hour; WBC $82 \cdot 10^9/L$, Platelets $142 \cdot 10^9/L$

Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
		myelocytes	juvenile cells	bands cells	segmented cells		
0	0	0	0	2	12	10	2

Myeloblasts - 70%, promyelocytes - 4%

Blood smear: normochromic RBCs, anisocytosis, poikilocytosis, reticulocytes- 0,4%.

Situational Problem 5

Patient G., 34 years, complains of weakness, fatigue, sweatiness, **pain in left subcostal region**. Blood count: RBC $2,9 \cdot 10^{12}/L$, Hemoglobin 120 g/L, Color index 0,85 ESR 50 mm/hour; **Leukocytes $93 \cdot 10^9/L$** , Platelets $190 \cdot 10^9/L$

Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
		myelocytes	juvenile cells	bands cells	segmented cells		
9	4	20	20	13	12	10	5

Myeloblasts - 1%, promyelocytes - 6% Blood picture: normochromic RBCs, reticulocytes - 0,1%.

Situational Problem 6

A girl, 4 years. Three weeks after quinsy (acute suppurative inflammation of the tonsils) became weak and pale. Blood count: **RBC $2,9 \cdot 10^{12}/L$** , Hemoglobin 89 g/L, Color index 0,9 ESR 50 mm/hour ; WBC $5,9 \cdot 10^9/L$, Platelets $120 \cdot 10^9/L$

Eosinophils	Basophils	Neutrophils				Lymphocytes	Monocytes
		myelocytes	juvenile cells	bands cells	segmented cells		
0	0	0	0	1	16	31	2

Blasts cells 50% Morphological and biochemical signs of blasts cells are similar to lymphoblasts and myeloblasts.

Which type of anemia is present in the patient?

Suppose the activity of immunity of this patient

Teacher's signature _____

UNIT 5

HEART FAILURE. ISCHEMIC HEART DISEASE. MYOCARDITIS

1. Heart failure: definition, principles of classification.
2. Clinical manifestation of heart failure. Right-sided and left-sided heart failure.
3. Urgent mechanisms of heart failure compensation.
4. Long-term mechanisms of heart failure compensation.
5. Ischemic heart disease: etiology, pathogenesis, classification.
6. Stenocardia (angina pectoris): etiology, pathogenesis, clinical manifestation, ECG-signs.
7. Myocardial infarction: clinical manifestation. ECG-signs. Reperfusion damage of myocardial cells. Cardiogenic shock.

Task 1.

Draw a sketch of systemic and pulmonary circulation connecting them with appropriate heart chamber.

Task 2.

Give the definition to the Minute Blood Volume, write the formula of it, and give the normal rate of it.

MBV=

Task 3.

Fill the table: “Causes of heart failure”.

Myocardial injury	Myocardial overload	
	increase of preload	increase of afterload

Task 4.

Fill the table: “Urgent mechanisms of heart failure compensation”.

Intra-cardiac mechanisms	Extra-cardiac mechanisms

Task 5.

Fill the table: “Signs of left-sided and right-sided heart failure”.

Left-sided heart failure	Right-sided heart failure

Situational Problem 1

Patient M., 46-year-old after intensive physical work felt severe pain behind the sternum. He experienced earlier the episodes of pain with such localization. Usually there was a relief from pain in the rest. He stopped his work, but the pain was still severe. In a few hours shortness of breath and coughing with abundant mucus appeared. The patient was hospitalized in cardiological department.

Clinical examination of the patient: pale skin with cyanotic tint. Moist rales are auscultated over left and right lung. Breath frequency – 42 per minutes. Heart rate – 120 bpm. BP – 110/70 mmHg. Arterial blood oxygenation is 85% (normal 95 to 100%).

1. What is the most likely diagnosis?
2. Which type of heart failure has developed in the patient?
3. Explain the mechanism of low blood oxygen saturation and moist rales.

Situational Problem 2

A 56-year-old woman complains of dyspnoe in the rest which increases with physical activity, legs edema, pains in the right subcostal region.

Clinical examination: pale skin with cyanotic tint, enlargement of the liver, fluid accumulation in the peritoneal cavity. Breath frequency – 38 per minute, heart rate – 136 bpm. Borders of the heart are enlarged.

1. Which type of heart failure has developed in the patient?
2. Explain the mechanism of legs edema and liver enlargement.

Situational Problem 3

A 58-year-old male teacher notices the sudden onset of “chest tightness” when he walks upstairs. The pain, which is localized over the sternum, goes away when he sits down. He does not experience any pain or discomfort at other times. He has mild hypertension, for which he is on dietary therapy. His cholesterol level is elevated. He does not smoke.

1. What is the most likely diagnosis?
2. What is the most likely mechanism for these symptoms?

3. What are the complications and prognosis for this patient?

Situational Problem 4

A 40-year-old man presents in the emergency department complaining of substernal chest pain that is also felt in his left shoulder. He is short of breath.

His blood pressure is 148/90 mm Hg and his heart rate is 110 bpm. Body temperature 37,3⁰ C. His ECG shows an ST-elevation with T-wave inversion. He is given aspirin, morphine, and oxygen. Blood tests reveal elevated levels of creatin kinase and troponin.

1. What is the probable cause of the man's symptoms?
2. Explain the origin of the left arm pain, fever, and increased heart rate.
3. What is the significance of the ST-segment changes and elevation in creatin kinase and troponin?
4. Relate the actions of aspirin, morphine, and oxygen to the treatment of this man's condition.

Situational Problem 5

A 26-year-old patient presents in the infectious department complaining of throat pain, coughing, shortness of breath, shooting pain in the heart. The throat is hyperemic, tonsils are covered with fibrinous coating. His heart rate is 92 bpm, body temperature 39⁰ C, breath rate – 25 per minute. Diphtheria diagnosis is supposed.

ECG shows multiply ventricle extrasystoles, amplitude of the ECG is lower than normal. Ultrasound research of the heart shows dilatation of left ventricle. Laboratory findings: total WBC - 15*10⁹/L (neutrophils -80%), ESR – 18 mm/hour, antibodies to diphtheria's toxins are found in high amount.

1. What heart pathology has developed in the patient?
2. Which clinical signs can prove your answer?
3. Describe the connection between infectious disease and heart pathology.

Teacher's signature

UNIT 6
BLOOD VESSELS PATHOLOGY.
ARTERIAL HYPERTENSION AND HYPOTENSION. ATHEROSCLEROSIS.

1. Mechanisms of arterial pressure regulation.
2. Definition of arterial hypertension. Classification of arterial hypertension.
3. Causes of primary and secondary hypertension development.
4. Pathogenesis of hypertension.
5. Signs, symptoms, and complications of hypertension; general principles of treatment.
6. Arterial hypotension: types, causes, pathogenesis. Acute decrease of blood pressure.
7. Atherosclerosis definition, etiology, risk factors.
8. Pathogenesis and clinical manifestation of atherosclerosis.

Task 1. Complete the table «Physiological mechanisms of vascular tone regulation»

Mechanism	Vasoconstriction	Vasodilation
nervous		
humoral		
hormonal		

Task 2. List the factors which influence systemic blood pressure:

Task 3. Draw schematically and explain principles of renin-angiotensin-aldosterone system function

Task 4. Name the basic pathogenetic mechanisms of arterial hypertension:

↑cardiac output _____

↑total peripheral vascular resistance _____

Task 5. Complete the table «Arterial hypotension pathogenesis»

type of hypotension	pathogenesis
acute	
primary chronic	
secondary chronic	

Task 6. Calculate the Kerdo index of vegetative homeostasis. Experimental work.

Measure arterial pressure (AP) on the hand; determine the heart rate (HR). Kerdo index (KI) is calculated by the formula:

$$KI = \left(1 - \frac{HR}{AP_{diastolic}} \right) \times 100$$

Ideal KI equal to 0.

Positive KI (+) testifies to prevalence of sympathetic influence upon the heart, negative (-) testifies to prevalence of parasympathetic influences.

KI needs to be calculated in the rest and after physical activity.

Arrange obtained results as a table in the protocol, in conclusions explain the change of KI after physical activity.

Student's name	Arterial BP	Heart rate	Kerdo index	Conclusion

Task 5. Complete the table “Atherosclerosis: risk factors”

Major Risk Factors	Minor Risk Factors

The stages of hypertension

Category	Systolic BP (mm hg)	Diastolic BP (mm hg)
Normal BP	Below 130	Below 85
High-normal BP (pre-hypertension)	130-139	85-89
Stage 1 (mild) hypertension	140-159	90-99
Stage 2 (moderate) hypertension	160-179	100-109
Stage 3 (severe) hypertension	180 or higher	110 or higher

Situational Problem 1

A 47-year-old man, who is an executive in a law office, had his blood pressure taken at a screening program and had been told that his pressure was 144/90 mm Hg. His father and older brother have hypertension, and his paternal grandparents had a history of stroke and myocardial infarction. The patient enjoys salty foods and gained about 7 kg in the past year. His physical activity is very low: he prefers watching television.

1. According to classification into what category does the patient’s blood pressure fall?
2. What are his risk factors for hypertension?
3. Explain how an increased salt intake might contribute to an increase in blood pressure.
4. What type of treatment would you suggest to the patient?

Situational Problem 2

A 36-year-old woman enters the clinic complaining of headache and not feeling well. Her blood pressure is 175/90 mm Hg. Her renal tests are abnormal, and follow-up tests confirm that she has a stricture of the left renal artery.

1. What type of arterial hypertension does the woman have?
2. Explain the physiologic mechanisms underlying her blood pressure elevation.

Situational Problem 3

A group of people was in the elevator, when the electricity was turned off and elevator was stopped. A 21-year-old man suddenly felt extreme weakness, nausea, and palpitations. He turned pale, his skin was covered with cold sweats and he was near loss of consciousness. Blood pressure – 80/50 mmHg.

1. Explain the mechanism of blood pressure fall in this patient.
 2. Which other causes of low blood pressure can you name?
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Situational Problem 4

A 56-year-old man complains of constant feeling of “chest tightness”. When patient’s BP increases, he feels severe substernal pain with irradiation to left shoulder. He is smoking for 35 years. His body mass index is 33,5.

Clinical examination of the patient: heart rate – 76 bpm, BP 150/80 mm Hg.

Laboratory data: total blood cholesterol level 6,2 mmol/L, LDL – 4,1 mmol/L, HDL 0,7 mmol/L.

Normal indices of lipid metabolism:

blood cholesterol level - < 5,2 mmol/L, LDL - <3,36 mmol/L, HDL - >1,15 mmol/L

1. Define the pathology. Prove your answer.
 2. What is the role of LDL and HDL in pathogenesis of the revealed disorders?
 3. Describe pathogenesis of the revealed pathology?
 3. Which possible complications of atherosclerosis do you know?
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Teacher’s signature _____

UNIT 7

INTERMEDIATE CONTROL 2 Checking of practical skills and theoretical knowledge «PATHOLOGY OF BLOOD AND CARDIOVASCULAR SYSTEM»

To be allowed to pass Section 2 control the student should:

1. successfully complete 5th semester (Part 1 General Pathophysiology);
2. attend all the lectures and practical classes to the current date;
3. get positive mark at each practical class;
4. complete all the practical classes' protocols and show the lectures notebook.

SECTION 2 PRACTICAL SKILLS

1. Students should be able to define:

- typical disorders in blood system: anemia, erythrocytosis, leukocytosis, leukopenia, leukemia, coagulation disturbances;
- typical disturbances of blood circulating system: heart failure, circulatory failure, arrhythmia, arterial hypotension and hypertension, arteriosclerosis, atherosclerosis using modern classifications;

2. Students should be able to analyze:

- complete blood count in different types of anemia, leukocytosis, leukopenia, leukemia and leukemoid reaction;
- changes of the cardiohaemodynamic indices in the pathology;
- causality-effective relations, pathological and adaptive features in pathogenesis of the following diseases: heart failure, circulatory failure, arrhythmia, ischemic heart disease, cardiogenic shock, arterial hypotension and hypertension, arteriosclerosis, atherosclerosis.

3. To obtain practical skills:

- in solving Situational Problems and tests – definition of etiology, pathogenesis, mechanisms of clinical signs development, principles of diagnosing, prophylaxis and treatment in such clinical conditions: anemia, erythrocytosis, leukocytosis, leukopenia, leukemia, coagulation disturbances, heart failure, circulatory failure, arrhythmia, ischemic heart disease, cardiogenic shock, arterial hypotension and hypertension, atherosclerosis;
- in solving problem Situational Problems and tests – definition of etiology, pathogenesis, mechanisms of clinical signs development, principles of diagnosing, prophylaxis and treatment in such clinical conditions: anemia, erythrocytosis, leukocytosis, leukopenia, leukemia, coagulation disturbances;
- to define different WBC forms count with the help of blood count;
- to define hemoglobin blood content and interpret the result;
- to calculate color index and interpret the result;
- to identify regenerative and degenerative forms of RBC and WBC in peripheral blood smear and interpret the results of findings.

UNIT 8
PATHOLOGY OF LUNG. RESPIRATORY FAILURE, SHORTBREATH.

1. Respiratory failure definition, classification. Intrapulmonary and intrapulmonary causes of development.
2. Causes and mechanisms of development of:
 - a. disturbances of alveolar ventilation;
 - b. disorders of blood perfusion in the lungs;
 - c. mismatching of ventilation/perfusion ratio;.
 - d. impairment of gases diffusion in the lungs.
3. Clinical manifestation of respiratory failure: hypoxemia and hypercapnia signs and symptoms.
4. Pulmonary edema: mechanisms of development, signs and symptoms.
5. Short breath. Principles of classification.
6. Cerebral dyspnoea, periodic and agonal breathing: causes and mechanisms of development.
7. Causes and mechanisms of lungs, cardiac and hematic shortbreath development.
8. Asphyxia: stages and mechanisms of development.

Task 1. Complete the table “Normal parameters of gases content in blood”

index	arterial blood	venous blood
partial oxygen pressure		
carbon dioxide partial pressure		
oxygen saturation		

Task 2. Describe clinical manifestation of hypoxemia _____

Task 3. Describe clinical manifestation of hypercapnia _____

Task 4. Complete the table “Etiology of respiratory insufficiency”

Lung disorders	Extra-lung disorders

Difference between obstructive, restrictive and mixed disorders of alveolar ventilation

Measure	Obstructive Disorders	Restrictive Disorders	Mixed Disorders
FEV1/FVC	↓	Normal or ↑	↓
FEV1	↓	Normal ↑ ↓	↓
FVC	Normal or ↓	↓	↓
TLC	Normal or ↑	↓	↓
RV	Normal or ↑	↓	Normal ↑ ↓

Situational Problem 1

Patient A has been working at cement factory for 30 years. He complains of inability to do his usual work due to short breath which appears during physical load. Clinical examination: skin is pale, stiff breathing with dry crepitation (rales) all over the lungs are heard. Lung's X-ray picture: pneumosclerosis. Arterial blood oxygen saturation - 74 %.

1. Disturbance of which process of external breathing is observed in the patient?
2. Is respiratory failure present in this patient? Prove it.
2. Why short breath develops only during physical load? Explain the mechanism of its development.

Situational Problem 2

Patient C ill with bronchial asthma suffers from frequent attacks of suffocation (asthmatic fit) without any apparent reason. The breathing become hard during this attack, it is accompanied by cough with little amount of viscous phlegm. Whistling rales during exhalation are heard.

1. What type of short breath is characteristic for such lung's pathology? Explain the mechanism of its development.
2. Is respiratory failure present in this patient? Prove it.
3. Will the partial pressure of carbon dioxide be normal in this patient? Explain it.

Situational Problem 3

Patient B. was treated in neurological ward with diagnosis "brain stroke". His state was hard. Breathing had a periodic pattern of Cheyne-Stokes. Two days later the type of breathing changed to Bioto type.

1. What is the leading factor in Cheyne-Stokes breathing development?
2. How can you estimate the changes of patient's breathing? Do they have good prognostic features?

Situational Problem 4

Patient R, 20 years suffering from kidneys disease was taken to hospital in pre-coma state. Short breath with high frequency of respirations was observed. Despite treatment the state of the patient got worse and coma developed. Now patient is unconsciousness. The breath is characterized with regularly deep inhalations and exhalations.

1. What type of short breath has developed in the patient and why?
2. What type of short breath has appeared in coma state? Explain the mechanism of it.

Situational Problem 5

Patient G., 42 years is present in traumatology department with a closed fracture of right X and XI ribs, without lung tissue injury. Patient is in satisfactory state. Breathing is shallow, 16 in a minute. The amplitude of the right part of thoracic chest movements is lower in comparison with the left one. Spirogram of the patient: respiratory volume – 83%, minute ventilation of lungs – 82%, total lung capacity – 90% of the normal volume.

1. Disturbance of which process of external breathing is observed in the patient? Describe the mechanism of it.
2. Which type of respiratory failure will develop in the patient?

Situational Problem 6

Patient F. is present in cardiological department in the heard state. Diagnosis: ischemic heart disease, acute myocardial infarction of the left ventricle, heart failure. Bp 140/100 mm Hg, HR- 124 bpm, inspiratory shortbreath, cough with pink phlegm.

1. Explain the mechanism of shortbreath development in this patient.
2. Which lung pathology development can you suppose in this patient? Explain it.

Teacher's signature

UNIT 9

GIT pathology. Gastritis, peptic ulcer disease, intestinal obstruction, malabsorption syndrome

1. The main symptoms of GIT functions violations.
2. The violation of digestion in the stomach:
 - a. types of gastric secretion;
 - b. the role of gastric mucosal barrier damage in stomach pathology development.
3. Gastritis: classification, etiology, pathogenesis, clinical symptoms.
4. Peptic ulcer disease: etiology, pathogenesis, clinical symptoms, complications, principles of therapy.
5. The violation of the digestion in the intestines: general mechanisms of pathogenesis.
6. Intestinal obstruction: types, mechanisms of development, clinical manifestation, complications.
7. The malabsorption syndrome: types, clinical manifestation, complications.

Task 1.

To analyze the results of gastric intubation and reveal the probable disturbances in stomach and intestines digestion.

Normal indices of gastric secretion

	Volume (ml.)	General acidity	Free HCl	Combined HCl	Pepsin
fasting secretion	less than 50	up to 40	up to 20		0-20
basal secretion	50-100	40-60	20-40	10-15	20-40
stimulated secretion	50-100	40-60	20-40	10-15	21-45

The result of **patient 1** gastric intubation:

	Volume (ml.)	General acidity	Free HCl	Combined HCl	Pepsin
fasting secretion	100	60	30	20	15
basal secretion	120	80	60	10	30
stimulated secretion	140	100	50	30	50

The result of **patient 2** gastric intubation:

	Volume (ml.)	General acidity	Free HCl	Combined HCl	Pepsin
fasting secretion	10	30	0	10	10
basal secretion	0	0	0	0	0
stimulated secretion	20	32	10	10	5

In conclusions you should analyze the given indices and describe the mechanisms of disturbances

CONCLUSION

Situational Problem 1

Patient D., 35 years old was admitted to the hospital with complaints about episodes of severe gnawing pain (burning sensation) in the epigastria area which occurs 2-3 hours after meals. Sometimes pain occurs at night and wakes him up. Pain is accompanied by nausea and occasionally vomiting. The patient claimed that after vomiting he feels better. Pain can be relieved by food and antacides. Eight month ago he had divorced and moved to a hostel near his workplace. In addition, he reports that he lost 8 kg of his body weight during last months; he smokes heavily and drinks alcohol almost every day in order to suppress his personal stress

1. What form of pathology does the patient suffer from?
 2. What is the most likely cause of pathology and what are the risk factors in this case?
 3. Explain the mechanism of pain in epigastrium and weight loss in the patient.
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Situational Problem 2

Patient Z. 43 years old suffers from severe chronic gastritis and enteritis. He complains of frequent diarrhea, progressive malaise, weakness, frequents respiratory infectious diseases, weight loss and generalized edema. Clinical examination reveals hypochromic anemia, signs of multiple vitamin deficiencies, adrenal insufficiency, and immunodeficiency state. Stool test findings: the presence of undigested muscle fibers (creatorrhea), undigested lipids (steatorrhea) and amyloorrhea. The results of smal intestine biopsy show decreased activity of the intraluminal and brush border fractions of digestive enzymes, atrophy of enterocytes' microvilli.

1. What pathology of the gastrointestinal tract is present in the patient?
 2. What are the possible causes and pathogenesis of this syndrome?
 3. Explain the mechanism of hypochromic anemia, generalized edema and immune deficiency in this patient
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-
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Situational Problem 3

Patient G. 75 years old, complains of the pain in the abdomen and dyspepsia disorders: eructation, pain, feeling of the fullness in the stomach. Anamnesis: during 8 years, patient had suffered from rheumatoid polyarthritis. Lately he took acetylsalicylic acid and prednisolone without doctor's prescription because of arthritis exacerbation. Defect of the gastric mucosa was found after gastroscopy (erosion 0.5 X 0.5 cm).

1. What pathology of the gastrointestinal tract is described in the Situational Problem? Explain your answer.
 2. What is the mechanism of the gastric's mucous defect development?
 3. What are the mechanisms of the dyspepsia disorders in this case?
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Situational Problem 4

Patient E. 55 years old was delivered to the surgery department in a severe condition. She complains of the intensive belting pain, continuous vomiting without relief. Examination: cyanosis of the skin, tachycardia, decrease of the BP, tongue with white spot, swollen stomach. Anamnesis: patient fell from stairs and got a trauma of the abdomen 3 days ago. Blood count: leukocytosis with regenerative neutrophils nuclear shift to the left, increase of the hematocrit, increase of the blood amylase level. Patient had been moved to the resuscitation department and intensive antienzymatic therapy was started.

1. What pathology of the GIT does this patient have? What is the cause of its development?
 2. Explain the decrease of BP and increase of hematocrit in the patient.
 3. Explain the pathogenetic meaning of the antienzymatic therapy to this patient.
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Situational Problem 5

Patient H. 56 years old suffers from diabetes mellitus, cholelithiasis and chronic cholecystitis. He complains of the pain in the epigastric area shortly after fat or pungent food. In addition, he has eructation, nausea, meteorism and diarrhea. Blood count: during worsening – increase of the ESR, neutrophilic leukocytosis, hypo- and dysproteinemia (increase of the globulins), moderate hyperglycemia and glucosuria, moderate increase of the pancreas's enzymes (trypsin and amylase).

1. Do these symptoms confirm pancreas' function disorders?
 2. What is the possible mechanism of this pathology development?
 3. What is the pathogenesis of the diabetes mellitus and its progress in this case?
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Situational Problem 6

Patient G. 68 years old was hospitalized to the surgery department with diagnosis "suppurative appendicitis, peritonitis". Examination: peristalsis of the intestines is absent, pain, flabbiness, sickness, symptoms of the intoxication (decrease of the BP, fever, vomiting). Diagnosis "intestinal obstruction, intestinal autointoxication" was established.

1. What is the mechanism of the gastrointestinal tract's function disorders during peritonitis?
 2. What kind and what is the cause of the bowel obstruction in this case?
 3. What is the mechanism of the intestinal autointoxication development?
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Teacher's signature _____

UNIT 10

Liver pathology. Jaundice, hepatic failure, portal hypertension.

1. The role of the liver in the organism. Syndromes of liver affection.
2. Normal bilirubin metabolism.
3. Jaundice: classification, mechanisms of development, clinical and laboratory findings in
 - a. hemolytic jaundice;
 - b. hepatic jaundice;
 - c. obstructive jaundice.
4. Cholemia syndrome: mechanisms of development, clinical and laboratory findings.
5. Hepatic failure: classification, mechanisms of development, clinical and laboratory findings. Hepatic encephalopathy.
6. Portal hypertension syndrome: classification, mechanisms of development, clinical manifestation.
7. Complications of portal hypertension syndrome: ascites, splenomegaly, portosystemic shunts.
8. Hepatorenal and hepatolienal syndromes: mechanisms of development, clinical and laboratory findings.

Normal indices of bilirubin metabolism

Index	Blood ($\mu\text{mol/L}$)	Urine	Feces
Total bilirubin	5,1 – 17		
Direct (conjugated) bilirubin	1,7 – 5,1		
Indirect (unconjugated) bilirubin	3,4 – 12		
Urobilinogen		present	
Stercobilinogen)			present

Task 1. Complete the table

“Disorders of bilirubin metabolism in different types of jaundice”

Index	Hemolytic jaundice	Hepatic jaundice	Obstructive jaundice
Synonym			
Synonym			
Total bilirubin			
Direct bilirubin			
Indirect bilirubin			
Urine			
Feces			

Task 2. Complete the table “Pathogenesis of liver failure clinical manifestation”

Disorder	Pathogenesis	Clinical manifestation
Disturbance of digestion		
Hemorrhagic syndrome		
Endocrine disorders		
Disturbance of water-electrolyte metabolism		
Skin disorders		
Hepatorenal syndrome		
Encephalopathy		

Situational Problem 1

Patient K., 14 years old arrived to clinic with complaints about general weakness, pain in left subcostal region. Icteric skin had appeared in her from the childhood. Three months ago jaundice has strengthened and pains in liver region appeared. Blood analysis showed increased level of non-conjugated bilirubin, urine and feces are darkly colored.

1. Which type of jaundice is present in this patient?
2. What is the mechanism of dark color of urine and feces?
3. Explain the mechanism of pain in the left subcostal region.

Situational Problem 2

Patient R., last week complained of weakness, headache, body temperature increase (37,3 – 37,9⁰C). A day ago, he noticed the yellowing of scleras and dark color of the urine. The doctor directed him to infectious hospital. Laboratory data: direct (conjugated) bilirubin 27,4 μmol/L, indirect (unconjugated) bilirubin 51,3 μmol/L. Urine: brown color, bilirubin is present. Feces: slightly colored.

1. Which type of jaundice is present in this patient?
2. Explain the mechanism of conjugated and unconjugated bilirubin blood level increase.
3. Which type of bilirubin can be found in the patient’s urine? Why?

Situational Problem 3

Patient L., complains of itching, icteric skin and scleras plural small hemorrhages on the skin BP – 110/80 mmHg, heart rate – 58 bpm. Laboratory data: direct (conjugated) bilirubin 147 $\mu\text{mol/L}$, indirect (unconjugated) bilirubin 19 $\mu\text{mol/L}$. Laboratory analysis of feces shows increased amount of non-digested lipids (steatorrhea). Feces are colorless, urine – dark color. Protrombin level is decreased in the blood. Patient was treated with vitamin K injections for 5 days. After last vitamin K injection prothrombine level increased on 40 %.

1. Which type of jaundice is present in this patient?
2. Does the result of vitamin K injection prove disturbances in protein-synthesizing liver function?
3. What is the mechanism of steatorrhea, alterations of blood pressure and heart rate indices.

Situational Problem 4

Patient C., is treated in the clinic with diagnosis chronic hepatitis complicated by liver cirrhosis. The patient is weak, complaints about appetite loss and waste of weight. His skin is dry and pale with yellow tint and small hemorrhages on it. His belly is enlarged because of ascites. Subcutaneous veins are enlarged and well seen on the skin of belly. Concentration of proteins in the blood is lower than normal.

1. What pathology has developed in this patient and what are the reasons of it?
2. Explain the mechanism of ascites development.
3. Why subcutaneous veins on the skin of belly are enlarged?

Situational Problem 5

Patient W, is ill with a severe form of viral hepatitis for two weeks. The patient is passive and disorientated, his skin is with yellow tint with hemorrhages on it, his weight loss is 7 kg.. He has a specific sweet smell from the mouth. Blood analysis: albumens 28g/L, alaninaminotransferase -5,5 $\mu\text{U/L}$ (N=0,1-0,88 $\mu\text{U/L}$) general bilirubin 171 $\mu\text{mol/L}$ (N=3,4 -22,2 $\mu\text{mol/L}$), fibrinogen 1,2 g/L (N=1,5-3,6 g/L), ammonia 65 $\mu\text{mol/L}$ (N 17,6-47,0 $\mu\text{mol/L}$).

1. Which liver pathology has developed in the patient as a complication of viral hepatitis?
2. Explain the pathogenesis of the patient's clinical signs (weight loss, disorientation, smell from the mouth) and laboratory findings.

Teacher's signature _____

UNIT 11

Kidney pathology. Glomerulonephritis, nephrotic syndrome, renal failure.

1. Quantitative and qualitative violations of uropoiesis: mechanisms of development, laboratory findings.
2. Pathological components of the urine: types of disorders, mechanisms of proteins, erythrocytes, leukocytes, renal casts and glucose appearance in the urine.
3. Glomerular diseases classification. Etiology and pathogenesis of glomerulonephritis.
4. Nephrotic and nephritic syndrome: clinical and laboratory findings, mechanisms of development.
5. Renal failure: etiology, classification, stages of development.
6. Clinical manifestation of renal failure: renal symptoms, extra-renal manifestations. Pathogenesis of renal hypertension.
7. Uremia syndrome: etiology, pathogenesis, clinical manifestation.

Normal indices of urine analysis

Daily diuresis: 1,5 – 2 L (or 65-75% of the ingested fluid)

Urine specific gravity: 1,010-1,020

Glomerular filtration: 90-120 ml/min

Daily protein: 10 mg/100 ml or 50-100 mg/24 hours

Task 1.

Complete the table «Pathogenesis of alterations in urine analysis»

Urinary alterations		Pathogenesis
Quantitative	Polyuria	
	Oliguria, anuria	
Qualitative	Isosthenuria	
	Hypothenuria	
	Hypersthenuria	
	Proteinuria	
	Glucosuria	
	Hemoglobinuria	
	Hematuria	
	Leukocyteuria	
	Cylinderuria	

Task 2

Complete the table «Pathogenesis of the main symptoms in nephrotic syndrome»

Symptom	Pathogenesis
oliguria	
proteinuria	
hypoalbuminemia	
edema	
hyperlipidemia	

Situational Problem 1

The mother of the 3-year-old boy complains of his weakness, fatigue, polyphagia, and polydipsia. Clinical examination of inner organs shows absence of pathology. Urine analysis: daily diuresis about 3 l., urine's specific gravity - 1,020 to 1,038. Daily glucose urine excretion 1,2 g. Blood analysis: glucose plasma level 3 mmol/L. Clinical examination of boy's brother (1,5 years) revealed the same clinical picture.

1. What kidney's function is disturbed in the patient?
 2. What is the reason and mechanism of glucosuria occurrence in this case?
 3. What is the reason of polyphagia and polydipsia in this case?
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-
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Situational Problem 2

An 8-year-old boy is brought to the pediatrician's office with a 2-day history of malaise, fever of 38.8°C, nausea, and vomiting. His mother reports that he has decreased urine output and that his urine is a dark, smoky color. His blood pressure is slightly elevated, and there is some swelling of his hands and feet and around his eyes. He has been in good health except for a sore throat a week or so ago.

Urine analysis: proteins 1,2 g/L, leukocytes 3-8, erythrocytes 40-100 (in the field of vision), hyaline cylinders. Glomerular filtration – 56 ml/min.

1. What kidney's function is disturbed in the patient? What is the most likely diagnosis?
 2. Which mechanism is involved in disease pathogenesis?
 3. Which additional laboratory data do you need to prove this mechanism?
-
-
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Situational Problem 3

Patient P. complains of fatigue, pain in lumbar region, nausea, increased thirst, dryness in the mouth, edema, rare urinations, decreased amount of daily urine.

Clinical examination: edema of face, feet, and shins. Skin is pale and dry with fragile hair. BP - 150/95 mmHg increased left border of the heart.

Laboratory data: total serum protein – 30 g/L (N – 60 – 80 g/L), blood cholesterol level – 13 mmol/L (N – 3 – 6 mmol/L), creatinine – 0,3 mmol/L (N – 0,088-0,18 mmol/L), urea – 28 mmol/L (N – 14,2-28

mmol/L). Urine total amount – 600 ml, specific gravity 1,040, albumens 5 g/L, renal casts (cylinders). In the field of vision: 3-4 erythrocytes, 1-2 leukocytes, single epithelial cells.

1. Which syndrome of kidney affection is present in this patient?
2. Explain the mechanism of edema in the patient.
3. Explain the mechanism of cardiovascular abnormalities in the patient

Situational Problem 4

Patient A., 45 years arrived the clinic with acute abundant gastric bleeding. The patient is in a hard state. BP– 85/60mmHg, daily diuresis less than 250 ml. Blood analysis: blood nitrogen – 62 mmol/L (norm 14,3 – 28,5 30 g/L), blood urea – 36 mmol/L (norm 2,5-8,3 mmol/L).

1. What kidney's function is disturbed in the patient? What are the signs of such disturbance?
2. What kidney's pathology has developed in this patient?
3. Describe the mechanism of oliguria development.

Situational Problem 5

Patient G., 43 years was admitted to clinic a hard state. She is unconscious, breath smells with ammonia. She suffers from kidney disease for 16 years. Clinical examination: edema of face and legs, enlarged liver, BP –190/120 mmHg., blood nitrogen – 148 mmol/L, glomerular filtration – 12 ml/min., daily diuresis 360 ml, urine specific gravity - 1003-1007.

Blood analysis: RBC – $2,4 \times 10^{12}/L$, Hb – 68 g/L, color index 0,85, WBC – $5,6 \times 10^9/L$. leukocytic formula – without changes. In a blood smear: anisocytosis, poikilocytosis.

1. What kidney's pathology has developed in the patient?
2. Are there signs of uremia in this patient?
3. Describe blood count of the patient and explain the mechanism of the changes.

Teacher's signature _____

UNIT 12
Pathology of endocrine system.
Hyper- and hypofunction of endocrine glands. Pathology of hypophysis

1. General mechanisms of endocrine system functions disturbances. General principles of endocrine diseases treatment.
2. General mechanisms of increased and decreased function of endocrine glands manifestation.
3. Anterior pituitary lobe disorders. Etiology, pathogenesis, clinical manifestations of:
 - a. pathology of growth hormone secretion;
 - b. pathology of ACTH, TSH, FSH secretion;
 - c. panhypopituitarism.
4. Posterior pituitary lobe disorders Etiology, pathogenesis, clinical manifestations of:
 - a. diabetes insipidus;
 - b. syndrome of inappropriate ADH secretion.

Task 1. Complete the table «Levels of endocrine disturbances development»

level of disturbance	description

Task 2. Complete the table «General mechanisms of endocrine hypofunction and hyperfunction»

hypofunction	hyperfunction

Task 3. Complete the table «Chemical structure of hormones»

	source of synthesis, examples of hormones
amines	
peptides	
steroids	

Task 4. Complete the table “Physiological effects of hypophyseal hormones”

posterior pituitary	
anterior pituitary (FLAGTOP)	

Task 5. Complete the table “Growth hormone pathology”

signs	pituitary dwarfism	gigantism	acromegaly
causes			
disease onset			
body proportion			
inner organs size			
blood pressure			
blood glucose			

Situational Problem 1

A 20-year-old man after cerebral trauma complains of excessive thirst and abundant urination (up to 7 L for 24 hours). Urine specific gravity - 1005. Blood glucose concentration is normal, glucose is absent in the urine.

1. Which endocrine pathology can be suggested?
2. Explain the mechanism of polyuria, hyposthenuria, polydypsia.

Situational Problem 2

Patient S., 28 years 6 months ago had difficult deliveries with abundant blood loss. Now she complains of significant weight loss, dry and thin skin. Body temperature – 35.7°C, ABP – 100/60 mmHg, blood glucose – 3,3 mmol/L, decreased level of urinary 17-ketosteroids.

1. Which endocrine pathology can be suggested?
2. Explain patient’s body temperature, ABP and laboratory data.

Situational Problem 3

A girl S aged 12 years was examined for of short stature. The parents are first cousins: their heights are normal and the mid-parental height is 'average' The pregnancy was without complications and her size, was normal at birth. At the age of 2-3 years, growth retardation was noted, but she continued to grow slowly. Intelligence is judged as normal for her chronological age. There has been no sexual development. Routine urinalysis, blood urea, creatinine, calcium, phosphate, electrolytes and fasting blood sugars were within normal limits.

1. Which endocrine pathology can be supposed?
2. Explain the pathogenesis of short stature and propose the necessary treatment.

Situational Problem 4

The 26 years old patient has visited doctor because of the general weakness, headaches, change of appearance, increase in the legs and hands size. Over 2 years the size of footwear has increased from 39 up to 42.

Objectively the massive features (massive superciliary and malar arches, big nose and lips) are marked. The thorax is barrel — like shape, thickening of the clavicles, hands and feet are increased in the size. The important changes of the internal organs are not revealed. Pulse is 70 per minute, the arterial blood pressure is 150/90 mm hg.

1. Which endocrine pathology can you suggest in the patient?
2. Explain the mechanism of the given clinical signs.

Situational Problem 5

Examination of a 42-year-old patient revealed a tumor of adenohypophysis. Objectively: the patient's weight is 117 kg; he has moon-like hyperemic face, red-blue striae of skin distension on his belly. Osteoporosis and muscle dystrophy are present. AP is 210/140 mm Hg.

What is the most probable diagnosis?

Explain the mechanism of red-blue striae of skin distension on his belly

Teacher's signature

UNIT 13

Pathology of endocrine system.

Hyper- and hypofunction of thyroid, parathyroid and adrenal glands.

1. Disturbances of thyroid gland function. Etiology, pathogenesis, clinical manifestations of hyperthyroidism and hypothyroidism.
2. Pathology of parathyroid glands. Etiology, pathogenesis, clinical manifestations of parathyroid hormone inadequate secretion.
3. Hypofunction of adrenal cortex. Etiology, pathogenesis, clinical manifestations of Addison's disease and secondary adrenal insufficiency.
4. Hyperfunction of adrenal cortex. Etiology, pathogenesis, clinical manifestations of adrenal virilism, Conn's syndrome, Cushing's syndrome.
5. Pathology of adrenal medulla.
6. General adaptation syndrome and stress. Stages of development. Biological role of general adaptation syndrome.

Task 1. Complete the table "Physiological effects of thyroid, parathyroid, and adrenal glands"

thyroid gland	follicular cells	
	C cells	
parathyroid gland		
adrenal cortex		
adrenal medulla		

Task 2. Complete the table "Stages of general adaptation syndrome"

Stage	Pathogenesis and manifestation

Situational Problem 1

A 34-year-old woman complains of increased irritability, perspiration, weakness, loss of body weight, tremor of the limbs, increased heart rate and exophthalmia. Clinical examination: body temperature 37,5⁰C, heart rate 122 bpm, thyroid gland is increased in size. Anti-thyroid antibodies were found during blood analysis.

1. What diagnosis would this woman's history, physical, and laboratory tests suggest?
2. Explain the mechanism of the given symptoms and the role of anti-thyroid antibodies in the endocrine disorder development.

Situational Problem 2

A 76-year-old woman presents with weight gain, subjective memory loss, dry skin, and cold intolerance. On examination, she is found to have a multinodular goiter. Laboratory findings reveal a low serum T4 and elevated TSH.

1. What diagnosis would this woman's history, physical, and laboratory tests suggest?
 2. Explain the possible relationship between the diagnosis and her weight gain, dry skin, cold intolerance, and subjective memory loss.
-
-
-

Situational Problem 3

A 45-year-old woman presents with a history of progressive weakness, fatigue, weight loss, nausea, and increased skin pigmentation (especially of skin folds; pressure points such as the elbows, knees, knuckles, and toes). Her blood pressure is 115/75 mm Hg when supine and 105/52 mm Hg when standing. Laboratory findings revealed a serum sodium level of 120 mmol/L (normal is 135-145 mmol/L); potassium level of 5.9 mmol/L (normal is 3.5 - 5.0 mmol/L); low plasma cortisol, and high ACTH levels.

1. What diagnosis would this woman's clinical features and laboratory findings suggest?
 2. Would her diagnosis be classified as a primary or secondary endocrine disorder?
 3. What is the significance of her darkened skin?
-
-
-

Situational Problem 4

Patient F., 26 years, complaints about muscle asthenia, headaches, thirst, night urination, convulsions of muscles of extremities and feeling of flesh crawling, pains in heart. ABP 190/110 mmHg. Borders of heart are widened to the left; at examination of eye-ground is revealed presence of spasm of arteriole and expanded venules; activity of renin in plasma is decreased, K^+ - 2,9 mmol/L, Na^+ - 165 mmol/L.

1. What diagnosis would these clinical features and laboratory findings suggest?
 2. How can you explain increase of arterial blood pressure in the patient?
-
-
-

Situational Problem 5

Patient L. 30 years, in 3 months after childbirth gained weight - 7 kg per month and her attention was drawn by unusual location of fat: in the neck and face. X-ray examination revealed increased size of sella Turcica (Turkish saddle). The patient has high blood glucose level and glucosuria.

1. What endocrine pathology can be suggested?
 2. Would it be classified as a primary or secondary endocrine disorder?
-
-
-

Teacher's signature

UNIT 14
Pathology of nervous system. Pathogenesis of extremal states.

1. Disorders of the sensor functions of the nervous system. Types of sensitivity. Qualitative and quantitative disorders of sensitivity.
2. Pain receptors. Nociceptive pain, mechanisms of development. natural antinociceptive mechanism. Headache. Migraine.
3. Disorders of moving function of the nervous system. Kinds of disorders. Peripheral and central paralysis and paresis. Myasthenia.
4. Acute and chronic disorders of cerebral circulation. Strokes. Brain edema.
5. General characteristic of extremal states (shock, collapse, coma).
6. General pathogenesis of shock. Alterations of neuroendocrine regulation, central haemodynamics and microcirculation and metabolic processes.
7. Types of shock (traumatic, hypovolemic, cardiogenic, septic, anaphylactic, burn)

Task 1. Complete the table “Signs of central and peripheral paralysis”

	Central paralysis	Peripheral paralysis
Damage location		
Muscle tone		
Muscles atrophy		
Neural reflexes		

Task 2. Complete the table “Mechanisms of shock development”

type of shock	reason of development	main link of pathogenesis
traumatic		
hypovolemic		
cardiogenic		
septic		
anaphylactic		
burn		

Situational Problem 1

A 32-year-old woman presents with complaints of drooping eyelids, difficulty chewing and swallowing, and weakness of her arms and legs that is less severe in the morning but becomes worse as the day progresses. She complains that climbing stairs and lifting objects is becoming increasingly difficult. Clinical examination confirms weakness of the eyelid and jaw muscles. She is told that she may have myasthenia gravis and is scheduled for a test using the short-acting acetylcholinesterase inhibitor edrophonium (Tensilon).

1. Explain the pathogenesis of this woman's symptoms as it relates to myasthenia gravis.
2. Explain how information from the administration of the acetylcholinesterase inhibitor edrophonium can be used to assist in the diagnosis of the disorder.

Situational Problem 2

Patient N., 49 years, is delivered to neurology department. There is limitation of voluntary movements in the left extremities, more in a hand. Tone of muscles in the left hand and leg is increased according to spastic type. There are increased local tendinous reflexes, pathologic reflexes.

1. How can you characterise the neurologic disorders of this patient?
2. Explain the mechanism of muscles tone increase in the left extremities.

Situational Problem 3

Patient L., 40 years, a month ago got the trauma of right thigh. At the examination of the neurologic status: active movements in right leg are limited because of severe pain, volume of muscles on the right leg is on 2 cm lesser, then on the left, Achilles and knee reflexes on the right side are absent. There is decreased proprioceptive sensitivity on the right leg in the region of foot.

1. How can you characterise the neurologic disorders at a patient?
2. Explain the mechanism of decreased muscles volume and reflexes absence in the patient.

Teacher's signature

UNIT 15
FINAL SEMESTER CONTROL
Checking of practical skills and theoretical knowledge

To be allowed to pass **FINAL SEMESTER CONTROL** the student should:

1. successfully complete all previous Controls;
2. attend all the lectures and practical classes to the current date;
3. get positive mark on each practical classes;
4. complete all the practical classes' protocols and show the lectures notebook.

SECTION 5 PRACTICAL SKILLS

1. Students should be able to define:

- respiratory failure using indices of blood gases and modern classifications;
- to define typical disturbances of GIT, liver and kidneys functions: malabsorption, peptic ulcer disease gastritis, intestinal obstruction, jaundice, hepatic failure, portal hypertension, glomerulonephritis, renal failure;
- to define typical disturbances of endocrine system disorders: acromegaly, gigantism, panhypopituitarism, Sheehan's syndrome, Cushing's disease and Cushing's syndrome, Grave's disease, myxedema, adrenal virilism, Conn's syndrome, Addison's disease
- to define typical disturbances of nervous system disorders: central and peripheral paralysis, Brown-Sequard syndrome, myasthenia

2. Students should be able to analyze:

- changes of spirogram and lungs volume.
- causality-effective relations, pathological and adaptive features in pathogenesis of the following diseases: lung edema, asphyxia and shortbreath;
- the role of disturbances of alveolar ventilation, disorders of blood perfusion in the lungs, mismatching of ventilation/perfusion ratio and impairment of gases diffusion in the lungs;
- to analyze the consequences of inadequate hormones secretion of hypophysis, thyroid, parathyroid, adrenal glands;
- to estimate biological role of general adaptation syndrome and stress, its etiology and pathogenesis.

3. To obtain practical skills:

- in solving Situational Problems and tests – definition of etiology, pathogenesis, mechanisms of clinical signs development, principles of diagnosing, prophylaxis and treatment in such clinical conditions: heart failure, circulatory failure, arrhythmia, ischemic heart disease, cardiogenic shock, arterial hypotension and hypertension, arteriosclerosis, atherosclerosis, respiratory failure, lungs edema, asphyxia and shortbreath.

List of topics for individual study:

1. Hemorrhagic shock – mechanisms of development. Consequences of blood transfusion; etiology pathogenesis, clinical manifestation.
2. Pathogenesis and clinical manifestations of blood circulation disturbances in the patients with arrhythmias.
3. Metabolic syndrome: etiology, pathogenesis clinical manifestation.
4. Experimental models of arterial hypertension.
5. Cholelithiasis: etiology, pathogenesis clinical manifestation, complications. Types of gallstones.
6. Urolithiasis: etiology, pathogenesis clinical manifestation, complications. Types and locations of urinary stones.
7. Chronic renal failure treatment. Principles of extracorporeal hemodialysis, peritoneal dialysis.
8. Primary and secondary hypogonadism – etiology and pathogenesis. Adrenogenital syndrome (congenital adrenal hyperplasia) – etiology pathogenesis clinical manifestation.
9. The role of vegetative nervous system in regulation of homeostasis. Vegetative vascular dysfunction: etiology, pathogenesis, features.
10. Types of pain: complex regional pain syndrome (causalgia), neuralgia, phantom pain, psychogenic pain – etiology and pathogenesis. Principles of anesthesia.
11. Mechanism of addiction development to chemical substances. Alcoholism, narcomania

RECOMMENDED LITERATURE

Basical:

1. Pathophysiology : textbook for students of higher medical educational institutions of the III-IV accreditation levels / N. V. Krishtal [et al.] ; ed. by.: N. V. Krishtal, V. A. Mikhnev. - 2nd ed., corrected. - Kyiv : AUS Medicine Publishing, 2018. - 656 p.
2. General and Clinical Pathophysiology : textbook for students of higher educational institutions, of IV th level of accreditation / A. I. Gozhenko[et al.] ed. by A. I. Gozhenko, Lukasz Szarpak – 5th ed. - Vinnytsya : Nova Knyha Publishers, 2021. - 696 p.
3. Simeonova, N. K. Pathophysiology : textbook for students of higher medical educational institutions of the III-IV accreditation levels / N. K. Simeonova ; ed. by.: V. A. Mikhnev. – 3th ed. - Kyiv : AUS Medicine Publishing, 2017. - 544 p.
4. Ataman, O. Crash Course in Pathophysiology. Questions & Answers textbook for students of higher medical educational institutions of the III-IV accreditation levels / O. Ataman. - - Vinnytsya : Nova Knyha Publishers, 2019. - 520 p.

Additional:

1. Porth C. M. Pathophysiology: Concepts of Altered Health States. – Lippincott Williams & Wilkins; 7th Edition USA.- 2004.- 1616 p
2. Kumar V. Robbins and Cotran Pathologic Basis of Disease. V. II / V. Kumar, A. K. Abbas, J. C. Aster. - South Asia ed. - India : Elsevier, 2015. - 1391 p.
3. Hammer G.D., & McPhee S.J.(Eds.),. Pathophysiology of Disease An Introduction to Clinical Medicine [Electronic resource] / Gary D. Hammer, Stephen J. McPhee. – 8th ed. - 708 MB. - NY : McGraw Hill, 2019.
4. Mufson, Maurice A. Pathophysiology : PreTest Self-Assessment & Review / M.A. Mufson, C. A. Heck, S. M. Nesler. - 3th ed. - Chicago : Medical Publishing Division, 2004. – 480 p.

PATHOPHYSIOLOGY EXAMINATION QUESTION

General Pathophysiology

1. Nosology – the science about disease; general definitions: health, disease, pathological reaction, pathological process, pathological state. Etiology and pathogenesis: definition, classification of etiological factors, sequence of events in disease pathogenesis.
2. Disease: definition, classifications, disease stages. General principles of diseases treatment. The difference between disease and pathological process.
3. Pathogenic effect of ionizing radiation: direct and indirect radiation damage, water radiolysis, concept of radiotoxins, tissues radiosensitivity. Remote consequences of irradiation. Definition of radioprotectors.
4. Acute radiation sickness. Pathogenesis and classification of: intestinal form, toxemia form, and cerebral form. Chronic radiation sickness (etiology, pathogenesis, clinical manifestation).
5. Pathogenesis of acute radiation sickness bone marrow form by its stages (etiology, pathogenesis, clinical manifestations, laboratory findings).
6. Etiology of cell injury. Cell injury features: specific and non-specific, morphological and functional. Intracellular and intercellular mechanisms of cell adaptation to injury.
7. Etiology and pathogenesis of hypoxic injury (sequence of events, reversible and irreversible hypoxic injury, consequences). Reperfusion injury.
8. Etiology and pathogenesis of free radicals injury. Definition of free radicals, their sources, molecular mechanism of their pathogenic influence. Antioxidative substances.
9. Types of cell death: necrosis and apoptosis. The difference between them (causes, morphology, reversibility, biological value and consequences).
10. Immunological reactivity: humoral and cellular mechanisms of primary immune response. The role of monocytes and tissue macrophages in immunity. Antigen presentation.
11. Etiology and pathogenesis of primary and secondary immunodeficiency. Classification, clinical manifestation, laboratory findings, examples of diseases.
12. Classification of allergic reactions by Gell and Coombs. Etiology of allergy, types of allergens. Distinctive and common features of allergic and immune reactions.
13. Type 1 allergic reactions (anaphylactic): etiology, pathogenesis by stages, examples of diseases. Pathogenesis of anaphylactic shock
14. Type 2 allergic reactions (cytotoxic): etiology, pathogenesis by stages, examples of diseases. Mechanisms of antibody dependent cytotoxicity. Stimulating allergic reactions
15. Type 3 allergic reactions (immunocomplex): etiology, pathogenesis by stages, examples of diseases. Immune complexes pathogenic effect. Serum disease.
16. Type 4 allergic reactions (delayed hypersensitivity): etiology, pathogenesis by stages, examples of diseases. The role of lymphokines. Immune mechanisms of transplant rejection.
17. Mechanism of natural and induced immunological tolerance formation. Autoallergic diseases. Causes and mechanisms of development.
18. Arterial and venous hyperemia: definition, types, mechanisms of development, consequences.
19. Ischemia and stasis: definition, causes, types, pathogenesis, consequences. Types and mechanisms of stasis development
20. Thrombosis and embolism: definition, types. Mechanism of thrombus formation. Embolism of pulmonary and systemic blood circulation.
21. Inflammation: definition, etiology, stages. Role of reactivity, neural and hormonal factors in inflammation development. Regeneration and repair mechanisms. Biological role of inflammation.
22. Primary and secondary alteration: causes and mechanisms. Physical and chemical changes in inflammatory site. The role of alteration in pathogenesis of inflammation.
23. Inflammation mediators, their classification, mechanisms of action. Local and general signs of inflammation.
24. Local blood circulation disturbance in inflammation. Vascular reactions order under inflammation, their mechanisms and importance.
25. Exudation mechanisms in inflammation center. Causes and mechanisms of blood vessels permeability increase. Inflammatory edema pathogenesis. Exudation importance.
26. Leukocytes role in the development of inflammation. Phagocytosis importance. Mechanism of leukocytes emigration to inflammation center.
27. Inflammation classification principles. Types of exudative inflammation. Factors which determine the type of exudative inflammation. The difference between acute and chronic inflammation; their peculiarities
28. Definition of fever. Etiology and types of fever. The role of primary and secondary pyrogens in fever development.
29. Fever pathogenesis. Changes of organs' functions and metabolism in different fever stages. The difference between fever and hyperthermia. Biological importance of fever
30. Hyperthermia and hypothermia: stages, mechanism of development, clinical manifestations

31. Tumors etiology. Genes controlling cell growth (proto-oncogenes, oncogenes, anti-oncogenes). Hayflick's limit in tumor cells. Mutational and epigenetic carcinogenesis.
32. General characteristics of tumor growth. Common and distinctive feature of benign and malignant neoplasms (autonomy, structure, type of growth, influence on the host organism, cancer cachexia).
33. Anaplasia definition and types (morphological, biochemical, physical, chemical, functional). Invasion and metastasis of malignant tumor cells: mechanisms of development.
34. Stages of tumors pathogenesis.. Mechanisms of anti-tumor defense (anticarcinogenic, antimutational, anticellular). Mechanisms of tumor cells escape from immune control.
35. Hypoxia definition, classification. Etiology and pathogenesis of hypoxic hypoxia and respiratory hypoxia. Protective adaptive (urgent) and compensatory (long-term, permanent) reactions under hypoxia.
36. Hypoxia definition, classification. Etiology and pathogenesis of circulatory hypoxia and hemic hypoxia. Protective adaptive (urgent) and compensatory (long-term, permanent) reactions under hypoxia.
37. Hypoxia definition, classification. Etiology and pathogenesis of tissue hypoxia, overload and substrate hypoxia. Protective adaptive (urgent) and compensatory (long-term, permanent) reactions under hypoxia.
38. Diabetes mellitus classification. Etiology and pathogenesis of type 1 and type2 diabetes mellitus. Principles of diabetes mellitus diagnosis (fasting blood glucose level, GTT, hemoglobin A1C, urine analysis).
39. Mechanisms of diabetes mellitus clinical manifestation and development. Disturbance of carbohydrate, protein, lipid, water-electrolyte metabolism and acid-base balance in diabetes mellitus.
40. Pathogenesis of diabetic comas: hyperglycemic, hypoglycemic, hyperosmolar, hyperlactacidemic. Pathogenesis of diabetes mellitus chronic complications development.
41. Acid-base balance disorders. Gas (respiratory) acidosis and alkalosis, causes and mechanisms of development, compensation mechanisms.
42. Acid-base balance disorders. Metabolic acidosis, kinds, causes and mechanisms of development, compensation mechanisms. Metabolic alkalosis
43. Fluid balance alteration: dehydration and hyperhydration (types, reasons and mechanisms of development, consequences). Edema: definition, classification, etiology, pathogenesis of different edema types.
44. Alterations of lipid and protein metabolism. Obesity: etiology, pathogenesis, types, clinical manifestation, complications, diagnosis and treatment principles.
45. Starvation and undernutrition: etiology, pathogenesis, types, clinical manifestation by stages, complications. Medical starvation.

Pathophysiology of Organs and Systems

1. Changes of blood circulating volume: hyper- and hypovolemia. Types and causes of development. Examples of diseases.
2. Vascular-thrombocytic hemostasis in norm. Pathology of vessels and platelets hemostasis. Disturbances of blood coagulation. Syndrome of disseminated intravascular coagulation (DIC-syndrome).
3. Anemia definition, principles of classification. Common clinical features and blood count in anemia. Regenerative and degenerative forms of RBC.
4. Etiology and pathogenesis of acute and chronic posthemorrhagic anemia. Stages of development, blood count at different stages.
5. Hemolytic anemias principles of classification. Mechanisms of erythrocytes hemolysis. Acute hemolytic anemias: causes and mechanisms of development, clinical manifestation, blood count.
6. Hemolytic anemias principles of classification. Mechanisms of erythrocytes hemolysis Chronic hemolytic anemias: classification, causes and mechanisms of development, clinical manifestation, blood count.
7. Anemias caused by disturbed erythropoiesis: IDA; B12/folic acid deficiency, iron refractory anemia; hypoplastic and metaplastic anemia. Etiology, pathogenesis of clinical signs, laboratory findings.
8. Erythrocytosis definition, principles of classification. Clinical features and blood count at erythrocytosis. Mechanism of primary and secondary erythrocytosis development. Vaquez disease.
9. Leukopenia definition. Causes, mechanisms of development, importance for the organism: Neutropenia and agranulocytosis; Lymphopenia
10. Leukocytosis definition. Classification of leukocytosis. Physiological leukocytosis causes and mechanisms of development. Definition of leukocytic formula. Regenerative and degenerative forms of leukocytes.
11. Pathological leukocytosis different forms. Mechanism of eosinophilia, basophilia, lymphocytosis, and monocytosis development:
12. Pathological leukocytosis different forms. Mechanism of neutrophilia development: Definition and types of neutrophil's nuclear shift in the leukocytic formula.
13. Leukemoid reaction: definition, causes of development. Types of leukemoid reactions. the difference between leukemia and leukemoid reaction.

14. Leukemia: definition, Etiology of leukemia, stages of leukemia pathogenesis. Principles of leukemia classification. Common symptoms and signs of leukemia manifestation, mechanisms of their development.
15. Acute leukemias (AML, ALL, undifferentiated type) – clinical symptoms and signs of leukemia manifestation, mechanisms of their development and hematological characteristic.
16. Chronic leukemias (CML, CLL) – clinical symptoms and signs of leukemia manifestation, mechanisms of their development and hematological characteristic.
17. Arrhythmia: definition, principles of classification. Arrhythmias caused by disorders of heart automatism and contractility.
18. Arrhythmia: definition, principles of classification. Arrhythmias caused by conduction abnormalities and by pathology of excitability.
19. Heart failure: definition, principles of classification. Clinical manifestation of heart failure. Right-sided and left-sided heart failure. Urgent and long-term mechanisms of heart failure compensation.
20. Ischemic heart disease (stenocardia and myocardial infarction) etiology, pathogenesis, clinical manifestation, ECG-signs. Reperfusion damage of myocardial cells. Cardiogenic shock
21. Definition of arterial hypertension. Classification of arterial hypertension. Pathogenesis of essential hypertension. Signs, symptoms and complications of hypertension; general principles of treatment.
22. Definition of arterial hypertension. Classification of arterial hypertension. Pathogenesis of secondary hypertension. Signs, symptoms and complications of hypertension; general principles of treatment.
23. Arterial hypotension: types, causes, pathogenesis. Acute decrease of blood pressure. Collapse
24. Atherosclerosis definition, etiology, risk factors. Pathogenesis and clinical manifestation of atherosclerosis. The mechanisms of vessel wall injury in atherosclerosis.
25. Respiratory failure definition, classification. Intrapulmonary and extrapulmonary causes of alveolar ventilation disturbances.
26. Respiratory failure Causes and mechanisms of development disorders of blood perfusion in the lungs; mismatching of ventilation/perfusion ratio; impairment of gases diffusion in the lungs.
27. Respiratory failure definition, classification. Clinical manifestation of respiratory failure: hypoxemia and hypercapnia signs and symptoms. Pulmonary edema: mechanisms of development, signs and symptoms..
28. Short breath causes and mechanisms. Principles of classification. Cerebral dyspnoea, periodic and agonal breathing: causes and mechanisms of development.
29. Peptic ulcer disease of stomach and duodenum: etiology, pathogenesis, clinical manifestation, complications, principles of therapy.
30. Acute and chronic pancreatitis: etiology, pathogenesis, clinical symptoms, complications, principles of therapy. Pathogenesis of pancreatic shock.
31. Syndromes of liver affection. Cholemia, hepatorenal and hepatolienal syndrome: mechanisms of development, clinical and laboratory findings.
32. Jaundice: classification, mechanisms of development, clinical and laboratory findings in hemolytic jaundice; hepatic jaundice; obstructive jaundice.
33. Hepatic failure: classification, mechanisms of development, clinical and laboratory findings. Hepatic encephalopathy.
34. Portal hypertension syndrome: classification, mechanisms of development, clinical manifestation. Complications of portal hypertension syndrome: ascites, splenomegaly, portosystemic shunts.
35. Etiology and pathogenesis of glomerulonephritis. Nephrotic and nephritic syndrome: clinical and laboratory findings, mechanisms of development.
36. Acute renal failure: etiology, classification, stages of development. Pathogenesis of pre-renal, renal and post-renal failure. Clinical manifestation of renal failure
37. Chronic renal failure: etiology, pathogenesis. Uremia syndrome: etiology, pathogenesis, clinical manifestation. extra-renal manifestations (edema, renal hypertension, anemia).
38. General mechanisms of endocrine system functions disturbances. General mechanisms of increased and decreased function of endocrine glands manifestation. General principles of endocrine diseases treatment.
39. Pituitary disorders. Etiology, pathogenesis, clinical manifestations of: pathology of growth hormone secretion, panhypopituitarism. Posterior pituitary lobe disorders
40. Disturbances of thyroid gland function. Etiology, pathogenesis, clinical manifestations of hyperthyroidism and hypothyroidism. Pathology of parathyroid glands.
41. Hypofunction of adrenal cortex and adrenal medulla.. Etiology, pathogenesis, clinical manifestations of Addison's disease and secondary adrenal insufficiency.
42. Hyperfunction of adrenal cortex and adrenal medulla. Etiology, pathogenesis, clinical manifestations of adrenal virilism, Conn's syndrome, Cushing's syndrome.
43. General adaptation syndrome and stress. Stages of development. Biological role of general adaptation syndrome.
44. Disorders of moving function of the nervous system. Kinds of disorders. Peripheral and central paralysis and paresis. Myasthenia.
45. General pathogenesis of shock. Alterations of neuroendocrine regulation, central hemodynamic and microcirculation, metabolic processes. Types of shock (traumatic, hypovolemic, cardiogenic, septic, anaphylactic, burn)

PART 2

SECTION 2“BLOOD AND CVS PATHOLOGY”

RBC pathology. ESR and OER changes. Pathology of hemostasis.

1. Blood count of an athlete is as follows: erythrocytes - $5,5 \times 10^{12}/L$, Hb-180 g/L, leukocytes - $7 \times 10^9/L$, neutrophils -64%, basophils - 0,5%, eosinophils - 0,5%, monocytes - 8%, lymphocytes - 27%. First of all, such results indicate the stimulation of:
 - a. Erythropoiesis
 - b. Leukopoiesis
 - c. Lymphopoiesis
 - d. Granulocytopoiesis
 - e. Immunogenesis
2. A 3-year-old boy with pronounced hemorrhagic syndrome doesn't have antihemophilic globulin A (factor VIII) in the blood plasma. Hemostasis has been impaired at the following stage:
 - a. Internal mechanism of prothrombinase activation
 - b. External mechanism of prothrombinase activation
 - c. Conversion of prothrombin to thrombin
 - d. Conversion of fibrinogen to fibrin
 - e. Blood clot retraction
3. A tooth extraction in a patient with chronic persistent hepatitis was complicated with prolonged hemorrhage. What is the reason for the hemorrhagic syndrome?
 - a. Decrease in thrombin production
 - b. Increase in thromboplastin production
 - c. Decrease in fibrin production
 - d. Increase in fibrinogen synthesis
 - e. Fibrinolysis intensification
4. A 43-year-old-woman against the background of septic shock developed thrombocytopenia; her blood fibrinogen levels are low; fibrin degradation products appeared. The patient developed petechial hemorrhages. What is the cause of these changes?
 - a. DIC syndrome
 - b. Platelet production disorder
 - c. Autoimmune thrombocytopenia
 - d. Exogenous intoxication
 - e. Hemorrhagic diathesis
5. After a tourniquet application a patient was found to have petechial haemorrhages. The reason for it is the dysfunction of the following cells:
 - a. Platelets
 - b. Eosinophils
 - c. Monocytes
 - d. Lymphocytes
 - e. Neutrophils
6. A 12-year-old patient has been admitted to a hospital for hemarthrosis of the knee joint. From early childhood he suffers from frequent bleedings. Diagnose the boy's disease:
 - a. Hemophilia
 - b. Hemorrhagic vasculitis
 - c. Hemolytic anemia
 - d. B12 (folic acid)-deficiency anemia
 - e. Thrombocytopenic purpura
7. In a traffic accident a man suffered a trauma with massive blood loss. What changes in the peripheral blood are most likely on the 2nd day after the trauma?
 - a. Erythropenia
 - b. Hypochromia
 - c. Anisocytosis
 - d. Microcytosis
 - e. Significant reticulocytosis
8. After the prolonged vomiting a pregnant 26-year-old woman was found to have the reduced volume of circulating blood. What change in the total blood volume can be the case?
 - a. Polycythemic hypovolemia
 - b. Simple hypovolemia
 - c. Oligocythemic hypovolemia
 - d. Polycythemic hypervolemia
 - e. Oligocythemic hypervolemia
9. In a dysentery patient undergoing treatment in the contagious isolation ward, a significant increase in packed cell volume (hematocrite) has been observed (60%). What other value will be affected by this change?
 - a. Increasing blood viscosity
 - b. Increasing volume of blood circulation
 - c. Leukopenia
 - d. Thrombocytopenia
 - e. Increasing erythrocyte sedimentation rate (ESR)
10. 10 minutes after the beginning of heavy physical work a person demonstrates increase of erythrocyte number in blood from $4,0 \times 10^{12}/L$ to $4,5 \times 10^{12}/L$. What is the cause of this phenomenon?
 - a. Erythrocytes exit from depot
 - b. Suppression of erythrocyte destruction
 - c. Erythropoiesis activation
 - d. Increase of cardiac output
 - e. Water loss
11. A 60-year-old man suffering from chronic hepatitis frequently observes nasal and gingival hemorrhages, spontaneous hemorrhagic rashes on the skin and mucosa. Such presentations result from:
 - a. Decreased synthesis of prothrombin and fibrinogen
 - b. Increased blood content of aminotransferases
 - c. Decreased synthesis of serum albumins
 - d. Increased blood content of macroglobulins and cryoglobulins
 - e. Decreased blood content of cholinesterase
12. After a prolonged fasting therapy, the patient presents with decreased ratio of albumins and globulins in blood plasma. What will be the result of this changed ratio?
 - a. Decreased ESR
 - b. Increased ESR
 - c. Increased hematocrit
 - d. Hypercoagulability
 - e. Decreased hematocrit
13. A patient is diagnosed with hereditary coagulopathy that is characterized by factor VIII deficiency. Specify the phase of blood clotting during which coagulation will be disrupted in the given case:
 - a. thromboplastin formation
 - b. thrombin formation
 - c. clot retraction
 - d. fibrin formation
14. Examination of a 43 y.o. anephric patient revealed anemia symptoms. What is the cause of these symptoms?
 - a. Reduced synthesis of erythropoietins
 - b. Enhanced destruction of erythrocytes
 - c. Iron deficiency
 - d. Vitamin B12 deficiency
 - e. Folic acid deficiency
15. A 34-year-old man visits his dentist complaining of toothache. After a dental procedure that involved extraction of several teeth, he developed severe bleeding lasting more than 15 minutes. He has a history of chronic hepatitis C. Which of the following is the most likely cause of prolonged bleeding in this patient?
 - a. Hypofibrinogenemia
 - b. Hypoalbuminemia
 - c. Hypocalcemia

- d. Thrombocytopenia
16. In a car accident a man got injured and lost a lot of blood. What changes in peripheral blood are most likely to occur on the 3rd day after the injury?
- Normocythem normovolemia
 - Simple hypovolemia
 - Oligocythem hypovolemia
 - Normocythem hypovolemia
 - Oligocythem normovolemia
17. The following RBC's forms were found in patient's blood smear. Choose the regenerative forms of RBCs
- poykilocytes
 - oxyphilic normocytes
 - anisocytes
 - hypochromic RBCs
 - RBCs with Jolly's bodies
18. The following RBC's forms were found in patient's blood smear. Choose the regenerative forms of RBCs
- poykilocytes
 - anisocytes
 - ovalocytes
 - reticulocytes
 - shistocytes
19. The following degenerative forms of RBC's may be found in patient's blood smear. Which of them is largest degenerative form of RBC?
- hypochromic RBC
 - anisocyte
 - microcyte
 - megalocyte
 - RBC with Jolly bodies
20. The following RBC's forms were found in patient's blood smear. Which of them is the sign of intravascular hemolysis?
- poykilocytes
 - anisocytes
 - ovalocytes
 - reticulocytes
 - shistocytes
- 21 Patient with anemia carried out blood test for estimation of bone marrow's regeneration. Increased quantity of which cells is the evidence of erythropoiesis high rate in bone marrow?
- reticulocytes
 - pronormocytes
 - erythroblasts
 - lymphocytes
 - platelets
22. Patient has an increased ESR. Which disease increased ESR is typical for?
- nephritis
 - polycytomia
 - ascites
 - heart failure
 - cataract
23. Patient has reduced ESR. Which disease decreased ESR is typical for?
- hepatitis
 - polycytomia
 - splenomegaly
 - anemia
 - myocardial infarction
24. Patient with anemia was carried out blood test. Oxyphilic normocytes were found in blood smear. How can you describe the state of bone marrow in this case?
- hyperregeneration
 - normal regeneration
 - hyporegeneration
 - not effective erythropoiesis
 - insufficient erythropoiesis
25. Patient has hereditary hemolytic anemia - thalassemia. Which degenerative RBC forms are typical for this disease?
- polychromatophils
 - megalocytes
 - target-like erythrocytes
 - poykilocytes
 - anisocytes
26. Patient has acute thrombopenia as a result of acute platelets destruction. Which changes will be in bone marrow after one week?
- Absence of megakaryocytes
 - Reduce of megakaryocytes number
 - Reduce of megakaryoblasts
 - Absence of megakaryoblasts
 - Increased megakaryocytes number
27. Which change of blood volume will be observed in the patient with infectious diseases accompanied by severe diarrhoea and vomiting?
- simple hypovolemia
 - olygocytomic hypovolemia
 - polycytomic hypovolemia
 - olygocytomic hypervolemia
 - polycytomic hypervolemia
28. Which change of blood volume will be observed in the patient with chronic kidney's disease accompanied by renal failure?
- simple hypovolemia
 - olygocytomic hypovolemia
 - polycytomic hypovolemia
 - olygocytomic hypervolemia
 - polycytomic hypervolemia
29. Which change of blood volume will be observed in the patient with Vaquez' disease?
- simple hypovolemia
 - olygocytomic hypovolemia
 - polycytomic hypovolaemia
 - olygocytomic hypervolemia
 - polycytomic hypervolemia
30. Woman has a premature detachment of placenta and 1st phase of disseminated intravascular coagulation syndrome. Activation of which blood factor leads to this pathology?
- tissue thromboplastin
 - plasminogen
 - fibrinogen
 - Hageman's factor
 - ions of calcium
31. Megalocytes were found in patient's blood smear. Which RBCs color index is possible in this case?
- 1,4
 - 1,0
 - 0,8
 - 0,5
 - 0,2

RBC pathology. Anemia and erythrocytosis.

1. Examination of a 52-year-old female patient has revealed a decrease in the amount of red blood cells and an increase in free hemoglobin in the blood plasma (hemoglobinemia). Color index is 0,85. What type of anemia is being observed in the patient?
- Acquired hemolytic
 - Hereditary hemolytic
 - Acute hemorrhagic
 - Chronic hemorrhagic
 - Anemia due to diminished erythropoiesis

2. A patient is diagnosed with iron deficiency sideroachrestic anemia, progression of which is characterized by skin hyperpigmentation, pigmentary cirrhosis, heart and pancreas affection. Iron level in the blood serum is increased. What disorder of iron metabolism causes this disease?
- Failure to assimilate iron leading to iron accumulation in tissues
 - Excessive iron intake with food
 - Disorder of iron absorption in bowels
 - Increased iron assimilation by body
3. A 30-year-old patient's blood test revealed the following: erythrocyte count is $6 \times 10^{12}/L$, hemoglobin is 10,55 mmol/L. Vaquez's disease was diagnosed. Name the leading part of pathogenesis:
- Neoplastic erythroid hyperplasia
 - Iron-deficiency
 - B12-deficiency
 - Hypoxia
 - Acidosis
4. A 37-year-old female patient complains of headache, vertigo, troubled sleep, numbness of limbs. For the last 6 years she has been working at the gas-discharge lamp-producing factory in the lead-processing shop. Blood test findings: low hemoglobin and RBC level, serum iron concentration exceeds the norm by several times. Specify the type of anemia:
- Iron refractory anemia
 - Iron-deficiency anemia
 - Minkowsky-Shauffard disease
 - Hypoplastic anemia
 - Metaplastic anemia
5. A patient is diagnosed with chronic atrophic gastritis attended by deficiency of Castle's intrinsic factor. What type of anemia does the patient have?
- B12-deficiency anemia
 - Iron refractory anemia
 - Hemolytic anemia
 - Iron-deficiency anemia
 - Protein-deficiency anemia
6. A 15 year old girl has pale skin, glossitis, gingivitis. Blood count: erythrocytes – $3,3 \times 10^{12}/L$, hemoglobin – 70 g/L, colour index - 0,5. Examination of blood smear revealed hypochromia, microcytosis, poikilocytosis. What type of anemia is it?
- Iron-deficient
 - B12-folic acid-deficient
 - Sickle-cell
 - Hemolytic
 - Thalassemia
7. Biochemical analysis of an infant's erythrocytes revealed evident glutathioneperoxidase deficiency and low concentration of reduced glutathione. What pathological condition can develop in this infant?
- Hemolytic anemia
 - Pernicious anemia
 - Megaloblastic anemia
 - Sickleemia
 - Iron-deficiency anemia
8. A 19-year-old female patient has had low hemoglobin rate of 90-95 g/L since childhood. Blood count results obtained after hospitalization are as follows: erythrocytes - $3,2 \times 10^{12}/L$, Hb- 85 g/L, color index - 0,78; leukocytes - $5,6 \times 10^9/L$, platelets - $210 \times 10^9/L$. Smear examination revealed anisocytosis, poikilocytosis and target cells. Reticulocyte rate is 6%. Iron therapy was ineffective. What blood pathology corresponds with the described clinical presentations?
- Thalassemia
 - Enzymopathy
 - Membranopathy
 - Sickle-cell anemia
 - Favism
9. Blood test of a patient suffering from atrophic gastritis gave the following results: RBC - $2,0 \times 10^{12}/L$, Hb- 87 g/L, color index - 1,3, WBC - $4,0 \times 10^9/L$, thrombocytes - $180 \times 10^9/L$. Anemia might have been caused by the following substance deficiency:
- Vitamin B12
 - Vitamin A
 - Vitamin K
 - Iron
 - Zinc
10. On the fifth day after the acute blood loss a patient has been diagnosed with hypochromic anemia. What is the main mechanism of hypochromia development?
- Release of immature red blood cells from the bone marrow
 - Impaired iron absorption in the intestines
 - Increased destruction of red blood cells in the spleen
 - Impaired globin synthesis
 - Increased excretion of body iron
11. Degenerative changes in posterior and lateral columns of spinal cord (funicular myelosis) caused by methylmalonic acid accumulation occur in patients with B12 - deficiency anemia. This results in synthesis disruption of the following substance:
- Myelin
 - Acetylcholine
 - Norepinephrine
 - Dopamine
 - Serotonin
12. A 3-year-old child with fever was given aspirin. It resulted in intensified erythrocyte haemolysis. Hemolytic anemia might have been caused by congenital insufficiency of the following enzyme:
- Glucose 6-phosphate dehydrogenase
 - Glucose 6-phosphatase
 - Glycogen phosphorylase
 - Glycerol phosphate dehydrogenase
 - γ -glutamyltransferase
13. A patient with hypochromic anemia has splitting hair and loss of hair, increased nail brittling and taste alteration. What is the mechanism of the development of these symptoms?
- Deficiency of iron-containing enzymes
 - Deficiency of vitamin B12
 - Decreased production of parathyrin
 - Deficiency of vitamin A
 - Decreased production of thyroid hormones
14. A patient with hypochromic anemia has hair with splitted ends and suffers from hair loss. The nails are brittle. Gustatory sensations are affected. What is the mechanism of development of these symptoms?
- Iron enzymes deficiency
 - Low production of thyroid hormones
 - Low production of parathyroid hormone
 - Vitamin A deficiency
 - Vitamin B12 deficiency
15. A year after subtotal stomach resection on account of ulcer of lesser curvature the following blood changes were revealed: anemia, leukocytopenia and thrombocytopenia, color index -1,3, megaloblasts and megalocytes. What factor deficiency caused the development of thos pathology?
- Castle's factor
 - Hydrochloride acid
 - Mucin
 - Pepsin
 - Gastrin
16. As a result of an accident (snakebite) a male patient has the following blood values: Hb- 80 g/l, RBC- $3,0 \times 10^{12}/l$; WBC- $5,5 \times 10^9/l$. What type of anemia is observed in this case?
- Hemolytic

- b. Aplastic
c. Iron-deficiency
d. Folic acid-deficiency
e. Posthemorrhagic
17. Due to trauma the patient has lost 25% of circulating blood volume. Name the emergency compensatory mechanism against blood loss:
a. Restoration of blood protein composition
b. Erythropoiesis activation
c. Interstitial fluid inflow to the vessels
d. Restoration of erythrocyte number
e. Increase of reticulocyte number
18. A 68-year-old man comes to his physician with complaints of severe fatigue and altered sensations in his extremities. Past medical history is remarkable for chronic gastritis. He drinks alcohol almost every day. BP -130/80 mmHg, heart rate 95/min, respiratory rate -14/min, body T – 37,1C. Neurologic examination reveals loss of touch and vibration sense in both upper and lower limbs. Laboratory data: hemoglobin 80g/L, Mean Corpuscular Volume – 115 fL (reference range – 80-100 fL), WBC – 3,08x10⁹/L. Which of the following is the most likely diagnosis?
a. Vitamin B12 deficiency
b. Vitamin A deficiency
c. Vitamin C deficiency
d. Iron deficiency
19. A patient is diagnosed with severe B12- deficiency anemia resulting in disturbed hematopoiesis and appearance of atypical erythrocytes in the blood. The patient has a history of total gastric resection. This diagnosis can be confirmed if the following cells are present in the peripheral blood:
a. Megalocytes
b. Microcytes
c. Elliptocytes
d. Normocytes
e. Anulocytes
20. In the hospital a patient was diagnosed with anemia. During the anamnesis collection, it was revealed that the patient had been suffering from peptic ulcer disease of the stomach for several years already. What type of anemia is most likely in this patient?
a. Sickle cell anemia
b. Acquired hemolytic anemia
c. Acute posthemorrhagic anemia
d. Chronic posthemorrhagic anemia
e. Hereditary hemolytic anemia
21. A 15-year-old girl complains of rapid fatigability, weakness, and palpitations. Blood test: erythrocytes - 2.5x10¹²/L, Hb - 50 g/L, color index - 0.6, anisocytosis with the prevalence of microcytosis. Blood serum iron is 5.4 mmol. What hematologic pathology is observed in this case?
a. Acute posthemorrhagic anemia
b. B12 and folate deficiency anemia
c. Iron deficiency anemia
d. Acquired hemolytic anemia
e. Acquired absolute erythrocytosis
22. Clinical and biochemical examination of the patient revealed sickle cell anemia. Measurement of what blood component was decisive for the diagnosis in this case.
a. hemoglobin S
b. hemoglobin A1
c. methemoglobin
d. hemoglobin C
e. hemoglobin F
23. Patient A, 54 years, 5th day after surgical operation. Blood count: Erythrocytes 3,6x10¹²/L, Hemoglobin 95 g/L, Color index 0,78; Leukocytes 16x10⁹/L, Platelets 450x10⁹/L, Blood smear: single anisocytes, poikilocytosis, reticulocytes-3,8%. Which type of anemia is present in the patient?
a. acute haemolytic
b. acute posthaemorrhagic
c. chronic haemolytic
d. chronic posthemorrhagic
e. iron deficiency anemia
24. Patient A, 54 years, 5th day after surgical operation. Blood count: Erythrocytes 3,6x10¹²/L, Hemoglobin 95 g/L, Color index 0,78; Leukocytes 16x10⁹/L, Platelets 450x10⁹/L. Blood smear: single anisocytes, poikilocytosis, reticulocytes-3,8%. Which stage of anemia is present in the patient?
a. Reflex spasm of vessels
b. Interstitial fluid inflow to bloodflow
c. Erythropoiesis activation
d. Compensation of blood loss
e. Decompensation of erythropoiesis
25. Patient A, 54 years, 5th day after surgical operation. Blood count: Erythrocytes 3,6x10¹²/L, Hemoglobin 95 g/L, Color index 0,78; Leukocytes 16x10⁹/L, Platelets 450x10⁹/L. Blood smear: single anisocytes, poikilocytosis, reticulocytes-3,8%. Which alteration of circulating blood volume can be revealed in the given clinical situation?
a. Normocytic normovolemia
b. Polycytemic hypovolemia
c. Oligocytemic hypovolemia
d. Oligocytemic normovolemia
e. Simple hypovolemia
26. Patient F., 56 years arrived at clinic with stenocardia attack and suspicion of myocardial infarction. Blood count: Erythrocytes 8,5x10¹²/L Hemoglobin 170 g/L, Color index 0,6, Erythrocytes sedimentation rate 0 mm/hour. Leukocytes 23x10⁹/L, Platelets 550x10⁹/L Blood smear: hypochromic and polychromatophilic erythrocytes, anisocytosis, poikilocytosis, reticulocytes - 3,1%. What is the reason of the patient's blood count changes?
a. Bone marrow hyperplasia
b. Disturbances of blood circulation
c. Changes of coronary vessels
d. Stenocardia
e. Cardiosclerosis
27. Patient F., 56 years arrived to clinic with stenocardia attack and suspicion of myocardial infarction. Blood count: Erythrocytes 8,5x10¹²/L Hemoglobin 170 g/L, Color index 0,6 Erythrocytes sedimentation rate 0 mm/hour Leukocytes 23x10⁹/L, Platelets 550x10⁹/L Blood smear: hypochromic and polychromatophilic erythrocytes, anisocytosis, poikilocytosis, reticulocytes - 3,1%. Define the state of blood circulating volume in this patient:
a. Normocytic hypovolemia
b. Polycytemic hypovolemia
c. Oligocytemic hypervolemia
d. Oligocytemic normovolemia
e. Polycytemic hypervolemia
28. Patient F., 56 years arrived to clinic with stenocardia attack and suspicion of myocardial infarction. Blood count: Erythrocytes 8,5x10¹²/L, Hemoglobin 170 g/L, Color index 0,6, Erythrocytes sedimentation rate 0 mm/hour Leukocytes 23x10⁹/L, Platelets 550x10⁹/L Blood smear: hypochromic and polychromatophilic erythrocytes, anisocytosis, poikilocytosis, reticulocytes - 3,1%. Which from the given changes of blood indices can be the cause of problems with coronary circulation in the patient?
a. low ESR
b. low color index
c. increased blood viscosity
d. increased WBC quantity
e. poikilocytosis
29. Patient W, 27 years, laboratory assistant of X-ray cabinet. Arrived to clinic with suspicion of acute leukemia. Last month there were complaints about weakness and frequent bleedings. Blood count: Erythrocytes 1,46x10¹²/L, Hemoglobin

42 g/L, Color index 0,85, Erythrocyte's sedimentation rate 23 mm/hour; Leukocytes $3,1 \times 10^9/L$, Platelets $97 \times 10^9/L$. Blood smear: normochromic RBCs, reticulocytes - 0,01%. Estimate RBC state in the patient:

- metaplastic anemia
- hypoplastic anemia
- chronic posthaemorrhagic anemia
- norm picture of RBC
- iron deficiency anemia

30. Patient W, arrived to clinic in order to define diagnosis. He complains of weakness, dizziness, loss of appetite. Blood count: Erythrocytes $2,7 \times 10^{12}/L$, Hemoglobin 81 g/L, Color index 1,0; Leukocytes $7,5 \times 10^9/L$, Platelets $230 \times 10^9/L$. Blood smear: normochromic RBCs, microspherocytes, reticulocytes - 12%. Which type of anemia is present in the patient?

- Hereditary hemolytic
- B12 deficiency
- Chronic posthemorrhagic
- Iron deficiency
- Hypoplastic

31. Patient W, arrived to clinic in order to define diagnosis. He complains of weakness, dizziness, loss of appetite. Blood count: Erythrocytes $2,7 \times 10^{12}/L$, Hemoglobin 81 g/L, Color index 1,0; Leukocytes $7,5 \times 10^9/L$, Platelets $230 \times 10^9/L$. Blood smear: normochromic RBCs, microspherocytes, reticulocytes - 12%. Explain, what is the reason of RBCs haemolysis in peripheral blood at this clinical situation:

- defect of RBC enzyme systems
- activation of blood destruction in spleen
- alteration of haemoglobin structure
- autoimmune reaction
- pathology of RBCs membrane

32. Patient W, arrived to clinic in order to define diagnosis. He complains of weakness, dizziness, loss of appetite. Blood count: Erythrocytes $2,7 \times 10^{12}/L$, Hemoglobin 81 g/L, Color index 1,0; Leukocytes $7,5 \times 10^9/L$, Platelets $230 \times 10^9/L$. Blood smear: normochromic RBCs, microspherocytes, reticulocytes - 12%. Estimate reticulocytes amount in this patient and explain it:

- normal reticulocytes count
- high reticulocytes count due to chronic hemolysis
- high reticulocytes count due to acute hemolysis
- high reticulocytes count due to bone marrow hyperplasia
- low reticulocytes count due to problems with digestion

33. Patient G is ill with chronic obstructive pulmonary disease for 12 years. He presented with the symptoms of chronic respiratory insufficiency.. Blood count: Erythrocytes $6,0 \times 10^{12}/L$, Hemoglobin 180 g/L, Color index 0,9 Leukocytes $7 \times 10^9/L$, Platelets $200 \times 10^9/L$. blood smear: single anisocytes, reticulocytes – 3,25. Define the RBC count in this patient:

- normal RBC count
- iron deficiency anemia
- secondary erythrocytosis
- myelogenous leukemia
- primary erythrocytosis

34. Patient G is ill with chronic obstructive pulmonary disease for 12 years. He presented with the symptoms of chronic respiratory insufficiency.. Blood count: Erythrocytes $6,0 \times 10^{12}/L$, Hemoglobin 180 g/L, Color index 0,9 Leukocytes $7 \times 10^9/L$, Platelets $200 \times 10^9/L$. blood smear: single anisocytes, reticulocytes – 3,25. What is the direct reason that causes changes of RBC count in this patient:

- anisocytosis
- hypoxia
- respiratory failure
- anemia
- erythrocytosis

35. Patient X 19 years, arrived to clinic in order to define diagnosis. Blood count: Erythrocytes $5,1 \times 10^{12}/L$, Hemoglobin 140 g/L, Color index 0,82; Leukocytes $5,9 \times 10^9/L$, Platelets $220 \times 10^9/L$. Blood smear: normochromic RBCs, reticulocytes - 0,5%. Estimate RBC count in the patient?

- Absolute erythrocytosis
- No pathology
- B12-folate deficiency
- Iron deficiency anemia
- Hypoplastic anemia

36. A child 12 years, presents in the emergency room with severe chest pain. His mother reports he was doing well until he came down with a respiratory tract infection. Blood count: Erythrocytes $3,4 \times 10^{12}/L$, Hemoglobin 85 g/L, Color index 0,79; Leukocytes $5,6 \times 10^9/L$, Platelets $210 \times 10^9/L$, reticulocytes 16%. Blood smear: anizocytosis, poikilocytosis, sickle cells. What is the most likely cause of chest pain in this boy?

- chest trauma
- chest vessels occlusion with sickle cells
- respiratory tract infection
- respiratory failure development
- myocardial infarction development

37. A child 12 years, presents in the emergency room with severe chest pain. His mother reports he was doing well until he came down with a respiratory tract infection. Blood count: Erythrocytes $3,4 \times 10^{12}/L$, Hemoglobin 85 g/L, Color index 0,79; Leukocytes $5,6 \times 10^9/L$, Platelets $210 \times 10^9/L$, reticulocytes 16%. Blood smear: anizocytosis, poikilocytosis, sickle cells. Explain, what is the reason anemia in this patient:

- defect of RBC enzyme systems
- activation of blood destruction in spleen
- alteration of haemoglobin structure
- autoimmune reaction
- pathology of RBCs membrane

38. Patient arrived to a hospital with gastric bleeding. Blood count: RBCs $3,0 \times 10^{12}/L$; Hb-100 g/L; RBCs color index 1,0; reticulocytes 0,8%. Which stage of acute posthaemorrhagic anemia is such blood count typical for?

- Reflex
- Hydremic
- Erythropoiesis activation
- Latent
- Decompensation of erythropoiesis

39. Woman, 36 years, was treated by sulfonamides on the occasion of respiratory virus infection. Blood count: hyporegenerative normochromic anemia, leukopenia, thrombocytopenia. In bone marrow: decreased number of marrow stem cells. Which type of anemia is described?

- Hemolytic
- Posthemorrhagic
- B12 and folate deficiency
- Hypoplastic
- Iron deficiency

40. Patient is carrier of sickle-cell anemia. He has got pneumonia and in few days his condition was complicated with anemia due to haemolytic crisis. What is the direct cause of hemolytic crisis in this case?

- Changes in blood osmotic pressure
- Heterozygosis on Hb S
- Hereditary defect of Hb synthesis
- Hyperoxia in consequence of hyperventilation
- Hypoxia in consequence of pneumonia

WBC pathology. Leukocytosis and leukopenia.

1. A 3-year-old child has eaten some strawberries. Soon he developed a rash and itching. What was found in the child's leukogram?
 - a. Eosinophilia
 - b. Lymphocytosis
 - c. Hypolymphemia
 - d. Neutroph leukocytosis
 - e. Monocytosis
2. A 59-year-old woman has been hospitalized in a surgical ward due to exacerbation of chronic osteomyelitis of the left shin. Blood test: leukocytes - $15,0 \times 10^9/L$. Leukogram: myelocytes - 0%, metamyelocytes - 8%, stab neutrophils - 28%, segmented neutrophils - 32%, lymphocytes - 29%, monocytes - 3%. Such blood count would be called:
 - a. Regenerative left shift
 - b. Right shift
 - c. Hyperregenerative left shift
 - d. Degenerative left shift
 - e. Regenerative-degenerative left shift
3. A 26-year-old man is in the torpid shock phase as a result of a car accident. In blood: leukocytes - $3,2 \times 10^9/L$. What is the leading mechanism of leukopenia development?
 - a. Redistribution of leukocytes in bloodstream
 - b. Leukopoiesis inhibition
 - c. Disturbed going out of mature leukocytes from the marrow into the blood
 - d. Lysis of leukocytes in the blood-forming organs
 - e. Intensified elimination of leukocytes from the organism
4. After an attack of bronchial asthma a patient had his peripheral blood tested. What changes can be expected?
 - a. Eosinophilia
 - b. Leukopenia
 - c. Lymphocytosis
 - d. Thrombocytopenia
 - e. Erythrocytosis
5. A patient has been suffering from bronchial asthma for 15 years. What changes in the patient's leukogram can be expected?
 - a. Eosinophilia
 - b. Leukopenia
 - c. Leukocytosis
 - d. Left shift
 - e. Basophilia
6. As a result of a road accident a 26-year-old man is in the torpid phase of shock. Blood count: leukocytes - $3,2 \cdot 10^9/L$. What is the leading mechanism of leukopenia development?
 - a. Leukocyte redistribution in the bloodstream
 - b. Leukopoiesis inhibition
 - c. Faulty release of mature leukocytes from the bone marrow into the blood
 - d. Leukocyte destruction in the hematopoietic organs
 - e. Increased excretion of the leukocytes from the organism
7. Examination showed that total leukocyte count in the patient's blood is $11 \cdot 10^9/L$, with 80% neutrophils, among which 9% are band neutrophils. Characterize the changes in the cell composition of "white" blood in this case:
 - a. Leukopenia
 - b. Nuclear right shift of neutrophils
 - c. Neutropenia
 - d. Nuclear left shift of neutrophils
 - e. Lymphocytosis
8. 24 hours after an appendectomy the patient's blood test shows neutrophilic leukocytosis with a regenerative shift. What is the most likely mechanism of absolute leukocytosis development in the patient's peripheral blood?
 - a. Intensification of leukopoiesis
 - b. Deceleration of leukocyte migration to the tissues
 - c. Immunity activation
 - d. Leukocyte redistribution
 - e. Decreased leukocyte disintegration
9. After a severe stress of patient presents with is eosinopenia in the blood test. In this case the decreased number of eosinophils can explain changes in the level of the following hormones:
 - a. vasopressin
 - b. insulin
 - c. adrenaline
 - d. mineralocorticoids
 - e. glucocorticoids
10. Blood of a man, who 3 days ago had an acute blood loss, was studied and its leukocyte composition was determined to be as follows: leukocytes - $12,0 \times 10^9/L$, basophils - 0%, eosinophils - 35%, myelocytes - 0%, juvenile - 3%, band neutrophils - 12%, segmented neutrophils - 62%, lymphocytes - 16%, monocytes - 4%. What change in the blood leukocyte composition takes place in this case?
 - a. Absolute lymphocytopenia
 - b. Absolute monocytopenia
 - c. Neutrophilia with a degenerative left shift
 - d. Neutrophilia with a regenerative left shift
 - e. Neutrophilia with a right shift
11. A 45-year-old woman developed an acute inflammatory disease of her upper respiratory tract and eyes during the flowering period. She presents with hyperemia, edema and mucous discharge. Increase in the number of what type of leukocytes would be characteristic in this case?
 - a. monocytes
 - b. lymphocytes
 - c. basophils
 - d. neutrophils
 - e. eosinophils
12. A child was diagnosed with helminths. What changes in the peripheral blood will be observed with this pathology?
 - a. neutrophilia
 - b. lymphocytosis
 - c. eosinophilia
 - d. basophilia
 - e. monocytosis
13. Patient T., 27 years, works as a laboratory assistant of radiological department. His usual work is to do the roentgenography. Last month complains about weakness and frequent bleedings. Blood count: Erythrocytes $1,46 \times 10^{12}/L$, Hemoglobin 42 g/L, Color index 0,85; Erythrocytes sedimentation rate 23 mm/hour, Leukocytes $3,1 \times 10^9/L$, Platelets $97 \times 10^9/L$ Leukocytes count: Eosinophils -1, bands cells - 2, segmented cells - 18, lymphocytes - 68, Monocytes - 11. Blood smear: normochromic RBCs, reticulocytes - 0,1%. Estimate the state of WBC:
 - a. Leukocytosis due to monocytosis
 - b. Leukopenia due to eosinophilia
 - c. Leukopenia due to lymphocytosis
 - d. Leukopenia due to neutropenia
 - e. Normal WBC count
14. Patient A, 54 years, is admitted to the cardiological ward with acute myocardial infarction. Blood count: Erythrocytes $3,9 \times 10^{12}/L$, Hemoglobin 110 g/L, Color index 0,85 Leukocytes $23 \times 10^9/L$, Platelets $250 \times 10^9/L$. Leukocyte's count: Eosinophils -3, Basophils -1, myelocytes -1, juvenile cells -2, bands cells -8, segmented cells-64, Lymphocytes - 18, Monocytes - 3. Blood smear: normochromic RBC, reticulocytes- 1,3%. Estimate the presence of neutrophils nuclear shift in the patient:
 - a. Absence of NNS

- b. Hyperregenerative left NNS
 c. Hyporegenerative left NNS
 d. Regenerative left NNS
 e. Regenerative right NNS
15. Patient A, 54 years, is admitted to the cardiological ward with acute myocardial infarction. Blood count: Erythrocytes $3,4 \times 10^{12}/L$, Hemoglobin 110 g/L, Color index 0,85 Leukocytes $23 \times 10^9/L$, Platelets $250 \times 10^9/L$. Leukocyte's count: Eosinophils -3, Basophils -1, myelocytes -1, juvenile cells -2, bands cells -8, segmented cells-64, Lymphocytes - 18, Monocytes - 3. Blood smear: normochromic RBC, reticulocytes- 1,3%. What is the direct reason of altered WBC count in the patient?
- a. Anemia
 b. Hypoxia
 c. Infection
 d. Inflammation
 e. Thrombosis
16. Patient F., 56 years arrived at clinic with hypertensive crisis BP – 180/100 mmHg. Blood count: Erythrocytes $8,5 \times 10^{12}/L$, Hemoglobin 170 g/L, Color index 0,6, Erythrocytes sedimentation rate 0 mm/hour Leukocytes $23 \times 10^9/L$, Platelets $550 \times 10^9/L$ Blood smear: hypochromic and polychromatophilic erythrocytes, anizocytosis, poikilocytosis, reticulocytes - 3,1%. What is the direct reason of altered WBC count in the patient?
- a. Anemia
 b. Hypoxia
 c. Infection
 d. Inflammation
 e. Tumor
17. A 40-year-old man presents in the therapeutic ward with the tuberculous inflammation of the lungs. His complaints now are: cough with bloody phlegm, pain in the chest, general malaise. Blood count: Erythrocytes $4 \times 10^{12}/L$, Hemoglobin 125 g/L, Color index 0,85 Leukocytes $11,5 \times 10^9/L$. Leukocyte's count: : Eosinophils -3, Basophils -0, myelocytes - 0, juvenile cells -0, bands cells -1, segmented cells-35, Lymphocytes - 53, Monocytes - 8. Estimate the state of WBC:
- a. Leukocytosis due to monocytosis
 b. Leukopenia due to eosinophilia
 c. Leukocytosis due to lymphocytosis
 d. Leukopenia due to neutropenia
 e. Normal WBC count
18. A person taking an oral sulfonamide is found to have a markedly decreased peripheral blood neutrophil count, but the numbers of platelets and erythrocytes are normal. If the peripheral neutropenia is the result of antineutrophil antibodies being produced in response to taking the sulfonamide, then this patient would be expected to have:
- a. An atrophic spleen
 b. Decreased vitamin B12 levels
 c. Hypoplasia of the bone marrow myeloid series
 d. Hyperplasia of the bone marrow myeloid series
 e. A monoclonal large granular lymphocyte proliferation in the peripheral blood
19. The deficiency of vitamin B12 and folic acid causes serious disorders in the human body and in hemopoiesis. Describe the state of WBC count in the patient with vitamin B12 deficiency:
- a. normal count
 b. absolute leukocytosis
 c. absolute lymphocytosis
 d. physiological leukopenia
 e. absolute neutropenia
20. In a day after sport competition leukocytosis without changes in leukocytic formula was revealed in the blood count of an athlete. Choose the most probable mechanism of relative leukocytosis development in peripheral blood.
- a. Redistribution of leukocytes
 b. Increased leukopoiesis
 c. Decreased leukocytes destruction
 d. Decrease of leukocytes migration to the tissues
 e. Rapid leukopoiesis
21. Patient H., manifested with fever, vomiting and stool with blood that occurred after uncontrolled reception of non-steroid anti-inflammatory drugs . Blood count: leukocytes- $0,9 \times 10^9/L$, leukoagglutinines (anti-leukocyte's antibodies). Leukocytic formula: segmented neutrophils - 22, lymphocytes - 68, monocytes - 10. Estimate patient's blood count?
- a. leukopenia
 b. leukemia
 c. agranulocytosis
 d. normal blood count
 e. anemia
22. Patient H., manifested with fever, vomiting and stool with blood that occurred after uncontrolled reception of non-steroid anti-inflammatory drugs. Blood count: leukocytes- $0,9 \times 10^9/L$, leukoagglutinines (anti-leukocyte's antibodies). Leukocytic formula: segmented neutrophils - 22, lymphocytes - 68, monocytes - 10. What is the mechanism WBC altered count development?
- a. myelotoxic influence of NSAIDs
 b. redistribution of WBC
 c. increased spleen activity
 d. idiopathic
 e. autoimmune destruction
23. Absolute neutropenia was revealed in the patient with splenomegaly. Which probable mechanism underlies such neutropenia?
- a. Redistribution of leukocytes in vessels
 b. Output of immature leukocytes
 c. Decreased marrow's production
 d. Accelerated leukocytes destruction
 e. Decreased leukopoietines production
24. Patient arrived at the hospital for specification of the diagnosis. Blood analysis has revealed neutrophilic leukocytosis with the shift of leukocytic formula to the left. Which disease from the following can be accompanied by such changes in blood?
- a. Allergic dermatitis
 b. Lympholeukemia
 c. Bronchial asthma
 d. Iron deficiency anemia
 e. Myocardial infarction
25. The child 6 years old with diarrhoea was treated by his parents with different antibiotics without doctor's control. In a month later the blood count of this child shows decreased WBC count, decreased neutrophils count, increased lymphocytes and monocytes count. What is most probable mechanism of the given blood count changes development in the child?
- a. autoimmune destruction of neutrophils
 b. redistribution of leukocytes in the vessels
 c. myelotoxic influence of antibiotics
 d. age-specific changes
 e. increased spleen activity
26. Splenectomy was carried out in the patient with abdominal trauma. Blood analysis –leukocytosis without essential changes in leukocytic formula. What is the most probable mechanism of leukocytosis in the patient?
- a. Activation of leukopoiesis
 b. Stimulation of leukocytes exit from bone marrow
 c. Slowing of leukocytes destruction
 d. Decreased WBC migration to the tissues
 e. Physiological leukocytosis
27. The patient with atrophic gastritis had deficiency of vitamin B12. Which change of leukocytic formula is most typical for hypovitaminosis B12?
- a. Lymphocytosis
 b. Monocytosis
 c. Degenerative neutrophils nuclear shift to the left

- d. Degenerative neutrophils nuclear shift to the right
 e. Regenerative neutrophils nuclear shift to the left
28. The patient with tuberculosis was made blood count. Which changes of leukocytic formula are most typical for this pathology?

- a. Neutrophils nuclear shift to the left
 b. Lymphocytosis
 c. Neutrophils nuclear shift to the right
 d. Eosinophilia
 e. Neutrophilia

29. Patient T., 27 years, works as a laboratory assistant of radiological department. His usual work is to do the roentgenography. Last month complains about weakness and frequent bleedings. Blood count: Erythrocytes $1,46 \times 10^{12}/L$, Haemoglobin 42 g/L, Color index 0,85; Erythrocytes sedimentation rate 23 mm/hour, Leukocytes $3,1 \times 10^9/L$, Platelets $97 \times 10^9/L$, Leukocytes count: eosinophils -1%; band neutrophils - 2%; segmented neutrophils - 18%; lymphocytes - 68%, monocytes - 11%. Blood smear: normochromic RBCs, reticulocytes - 0,1%. Define the state of WBC in this case:

- a. relative lymphocytosis

- b. agranulocytosis
 c. absolute lymphocytosis
 d. absolute monocytosis
 e. relative eosinopenia

30. Patient T., 27 years, works as a laboratory assistant of radiological department. His usual work is to do the roentgenography. Last month complains about weakness and frequent bleedings. Blood count: Erythrocytes $1,46 \times 10^{12}/L$, Hemoglobin 42 g/L, Color index 0,85; Erythrocytes sedimentation rate 23 mm/hour, Leukocytes $3,1 \times 10^9/L$, Platelets $97 \times 10^9/L$ Leukocytes count: Eosinophils -1, bands cells - 2, segmented cells - 18, lymphocytes - 68, Monocytes - 11. Blood smear: normochromic RBCs, reticulocytes - 0,1%. Suppose the functional state of bone marrow in this patient using the blood count:

- a. hyperplasia
 b. normal functional state
 c. hypoplasia
 d. metaplasia
 e. dysplasia

WBC pathology. Leukemia and leukemoid reaction.

1. A 21-year-old patient complains of weakness, fever up to $38^{\circ}C - 40^{\circ}C$. Objectively: the liver and spleen are enlarged, lymph nodes on palpation are slightly enlarged, dense, painless. Blood test: Hb- 100 g/L; erythrocytes - $2,9 \times 10^{12}/L$; leukocytes - $4,4 \times 10^9/L$, platelets - $48 \times 10^9/L$, segmented neutrophils -17%, lymphocytes - 15%, blast cells - 68%. All cytochemical reactions are negative (to glycogen, peroxidase, non-specific esterase, lipids). What hematological conclusion can be made?

- a. Acute undifferentiated leukemia
 b. Acute myeloid leukemia
 c. Acute monoblastic leukemia
 d. Acute lymphoblastic leukemia
 e. Acute megakaryoblastic leukemia

2. A patient suffering from chronic myeloleukemia has got the following symptoms of anemia: decreased number of erythrocytes and low haemoglobin concentration, oxyphilic and polychromatophilic normocytes, microcytes. What is the leading pathogenetic mechanism of anemia development?

- a. Substitution of haemoblast
 b. Intravascular hemolysis of erythrocytes
 c. Deficiency of vitamin B12
 d. Reduced synthesis of erythropoietin
 e. Chronic haemorrhage

3. A 32-year-old welder complains of weakness and fever. His illness initially presented as tonsillitis one month earlier. On examination: BT- $38,9^{\circ}C$, RR- 24/min., HR- 100/min., BP- 100/70 mm Hg, hemorrhages on the legs, enlargement of the lymph nodes. CBC shows: Hb- 70 g/L, RBC- $2,2 \times 10^{12}/L$, WBC- $3,0 \times 10^9/L$ with 32% of blasts, 1% of eosinophiles, 3% of bands, 36% of segments, 20% of lymphocytes, and 8% of monocytes, ESR- 47 mm/hour. What is the cause of anemia?

- a. Acute leukemia
 b. Aplastic anemia
 c. Chronic hemolytic anemia
 d. B12-deficient anemia
 e. Chronic lympholeukemia

4. A 54-year-old man complains of general weakness, frequent colds, bruises constantly appearing on his body. Blood test: RBC - $2,5 \times 10^{12}/L$, Hb - 80 g/L, color index - 0,9; reticulocytes - absent, platelets - $50 \times 10^9/L$, WBC - $58 \times 10^9/L$. Leukogram: basocytes - 5%, eosinophils - 15%, myeloblasts - 6%, myelocytes - 10%, juvenile - 18%, stab neutrophils - 26%, segmented neutrophils - 10%, lymphocytes - 8%, monocytes - 2%. ESR- 40mm/hour. What hematologic conclusion can be made?

- a. Myeloblastic leukemia

- b. Chronic myelogenous leukemia
 c. Chronic lymphocytic leukemia
 d. Leukemoid response
 e. Basophilic eosinophilic leukocytosis

5. Hematologic study shows the following pattern: RBC - $2,8 \times 10^{12}/L$, Hb - 80 g/L, color index - 0,85; reticulocytes - 0,1%, platelets - $160 \times 10^9/L$, WBC - $60 \times 10^9/L$. Basocytes - 2%, eosinophils - 5%, promyelocytes - 5%, myelocytes - 5%, juvenile - 16%, stab neutrophils - 20%, segmented neutrophils - 34%, lymphocytes - 5%, monocytes - 5%. This clinical presentation indicates the following blood pathology:

- a. Chronic myeloleukemia
 b. Undifferentiated leukemia
 c. Acute myeloleukemia
 d. Hemolytic anemia
 e. Hypoplastic anemia

6. During clinical examination of the patient with myelogenous leukemia enlargement of liver and spleen is found. Blood analysis: anemia, thrombocytopenia, myeloblasts in peripheral blood. Find the sign which is typical ONLY for chronic myelogenous leukemia from the given:

- a. Blast cells in peripheral blood
 b. Anemia
 c. Philadelphia chromosome
 d. Pancytopenia
 e. Decreased platelets

7. Woman C., 38 years with acute sepsis. Blood count: RBC $4,1 \times 10^{12}/L$; Hemoglobin 129 g/L; Color index 0,94; WBC $36 \times 10^9/L$; Leukocytic formula: eosinophils -1%, basophils - 1%, myelocytes -4%, juvenile cell - 7%; band neutrophils -9%; segmented neutrophils - 51%; lymphocytes - 20%, monocytes - 5%. Blood smear: single promyelocytes, toxic grain in neutrophile's cytoplasm, reticulocytes - 0,9%. Which blood pathology is present?

- a. Relative neutrophilic leukocytosis
 b. Leukemoid reaction
 c. Absolute lymphopenia
 d. Chronic myeloleukemia
 e. Eosinophil-basophil association

8. It is known that enlargement of liver and spleen is a typical clinical manifestation of leukemia. Why does it happen?

- a. due to increased functional activity of these organs
 b. due to leukemic infiltration of these organs
 c. due to acute inflammation of these organs
 d. due to edema of these organs
 e. spleen and liver enlargement is not a specific symptom

9. Patient has high neutrophilia ($60 \times 10^9/L$) with shift up to promyelocytes and myeloblasts because of acute sepsis development. Which type of leukemoid reaction is present?
- lymphogenous
 - eosinophilous
 - erythromyelogenous
 - agranulocytous
 - myelogenous
10. The patient arrived to hospital with suspicion on leukemia. Which sign from listed below is diagnostic criterion of acute leukemia?
- Significant increase of leukocytes quantity
 - Spleen enlargement
 - Eosinophil-basophil association
 - Blast cells in peripheral blood
 - Development of aplastic anemia
11. The patient arrived at hospital with suspicion on leukemia. Which sign from listed below is observed in every type of leukemia?
- Significant increase of leukocytes quantity
 - Spleen hyperplasia
 - Suppression of normal hemopoiesis
 - Eosinophil-basophil association
 - Development of aplastic anemia
12. The patient arrived at hospital with suspicion on leukemia. Which sign from listed below is diagnostic criterion differentiating acute leukemia from chronic?
- Significant increase of leukocytes quantity
 - Speed of disease development
 - Eosinophil-Basophil association
 - Gumprecht's cells
 - Prevalence of blasts cells in blood
13. The patient arrived at hospital with suspicion on leukemia. Which criterion from listed below verifies chronic myelogenous leukemia?
- Gumprecht's cells
 - Speed of disease development
 - Myeloblasts prevalence in blood count
 - Eosinophil-basophil association
 - Lymphoblasts presence in blood
14. The patient arrived at hospital with suspicion on leukemia. Which criterion from listed below verifies chronic lymphogenous leukemia?
- Eosinophil-basophil association
 - Speed of disease development
 - Gumprecht's cells
 - Lymphoblasts presence in blood
 - Myeloblasts presence in blood
15. Patient S, 43 years, has CML, anemia, and decreased platelets number. What anemia from listed below accompanies leukemia?
- Hypoplastic
 - Aplastic
 - Hyperplastic
 - Metaplastic
 - Aneplastic
16. Patient K, 46 years has anemia, decreased platelets number, high leukocytosis with immature WBC forms prevalence in blood smear. What is probable diagnosis for him?
- Leukemia
 - Hypoplastic anemia
 - Hemophilia
 - Leukemoid reaction
 - Leukocytosis
17. During clinical examination of the patient with acute myelogenous leukemia enlargement of liver and spleen is found. Blood analysis: anemia, myeloblasts in peripheral blood. What is the basic distinction between acute and chronic myelogenous leukemia?
- Blast cells in peripheral blood
 - Anemia
 - Hiatus leukemicus
 - Pancytopenia
 - Decreased platelets
18. A young patient addressed a doctor with complaints of fatigue, fever up to $38^{\circ}C - 40^{\circ}C$. Objectively: the liver and spleen are enlarged, lymph nodes on palpation are slightly enlarged, dense, painless. Blood test: Hb- 100 g/L ; erythrocytes - $2,9 \times 10^{12}/L$; leukocytes - $4,4 \times 10^9/L$. Leukogram: 68% of blast cells. Cytochemical investigation of blast cells revealed negative reactions to glycogen, peroxidase, non-specific esterase, lipids. Which of the listed forms of leukemia is present in the patient?
- leukemic
 - subleukemic
 - aleukemic
 - leukopenic
19. A 32-year-old welder complains of weakness and fever. His illness initially presented as tonsillitis one month earlier. On examination: BT- $38,9^{\circ}C$, RR- $24/\text{min.}$, HR- $100/\text{min.}$, BP- $100/70\text{ mm Hg}$, hemorrhages on the legs, enlargement of the lymph nodes. CBC shows: Hb- 70 g/L , RBC- $2,2 \times 10^{12}/L$, WBC- $3,0 \times 10^9/L$ with 32% of blasts, 1% of eosinophiles, 3% of bands, 36% of segments, 20% of lymphocytes, and 8% of monocytes, ESR- 47 mm/hour . What is the cause of anemia? Which of the listed forms of leukemia is present in the patient?
- leukemic
 - subleukemic
 - aleukemic
 - leukopenic
20. Patient K., 55 years, arrived at clinic with complains about general weakness, fever, enlarged spleen and regional lymph nodes. Blood count: Erythrocytes $2,8 \times 10^{12}/L$, Hemoglobin 84 g/L , Color index 0,9, Erythrocytes sedimentation rate 30 mm/hour , Leukocytes $22 \times 10^9/L$, Platelets $142 \times 10^9/L$. Leukocyte count: eosinophils - 1%, band cells - 1%, segmented neutrophils - 22%, lymphoblasts - 3%, prolymphocytes - 9%, big lymphocytes - 13%, medium lymphocytes - 18%, small lymphocytes - 30%, monocytes - 3%. Blood smear: normochromic erythrocytes, anizocytosis, poikilocytosis, reticulocytes- 0,05%, many "lymphocyte's shadows" (Gumprecht cells). What hematologic conclusion can be made?
- Myeloblastic leukemia
 - Chronic myelogenous leukemia
 - Chronic lymphocytic leukemia
 - Lukemoid response
 - Basophilic eosinophilic leukocytosis
21. Patient K., 55 years, arrived at clinic with complains about general weakness, fever, enlarged spleen and regional lymph nodes. Blood count: Erythrocytes $2,8 \times 10^{12}/L$, Hemoglobin 84 g/L , Color index 0,9, Erythrocytes sedimentation rate 30 mm/hour , Leukocytes $22 \times 10^9/L$, Platelets $142 \times 10^9/L$. Blood smear: normochromic erythrocytes, anizocytosis, poikilocytosis, reticulocytes- 0,05%, many "lymphocyte's shadows" (Gumprecht cells). What is the mechanism of Gumprecht cells appearance in the blood smear?
- lymphocytes breakdown during smear preparation
 - due to their increased blood count
 - due to autoimmune reaction against lymphocytes
 - due to increased hemolysis
22. Patient M., 17 years. Complains of great number of subcutaneous hemorrhages and gums bleedings. Blood count: Erythrocytes $3,6 \times 10^{12}/L$, Hemoglobin 100 g/L , Color index 0,83 Erythrocytes sedimentation rate 50 mm/hour ; Leukocytes $6,5 \times 10^9/L$, Platelets $60 \times 10^9/L$. Leukocyte count: lymphoblasts - 63%, prolymphocytes - 4%, lymphocytes - 12%, band cells - 1%, segmented cells - 18%, Monocytes - 2%. Blood picture: normochromic RBCs, anizocytosis,

poikilocytosis, reticulocytes - 0,02%. What hematological conclusion can be made?

- a. Acute undifferentiated leukemia
- b. Acute myeloid leukemia
- c. Acute monoblastic leukemia
- d. Acute lymphoblastic leukemia
- e. Acute megakaryoblastic leukemia

23. Patient M., 17 years. Complains of great number of subcutaneous hemorrhages and gums bleedings. Blood count: Erythrocytes $3,6 \times 10^{12}/L$, Hemoglobin 100 g/L, Color index 0,83 Erythrocytes sedimentation rate 50 mm/hour; Leukocytes $6,5 \times 10^9/L$, Platelets $60 \times 10^9/L$. Leukocyte count: lymphoblasts - 63%, prolymphocytes - 4%, lymphocytes - 12%, band cells - 1%, segmented cells - 18%, Monocytes - 2%. Blood picture: normochromic RBCs, anisocytosis, poikilocytosis, reticulocytes - 0,02%. What is the reason of hemorrhagic syndrome manifestation in this patient?

- a. decreased platelets count due to bone marrow metaplasia

- b. decreased platelets count due to their increased use
- c. anemia development
- d. blood vessels pathology
- e. mechanical trauma of blood vessels

24. A 21-year-old patient complains of weakness, fever up to $38^{\circ}C - 40^{\circ}C$. Objectively: the liver and spleen are enlarged, lymph nodes on palpation are slightly enlarged, dense, painless. Blood test: Hb- 100 g/L; erythrocytes - $2,9 \times 10^{12}/L$; leukocytes - $4,4 \times 10^9/L$, platelets - $48 \times 10^9/L$, segmented neutrophils - 17%, lymphocytes - 15%, blast cells - 68%. All cytochemical reactions are negative (to glycogen, peroxidase, non-specific esterase, lipids). What cell the most probably is a source of blasts in the patient?

- a. erythroblast
- b. hemopoietic pluripotent cell
- c. myeloblasts
- d. lymphoblast
- e. megacaryoblast

Heart pathology. Ischemic heart disease, heart failure.

1. ECG of a 44-year-old patient shows signs of hypertrophy of both ventricles and the right atrium. The patient was diagnosed with the tricuspid valve insufficiency. What pathogenetic variant of cardiac dysfunction is usually observed in case of such insufficiency?

- a. Heart overload by volume
- b. Heart overload by resistance
- c. Primary myocardial insufficiency
- d. Coronary insufficiency
- e. Cardiac tamponade

2. Coronary artery thrombosis resulted in development of myocardial infarction. What mechanisms of cell damage are leading in this disease?

- a. Calcium
- b. Lipid
- c. Acidotic
- d. Protein
- e. Electroosmotic

3. After a serious psychoemotional stress a 48-year-old patient suddenly developed acute heart ache irradiating to the left arm. Nitroglycerine relieved pain after 10 minutes. What is the leading pathogenetic mechanism of this process development?

- a. Spasm of coronary arteries
- b. Dilatation of peripheral vessels
- c. Obstruction of coronary vessels
- d. Compression of coronary vessels
- e. Increase in myocardial oxygen consumption

4. The patient with acute myocardial infarction was given intravenously different solutions during 8 hours with medical dropper 1500 ml and oxygen intranasally. He died because of pulmonary edema. What caused the pulmonary edema?

- a. Volume overload of the left ventricle
- b. Decreased oncotic pressure due to hemodilution
- c. Allergic reaction
- d. Neurogenic reaction
- e. Inhalation of the oxygen

5. A patient with a pathology of the cardiovascular system developed edema of the lower extremities. What is the mechanism of cardiac edema development?

- a. Increased hydrostatic pressure at the venous end of the capillary
- b. Increased oncotic pressure
- c. Increased hydrostatic pressure at the arterial end of the capillary
- d. Reduced osmotic pressure
- e. Lymph efflux disorder

6. An athlete (long-distance runner) during a contest developed a case of acute cardiac insufficiency. This pathology resulted from:

- a. Cardiac volume overload
- b. Disrupted coronary circulation
- c. Direct damage to myocardium
- d. Pericardium pathology
- e. Cardiac pressure overload

7. A woman who has been suffering from marked hypertension for 15 years, has lately developed dyspnea, palpitations, slightly decreased systolic pressure, while diastolic remains the same. What is the main mechanism of heart failure development in this case?

- a. Cardiac overload due to increased vascular resistance
- b. Disorder of impulse conduction in the myocardium
- c. Damage to the myocardium
- d. Cardiac overload due to increased blood volume
- e. Dysregulation of cardiac function

8. A 59-year-old man, a business manager, developed intense burning retrosternal pain that irradiates to the left arm. The pain occurred in the evening after tax audit. 15 minutes later the patient's condition normalized. What mechanism of angina pectoris development is leading in this patient?

- a. Increased level of blood catecholamines
- b. Coronary artery atherosclerosis
- c. Intravascular aggregation of blood cells
- d. Coronary artery thrombosis
- e. Functional cardiac overload

9. One hour after the putting of the surgical clamp narrowing the aorta, the strength and frequency of heart rate significantly increased in the dog, and the volume of circulating blood and the thickness of the left ventricle wall did not differ from the baseline. What stage of myocardial hypertrophy is observed in an animal?

- a. Emergency
- b. Decompensation
- c. Progressive cardiosclerosis
- d. Relatively stable hyperfunction
- e. Completed hypertrophy

10. While modeling arterial hypertension in a dog after 1 month, the thickness of the wall of the left ventricle increased by 1.7 times, and the volume of circulating blood did not change compared with the initial data. What stage of myocardial hypertrophy is observed in an animal?

- a. Complete hypertrophy
- b. Emergency
- c. Initial
- d. Progressive cardiosclerosis

- e. Decompensation
11. A 49-year-old man has mitral stenosis. What is the leading mechanism of heart failure in this case?
- Pressure overload
 - Volume overload
 - Myocardial tension
 - Myocardial injury
 - Fluid overload
12. A woman of 25 years complains of permanent pain in the heart, shortness of breath when moving, general weakness. Objectively: skin is pale and cold, acrocyanosis. Pulse 96 in 1 minute, BP - 105/70 mm Hg. The heartline is shifted 2 cm to the left. The first tone above the top of the heart is weakened, systolic noise is auscultated. Diagnosis of mitral valve insufficiency is diagnosed. What is the reason of circulatory disorders?
- Overload of myocardium with increased blood volume
 - Overload of myocardium with increased resistance to blood outflow
 - Myocardial damage
 - Reduced volume of circulating blood
 - Increased volume of the vascular bed
13. One of the most dangerous moments in the pathogenesis of myocardial necrosis is the further increase in areas of necrosis, dystrophy and ischemia. An important role in this is to increase the consumption of oxygen by the myocardium. What substances contribute to this process?
- Catecholamines
 - Acetylcholine
 - Adenosine
 - Cholesterol
 - Ions of chlorine
14. The patient 59 years old was hospitalized in a cardiac department in a difficult condition with a diagnosis: an acute myocardial infarction in the region of the posterior wall of the left ventricle and septum, an initial pulmonary edema. What is the primary mechanism that causes the patient to develop pulmonary edema?
- Left ventricular insufficiency
 - Pulmonary venous hypertension
 - Pulmonary arterial hypertension
 - Hypoxemia
 - Reduction of alveolar-capillary oxygen diffusion
15. The patient has an increase in the resistance of the outflow of blood from the left ventricle, which led to the inclusion of the homeometric compensation mechanism. Which of the listed pathological processes may activate this compensation mechanism in the left ventricle of the heart?
- Aortic valve stenosis
 - Aortic valve deficiency
 - Mitral stenosis
 - Arterial hypotension
 - Pulmonary artery embolism
16. A 45-year-old patient complains of shortness of breath with a small physical load, swelling on the legs, in the anamnesis of frequent tonsillitis, is ill for two years. Diagnosed with insufficiency of blood circulation. What hemodynamic index of cardiac decompensation is observed in this case?
- Reduce of the minute volume of the heart.
 - Reduce of the volume of circulating blood.
 - Decreased venous pressure.
 - Increased blood pressure.
 - Tachycardia.
17. In a patient with ischemic heart disease suddenly there was a severe attack of angina pectoris. About him: face pale, wet skin, cold, blood pressure 70/50 mm Hg. Art. extrasystole. Diagnosed myocardial infarction and cardiogenic shock. What is the primary mechanism of pathogenesis?
- Decrease of the minute volume of blood
 - Extrasystoles
 - Toxemia
 - Pain syndrome
 - Hypotension
18. A man has 25 years of insufficiency of the mitral valve without disturbance of blood circulation. What immediate mechanism provides for cardiac compensation?
- Heterometric
 - Homeometric
 - Myogenic dilation
 - Decreased heart rate.
 - Strengthening the synthesis of catecholamines
19. A 65-year-old woman presents to the doctor's office with shortness of breath for 1 month. She complains of easy fatigability and is concerned of being unable to keep up with her grandchildren at the park. Over the last few weeks, she had to increase the number of pillows under her head to sleep comfortably. She denies a cough and fever. Her medical history includes hypercholesterolemia and hypertension. Vitals include blood pressure of 160/90 mm Hg, heart rate of 90/min, respiratory rate of 14/min. Physical examination reveals distended jugular veins, bilateral pitting edema of the lower limbs and fine crackles at the base of lungs. An echocardiogram reveals an ejection fraction of 40%. Which of the following is the most likely mechanism of heart failure in this patient?
- Increased afterload
 - Myocardial injury
 - Abnormal impulse conduction in myocardium
 - Abnormal regulation of heart activity
20. A 56-year-old woman is rushed to the emergency department with sudden onset of severe chest pain radiating to her left arm and jaw. She has a history of periodic chest pain for which she uses nitroglycerine sublingually but today her medication did not relieve the pain. Her blood pressure is 140/100 mm Hg, pulse - 130/min., respiratory rate - 18/min., temperature - 37°C. A bedside electrocardiogram shows ST-segment elevation in leads II, III, and aVF. Blood is drawn and sent to the lab, which is positive for specific biomarker. A diagnosis of acute inferior myocardial infarction is made, and the patient is sent to the catheterization lab for angioplasty with stent placement. Which of the following is the most likely specific and sensitive biomarker of cardiac injury?
- Troponin (cTn) I or T
 - Alanine aminotransferase (ALT)
 - Lactate dehydrogenase 5 (LDH-5)
 - Alanine aminopeptidase (AAP)
 - Lactate dehydrogenase 4 (LDH-4)
21. A 59-year-old man in a severe condition was hospitalized into the cardiology department with the following diagnosis: acute myocardial infarction in the region of the posterior wall of the left ventricle and septum, initial pulmonary edema. What mechanism of pulmonary edema development is primary in this patient?
- Hypoxemia
 - Decrease of alveolar-capillary oxygen diffusion
 - Pulmonary arterial hypertension
 - Left ventricular failure
 - Pulmonary venous hypertension
22. A 56-year-old patient with heart failure has edema of feet and shins. The skin in the edematous area is pale and cold. What is the leading link of edema pathogenesis in this patient?
- Disturbed lymph efflux
 - Increased hydrostatic pressure in the venules
 - Decreased oncotic pressure in the capillaries
 - Increased permeability of the capillaries
 - Positive fluid balance
23. The patient's blood test shows a significant increase in the activity of the MB-fraction of CPK (creatine phosphokinase) and LDH-1. What pathology can it indicate?

- a. pancreatitis
b. myocardial infarction
c. cholecystitis
d. rheumatism
e. hepatitis
24. In the patient B. acute fall of systolic blood pressure up to 60 mmHg, tachycardia - 140 bpm, short breath and loss of consciousness has developed in 2 days after heart attack. What is the main mechanism of the shock development in this case?
- a. Decrease of the minute blood volume
b. Increased excitability of myocardium
c. Decreased volume of circulating blood
d. Development of paroxysmal tachycardia
e. Development of anaphylactic reaction
25. Clinical examination of the patient with hypertension: arterial blood pressure is 180/110 mmHg, tachycardia; borders of the heart are enlarged to the left, rales in lungs. Which sign of cardiac failure urgent compensation is observed in the patient?
- a. tachycardia
b. increased blood pressure
c. cyanosis
d. short breath
e. myogenic dilatation of heart
26. Patient M., 36 years is an athlete. On an ECG - signs of the left ventricle hypertrophy. Which changes in myocardium are characteristic for physiological hypertrophy?
- a. Increased energy supply of myocardium
b. Activation of Starling mechanism in myocardium
c. Increased electric activity of the conducting system
d. Lag of skeletal muscles weight growth from the myocardium
e. Decrease of the lipid peroxidation in myocardium
27. Ultrasonic examination revealed pathological hypertrophy of the left ventricle in the patient with chronic cardiac failure. Which changes in the hypertrophied heart are observed in the patient?
- a. Increased quantity of the capillaries and the nervous fibers in the myocardium
b. Activation of the conducting system electric activity
c. Decrease of blood residual diastolic volume
d. Decrease of the myocardial cells energy supply
e. Increased blood circulation minute volume
28. Tonogenic dilatation of the left ventricle is revealed at the sportsman during planned examination. Which hemodynamic parameter characterizes tonogenic dilatation of the heart chambers?
- a. Increased stroke volume
b. Decrease of stroke volume
c. The stroke volume does not change.
d. Decreased force of contraction
e. Increased residual diastolic volume
29. Myogenic dilatation of the left ventricle was revealed in the patient with chronic cardiac failure during clinical examination. Which hemodynamic parameter characterizes myogenic dilatation of the heart chambers?
- a. Decrease of stroke volume
b. Increased heart contractility
c. Activation of Starling's mechanism
d. Increased stroke volume of heart
e. Decrease of heart automatism
30. The patient with chronic pneumonia complains of fatigue, cyanosis and edema of the extremities, pain in the liver. Which pathology from the given may cause such clinical symptoms?
- a. Chronic right ventricle failure
b. Chronic left ventricle failure
c. Liver cirrhosis
d. Myocardial infarction
e. Stenocardia
31. The patient with varicose veins after intensive physical work suddenly felt acute pain in the chest, difficulty in breathing. He quickly became cyanotic, jugular veins were distended. The embolism of pulmonary artery was suggested in the patient. Which heart pathology from the given may accompany this pathological state?
- a. Chronic right ventricle failure
b. Chronic left ventricle failure
c. Acute right ventricle failure
d. Acute left ventricle failure
e. Myocardial infarction
32. Patient is suffering from chronic renal failure for a long period. His BP is constantly elevated to 160/110 mmHg. He also complains of increased fatigue, short breath is manifested even in the period of rest. Which heart pathology from the given may accompany this pathological state?
- a. Chronic right ventricle failure
b. Chronic left ventricle failure
c. Acute right ventricle failure
d. Acute left ventricle failure
e. Myocardial infarction
33. Patient with hypertonic disease during physical or emotional loading had felt short breath and tachycardia. In a year after that pains in the right subcostal region and edema of the legs appeared. What is the probable mechanism that causes occurrence of new symptoms in the patient?
- a. Functional overload of the heart
b. Ischemic damage of the myocardial cells
c. Disturbance of heart energy supply
d. Damage of the myocardial cells enzymes
e. Disturbance of the neurohumoral heart activity regulation
34. Decompensation of heart function has developed in the patient with chronic cardiac failure after viral infection. Which hemodynamic index proves the development of decompensation?
- a. Decrease of minute blood circulating volume
b. Tachycardia
c. Decrease of blood circulating volume
d. Decrease of the central venous pressure
e. Bradycardia
35. Rales appeared in lungs and short breath developed in the patient with myocardial infarction in 2 days after heart attack. Which pathological process could develop in the patient's heart?
- a. Acute left ventricle failure
b. Acute right ventricle failure
c. Metabolic syndrome X
d. Reperfusion damage of myocardium
e. AV block
36. Physiological hypertrophy of myocardium is often developing in the sportsmen. What are the most characteristic signs of the physiological hypertrophy?
- a. Increased speed of myocardial contractility
b. Prevalence of anaerobic glycolysis in the myocardium
c. Increased volume of right ventricle muscular fibers
d. Increased volume of muscular fibers of all heart chambers
e. Increased volume of left ventricle muscular fibers
37. The patient complains of the intensive burning pain located behind the sternum irradiating to the left hand after intensive physical work. Condition of the patient was normalized in 15 minutes of rest. What is the probable mechanism of stenocardia development in the patient?
- a. Increased catecholamines' level in the blood
b. Atherosclerosis of the coronary vessels
c. Intravascular aggregation of blood cells
d. Thrombosis of the coronary vessels
e. Functional overload of the heart

38. Patient suffers from stenosis of a.pulmonalis. Cyanosis, enlargement of the liver, jugular veins distention, edema of the legs has appeared in the patient recently. On the ECG – signs of right ventricle’s failure. What is the leading pathogenic mechanism of the given symptoms’ development?

- Decreased speed of contract process in a myocardium
- Increased venous pressure in the systemic circulation
- Disturbance of diastolic fillings of atrium
- Dilatation of heart chambers
- Disturbance of the heart conducting system electric activity

39. Patient spent his summer holidays in mountains. Acute cardiac failure with acute short breath, dry cough, and tachycardia has developed during climbing on the height about 2000 m. What is the probable cause of the cardiac failure development at this patient?

- High concentration of adrenaline
- Calcium channels block
- Acute hypoxia
- Decompression syndrome
- Arterial hypertension

40. Patient suffers from hypertension for 7 years. Last year during physical and emotional loading she feels short breath, palpitation and fatigue. Lately her condition has worsened: pain in the right subcostal region, edema on the legs had been appeared. What is the most probable cause of the given symptoms development at this patient?

- Ischemic damage of myocardial cells
- Increased preload on the heart
- Disturbance of the heart neurohumoral regulation
- Activation of lipid peroxidation
- Increased heart afterload

41. Hypertrophy of left ventricle has developed in the patient who suffers from hypertonic disease. Which pathogenic mechanism causes increased volume of the myocardium during hypertrophy?

- Increased volume of the myocardial cells
- Increased quantity of the myocardial cells
- Growth of the connecting tissue in the myocardium
- Delay of water in interstitial tissue of the myocardium
- Accumulation of the lipids in the myocardial cells

42. Coronary heart disease causes feeling of pain in the patient chest. Which of the named events is the direct reason of pain in the patient with angina pectoris?

- coronary vessels spasm
- left ventricle failure
- myocardial ischemia
- local disturbance of contractility
- increased diastolic pressure in the left ventricle

43. Many heart diseases are manifested with excessive fatigue of the patient. What is the direct reason of excessive fatigue in the patients with different cardiac diseases?

- myocardial ischemia
- decreased cardiac output
- increased AP
- myocardial necrosis
- myocardial inflammation

44. Ischemic heart disease is defined as acute or chronic form of cardiac disability which results from imbalance between the myocardial supply and its demands in oxygenated blood. Which of the listed conditions results in low myocardial oxygen supply?

- exercises
- lung diseases
- pregnancy
- increased basal metabolic rate
- hypertrophy of cardiac muscle

45. A patient with acute myocardial infarction presents in the emergency department. He is given aspirin, morphine, and oxygen. Blood tests reveal elevated levels of creatin kinase and troponin. Explain why oxygen is needed for patient’s treatment in this case?

- to treat hemic hypoxia
- to treat circulatory hypoxia
- to improve heart contractility
- to improve metabolism in myocardial cells
- to prevent myocardial ischemia

46. A 40-year-old man presents in the emergency department complaining of substernal chest pain that is also felt in his left shoulder. The diagnosis is “acute myocardial infarction”. He is given aspirin, morphine, and oxygen. Why aspirin is given to the patient?

- to treat circulatory hypoxia
- to improve heart contractility
- to improve metabolism in myocardial cells
- to prevent myocardial ischemia
- to prevent thrombi formation

47. A 40-year-old man presents in the emergency department complaining of substernal chest pain that is also felt in his left shoulder. Heart rate - 98 bpm. Body temperature – 37,5 C. Blood tests reveal elevated levels of creatin kinase and troponin. Why body temperature is increased in the patient?

- due to aseptic inflammation
- due to increased basal metabolic rate
- due to increased heart rate
- due to elevated levels of creatin kinase and troponin
- due to emotional stress

Blood vessels pathology. Arterial hypertension and hypotension. Atherosclerosis.

1. A patient has been diagnosed with influenza. His condition became drastically worse after taking antipyretic drugs. His consciousness is confused, AP is 80/50mm Hg, Ps is 140/m, body temperature dropped down to 35, 8oC. What complication developed in this patient?

- Collapse
- Hyperthermia
- Hypovolemia
- Acidosis
- Alkalosis

2. A month after surgical constriction of rabbit’s renal artery the considerable increase of systematic arterial pressure was observed. What of the following regulation mechanisms caused the animal’s pressure change?

- Angiotensin-II
- Vasopressin
- Adrenaline

- Noradrenaline
- Serotonin

3. A patient with constant headaches, pain in the occipital region, tinnitus, dizziness has been admitted to the cardiology department. Objectively: AP- 180/110 mm Hg, heart rate - 95/min. Radiographically, there is a stenosis of one of the renal arteries. Hypertensive condition in this patient has been caused by the activation of the following system:

- Renin-angiotensin
- Hemostatic
- Sympathoadrenal
- Kinin
- Immune

4. A 43-year-old-patient has arterial hypertension caused by an increase in cardiac output and general peripheral resistance. Specify the variant of hemodynamic

development of arterial hypertension in the given case:

- a. Eukinetic
 - b. Hyperkinetic
 - c. Hypokinetic
 - d. Combined
5. A patient has insufficient blood supply to the kidneys, which has caused the development of pressor effect due to the constriction of arterial resistance vessels. This is the result of the vessels being greatly affected by the following substance:
- a. Angiotensin II
 - b. Angiotensinogen
 - c. Renin
 - d. Catecholamines
 - e. Norepinephrine
6. A 16-year-old girl fainted when she tried to change quickly her position from horizontal to vertical. What caused the loss of consciousness in the girl?
- a. Decreased venous return
 - b. Decreased oncotic plasma pressure
 - c. Increased arterial pressure
 - d. Increased central venous pressure
 - e. Increased venous return
7. Increased HDL levels decrease the risk of atherosclerosis. What is the mechanism of HDL anti-atherogenic action?
- a. They remove cholesterol from tissues
 - b. They supply tissues with cholesterol
 - c. They are involved in the breakdown of cholesterol
 - d. They activate the conversion of cholesterol to bile acids
 - e. They promote absorption of cholesterol in the intestine
8. The patient for 17 years suffers from chronic glomerulonephritis for 17 years. Pulse 82 per minute. BP 190/120 mm Hg. What is the primary mechanism of blood pressure increase in the patient?
- a. Increased total peripheral resistance
 - b. Increased volume of circulating blood
 - c. Increased venous tone
 - d. Increased shock volume
 - e. Increase in minute volume of blood
9. A man has 65 years of age had arterial hypertension for 15 years. Recently, systolic pressure has started to decrease, and the diastolic remains elevated. What is the hemodynamic type of hypertension in the patient?
- a. Hypokinetic.
 - b. Normokinetic.
 - c. Hyperkinetic.
 - d. Eukinetic.
 - e. -
10. In a patient with ischemic heart disease caused by atherosclerosis of the coronary arteries thrombosis of the anterior ventricular coronary artery has developed. What mechanism in the development of this complication is the most significant?
- a. Damage to the endothelium of the vascular wall
 - b. Slow speed of blood flow
 - c. Increased concentration of blood coagulants
 - d. Reducing blood anticoagulants
 - e. Reduced activity of the fibrinolytic system
11. A 14-year-old adolescent has diphtheria. During the peak of the disease against the background of acute drop in body temperature and tachycardia the blood pressure is 70/50 mmHg. What type of vascular tone disturbance is it?
- a. Acute hypotension
 - b. Somatoform autonomic dysfunction

- c. Essential hypotension
 - d. Chronic hypotension
12. A 4-year-old person developed elevated BP after an emotional excitement. What is the likely cause of this effect?
- a. Increased sympathetic nervous system tone
 - b. Increased parasympathetic nervous system tone
 - c. Arteriolar dilation
 - d. Decreased cardiac contraction frequency
 - e. Hyperpolarization of cardiomyocytes
13. In stress conditions an elderly person developed elevated blood pressure. It is caused by activation of:
- a. Sympathoadrenal system
 - b. Adrenocortical functions
 - c. Thyroid functions
 - d. Parasympathetic nucleus of the vagus nerve
 - e. Pituitary functions
14. A junior doctor that works under the physician plots a Darrow-Yannet diagram for the patient with a history of diarrhea and vomiting for 2 days. This diagram suggests a decreased extracellular fluid (ECF) volume without any change in the intracellular fluid (ICF) volume or body osmolality. The doctor assumes that the secretion of renin is most likely to be stimulated in this patient, which would consequently lead to vasoconstriction and increase in blood pressure. Which of the following hormones is most likely responsible for this patient's changes in blood pressure?
- a. Angiotensin II
 - b. Angiotensinogen
 - c. Epinephrine
 - d. Norepinephrine
15. A 24-year-old woman was hospitalized with complaints of headache, lumbar pain, face edema, and general weakness. One month ago, she had a case of tonsillitis. On admission into the hospital her blood pressure is 180/110 mm Hg. In urine: marked proteinuria, microhematuria, leukocyturia. What type of hypertension is it?
- a. Endocrine hypertension
 - b. Essential hypertension
 - c. Renal hypertension
 - d. Primary hypertension
 - e. Hypertensive disease
16. A patient has insufficient blood supply to the kidneys which has caused the development of pressor effect due to the constriction of arterial resistance vessels. This is the result of the vessels been greatly affected by the following substance
- a. renin
 - b. catecholamines
 - c. norepinephrine
 - d. angiotensinogen
 - e. angiotensin II
17. Patient P. suffers from atherosclerosis, IHD, stenocardia. Increased level of the lipids in blood plasma was revealed during laboratory examination. Which class of the plasma's lipids plays the leading role in the pathogenesis of atherosclerosis?
- a. chylomicrones
 - b. very low density lipoproteins
 - c. alpha-lipoproteins
 - d. high density lipoproteins
 - e. complexes of fat acids with albumens
18. Blood pressure was increased up to 140/110 mmHg at surgeon C. after long operation ending. Which changes of humoral regulation can increase arterial pressure in this case?
- a. Activation of aldosteron formation
 - b. Activation of rennin-angiotensin system

- c. Activation of sympathetic-adrenal system
 - d. Activation of kallikrein-kinin system
 - e. Inhibition of rennin synthesis
19. Patient complains of headache, bad appetite, blunt pain in a loin. Heart rate – 70 bpm, BP – 190/100 mmHg. Patient complains of nocturia. Blood count: Hb-96 g/l, erythrocytes-3.0 T/l. Urine analysis: protein- 3.0 g/l, leukocytes 1-3, erythrocytes 10-15. ECG examination: signs of the left ventricle hypertrophy. Which kind of the arterial hypertension is observed in the given clinical situation?
- a. Endocrine - caused by Kushing disease
 - b. Cerebroischemic - caused by disturbance of brain blood circulation
 - c. Endocrine - caused by feochromocytoma
 - d. Primary arterial hypertension
 - e. Renal - caused by glomerulonephritis
20. Patient complains of headache attacks accompanied with palpitation, feeling of fear, increased arterial pressure up to 260/160 mmHg. Between attacks blood pressure is around 180/90 mmHg. Examination: heart rate 120 bpm, BP – 250/140 mmHg. ECG – single extrasystoles. Glucose's level in the blood - 10.5 mmol/l. Urine analysis - without pathology. What kind of arterial hypertension is observed in the given clinical situation?
- a. Secondary endocrine
 - b. Cerebroischemic
 - c. Essential
 - d. Primary arterial hypertension
 - e. Renal hypertension
21. Two types of hypertension are known: primary or essential and secondary which occurs because of other diseases. Which parameter is typical for the patient with primary hypertension?
- a. Increased TPVR
 - b. Decreased TPVR
 - c. Increased heart stroke volume
 - d. Decreased heart stroke volume
 - e. Increased minute blood volume
22. A female patient 18-year-old complains of general weakness, fatigueability, depressed mood. She has asthenic type of constitution. ABP -90/60 mmHg, heart rate 68 bpm. Primary neurocirculatory arterial hypotension was diagnosed. What is the main factor of AP decreasing in the patient?
- a. Decrease of blood minute volume
 - b. Decrease of cardiac output
 - c. Decrease of resistant vessels tension
 - d. Hypovolemia
 - e. Deposition of the blood in the veins of systemic circulation
23. While climbing upstairs on the 5-th floor the patient has got an increased arterial blood pressure. The cause is the increase of:
- a. Minute volume of blood
 - b. The number of functioning capillaries
 - c. Ion content in blood plasma
 - d. Viscosity of the blood
 - e. Circulating blood volume
24. One of the most dangerous events in myocardial necrosis development is the further increase of the necrosis zone. The important role in it belongs to the increase of the oxygen consumption by myocardium. Which substance contributes to this process?
- a. Chlorine ion
 - b. Cholesterol
 - c. Catecholamine
 - d. Acetylcholine
 - e. Adenosine
25. Which substance secretion is primarily increased in the patients with secondary renal hypertension?
- a. angiotensin
 - b. aldosterone
 - c. rennin
 - d. glucocorticoids
 - e. bradykinin
26. The kidneys play an important role in vessels tone regulation. Which substance secreted by the kidneys can directly cause vessels dilation?
- a. angiotensin
 - b. aldosterone
 - c. rennin
 - d. glucocorticoids
 - e. bradykinin
27. It is known that essential hypertension is asymptomatic until the complications occur. Which of the listed complications can occur as a result of arterial hypertension?
- a. circulatory hypoxia
 - b. hemic hypoxia
 - c. myocardial hypertrophy
 - d. increased urine formation
 - e. decreased urine formation
28. Clinical manifestation of arterial hypotension includes variety of symptoms. Which of the listed complications can occur as a result of arterial hypotension?
- a. overload heart failure
 - b. myocardial hypertrophy
 - c. brain stroke
 - d. ischemic heart disease
 - e. circulatory hypoxia
29. The atherosclerotic plaque formation is the main event in atherosclerosis pathogenesis. Which of the listed blood cells take active part in atherosclerotic plaque formation?
- a. erythrocytes
 - b. monocytes
 - c. leukocytes
 - d. basophils
 - e. eosionophils
30. The atherosclerotic plaque formation is the main event in atherosclerosis pathogenesis. Accumulation of which substance inside the cells found in the atherosclerotic plaque transforms them into the “foam cells”?
- a. glucose
 - b. proteins
 - c. chilomicrones
 - d. low density lipoproteins
 - e. calcium
31. Atherosclerosis is known to be a multifactorial disease. Choose the negative risk factor of atherosclerosis (which decreases the risk of disease development) from the following:
- a. hypertension
 - b. diabetes mellitus
 - c. high level of high-density lipoproteins
 - d. high level of low-density lipoproteins
 - e. excess of alcohol consumption

LUNG PATHOLOGY. RESPIRATORY FAILURE, SHORTBREATH.

1. In the patient who suffers from cardiac failure with typical signs of brain hypoxia short breath has

- developed. Pathogenesis of which short breath is explained by decreased excitability of the respiratory center due to hypoxia?
- Periodic breath
 - Expiratory short breath
 - Inspiratory short breath
 - Frequent and deep breath
 - Mixed short breath
- 2.** Patient who suffers from stomach ulcer complains of the weakness, nausea, dizziness, noise in ears. Clinical examination: the expressed short breath and pallor of the skin. In subcostal region – there is a moderate pain. BP - 100/70 mmHg. Heart rate – 95 bpm. What is the cause of the short breath development in the patient?
- Decreased O₂ in blood
 - Increased CO₂ in blood
 - Decreased pH of blood
 - Increased pH of blood
 - Decreased CO₂ in blood
- 3.** Patient who suffers from bronchial asthma complains of frequent attacks. During the attack breath becomes difficult and is accompanied by cough. What is the leading mechanism that defines character of the short breath during bronchial asthma?
- Increased lungs tissue density
 - Braking of the respiratory center's expiratory neurons
 - Excitation of the respiratory center's inspiratory neurons
 - Difficulty of exhalation
 - Difficulty of inhalation
- 4.** The ambulance surgeon was called to the patient with expiratory short breath. Which disease can be accompanied by such disturbance of the breathing?
- Lung's fever
 - Exudative pleurisy
 - Bronchial asthma
 - Tuberculosis of lungs
 - Stenocardia
- 5.** Patient suffers from restrictive respiratory failure. Which pathology from listed below can be the cause of such type of the failure?
- Compression of bronchial ways by a tumor
 - Rib fractures
 - Bronchospasm
 - Lungs emphysema
 - Bronchitis
- 6.** Breath becomes complicated during exhalation in the patient who suffers from bronchial asthma. What is the leading mechanism which determines the character of the short breath in bronchial asthma?
- Decrease of lungs tissue elasticity
 - Inhibition of the respiratory center
 - Excitation of the respiratory center
 - Passivity of the exhalation
 - Decrease of the alveolar receptors sensitivity
- 7.** Emphysema was found in the patient during X-ray examination. Which pathogenic mechanism determines expiratory short breath at this pathology?
- Increased lungs tissue elasticity
 - Inhibition the respiratory center
 - Excitation of the respiratory center
 - Decreased sensitivity of alveolus's receptors
 - Violation of bronchi flexibility
- 8.** Patient with signs of stenotic breath was delivered to the center of extreme medicine. What is the cause of patient's breath changes?
- Narrowing of the upper respiratory ways
 - Decrease of lungs tissue elasticity
 - Occurrence of inflammatory process in lungs
 - Development of pneumothorax
 - Spasm of the bronchioles
- 9.** Patient had attack of the bronchial asthma accompanied with changes of respiratory movements frequency and change of the breath during exhalation. What kind of the short breath is often observed at this pathology?
- Stenotic breath
 - Frequent and superficial breath
 - Inspiratory short breath
 - Expiratory short breath
 - The mixed short breath
- 10.** Noisy breath is observed in the comatose patient. Characteristics: after a deep inhalation follows amplified exhalation with participation of the expiratory muscles and long pause. What is the name of this breath type?
- Kussmaul breath
 - Bioth breath
 - Cheyne-Stokes breath
 - Agonal breath
 - Stenotic breath
- 11.** Patient who suffers from diabetes during 10 years was delivered to the hospital in a heavy condition. His condition was acutely worsened for 2nd day at the hospital – coma with noisy deep breath had been developed. Characteristics of the breath: after a deep inhalation follows amplified exhalation with participation of the expiratory muscles and long pause. Which form of the breath disturbance is observed in the patient?
- Kussmaul breath
 - Stenotic breath
 - Tachipnoe
 - Cheyne-Stokes breath
 - Bioth breath
- 12.** The patient with asbestosis in 5 years has developed chronic respiratory failure due to the gases diffusion through alveolar membrane disturbance. Which concentrations of oxygen and carbon dioxide in patient's blood can you suppose?
- hypoxia and normocapnia
 - hypoxia and hypercapnia
 - hypoxia and hypocapnia
 - normoxia and normocapnia
 - normoxia and hypercapnia
- 13.** Acute respiratory failure has developed in the patient who suffers from bronchial asthma. What is the basic pathogenic mechanism of the given pathology development?
- Restrictive disturbances of lungs ventilation
 - Obstructive disturbances of lungs ventilation
 - Disturbances of lungs blood supply
 - Disturbances of surfactant's system in lungs
 - Disturbances of oxygen diffusion through membranes
- 14.** In the patient with a craniocerebral trauma breath is characterized by the respiratory movements increasing on depth and then decreasing with short pause. Which type of the periodic breath is observed in the task?
- Bioth breath
 - Kussmaul breath
 - Cheyne-Stokes breath
 - Gasping-breath
 - Apnoe
- 15.** Acute respiratory failure was developed in the patient with multiply rib's fractures. Which pathogenic mechanism explains the development of complications in this case?
- Restrictive disturbance of alveolar ventilation
 - Obstructive disturbance of alveolar ventilation
 - Disturbance of blood perfusion in lungs capillaries
 - Disregulatory disturbance of alveolar ventilation
 - Disturbance of gases diffusion through membranes

16. Patient who suffers from lungs tuberculosis for 10 years complains of the cough with bloody phlegm, weakness, short breath. Which reason from listed below caused respiration insufficiency in this case?

- decrease of functioning alveoles' quantity
- disturbances of respiratory center functions
- disturbances of airways passage
- decrease of thorax flexibility
- disturbance of thorax muscles function

17. It is known that there are cardiogenic and non-cardiogenic types of pulmonary edema. Which from the listed conditions will not be accompanied by pulmonary edema,

- Right sided heart failure
- Left sided heart failure
- Acute respiratory distress syndrome
- Excessive intravenous infusion of physiological solution
- Acute pneumonia

18. A 54-year-old man sustains third degree burns in a house fire. His respiratory rate is 30/min, arterial O₂ saturation is 50%. The most likely cause of his low oxygen saturation is

- Airway obstruction from smoke inhalation
- Carbon monoxide poisoning
- Pulmonary edema
- Fever

19. Patient was admitted to cardiological ward in a severe state with the diagnosis "myocardial infarction of the left ventricle posterior wall, starting pulmonary edema". Which mechanism causes the development of pulmonary edema in the patient?

- Pulmonary arterial hypertension
- Left ventricular failure
- Pulmonary venous hypertension
- Hypoxemia
- Decrease of alveolo-capillary diffusion of oxygen

20. Pulmonary edema developed in a patient with hypertonic crisis. Which factor determines pulmonary edema in this clinical case?

- Increase of arterial pressure
- Increased permeability of the pulmonary vessels
- Increased hydrostatic pressure in pulmonary

vessels

- Increased resistance of pulmonary vessels
- Decreased oncotic pressure of blood plasma

21. A 3 year old child developed asphyxia after inhalation of a hard candy. The breathing is regular - 20 per minute, expiratory short breath, heart rate – 40 bpm, BP 70/50 mmHg. Define the stage of asphyxia in the patient:

- 1 stage of asphyxia
- 2 stage of asphyxia
- 3 stage of asphyxia
- 4 stage of asphyxia

22. A patient with respiratory failure was examined in order to measure spirogram and lungs volumes. The following indices were obtained after examination: total lungs capacity and residual volume are increased, forced expiratory volume and forced vital capacity are decreased. Define the mechanism of respiratory failure development in this case:

- restrictive disturbances
- obstructive disturbances
- diffusion disturbances
- perfusion disturbances
- regulation disturbances

23. A patient with respiratory failure was examined in order to measure spirogram and lungs volumes. The following indices were obtained after examination: total lungs capacity, forced vital capacity and residual volume are decreased, forced expiratory volume is increased. Define the mechanism of respiratory failure development in this case:

- restrictive disturbances
- obstructive disturbances
- diffusion disturbances
- perfusion disturbances
- regulation disturbances

24. A 3 year old child developed asphyxia after inhalation of a hard candy. The frequency of breathing is 56 per minute, inspiratory short breath, heart rate – 135 bpm, BP 140/100 mmHg. Define the stage of asphyxia in the patient:

- 1 stage of asphyxia
- 2 stage of asphyxia
- 3 stage of asphyxia
- 4 stage of asphyxia

PATHOLOGY OF GASTRO-INTESTINAL TRACT

1. Signs of the food poisoning are observed at patient. Chemical analysis of the food's rests has shown presence of nitrites. What is the most specific mechanism of the nitrites poisoning?

- Blocking enzymes of the respiratory circuit
- Toxic damage of the respiratory center
- Disturbance of the myocardium contractive functions

- Damage of the digestive mucous tunic
- Inactivation of the hemoglobin in erythrocytes

2. Signs of steatorrhea and avitaminosis of fat-soluble vitamins are observed in the patient. What enzyme's deficiency is most frequently reason of fats digestion disturbances in the gastrointestinal tract and increase of neutral fat's quantity in the faeces?

- Pancreatic lipase
- Gastric lipase
- Intestinal lipase
- Hepatic lipase
- Enterokinase

3. Patient with duodenal ulcer complains of stable weight loss. Examination: atrophy of the intestine's membrane, in faeces –increased amount of not digested food. What is the most probable mechanism of the patient's exhaustion in the given clinical situation?

- Disturbance of digestion in a stomach

- Disturbance of nutrients absorption
- Increased proteins catabolism
- Disturbance of digestion in the large intestine
- Insufficient receipt of plastic substances

4. Patient E. with pneumonia was treated with antibiotics last two weeks. Now he complains about rumble in the stomach, frequent diarrhea with a specific smell. What is the probable mechanism of these disturbances?

- Toxic action of antibiotics on the mucous membrane
- Development of cytotoxic immune reaction
- Development of intestines' dysbacteriosis
- Action of bacterial toxins on the mucous membrane
- Hereditary defect of mucous membrane's enzymes

5. Increased production of glucocorticoids is revealed in the patient. She complains of pain in subcostal region, heartburn. Hyperacidity was found during fractional sounding of the stomach. What is the probable mechanism of such hyperacid state development?

- Stimulation of the pepsin secretion only
- Stimulation of the hydrochloric acid secretion only
- Stimulation of the parietal cells proliferation
- Stimulation of the pepsin and hydrochloric acid secretion
- Stimulation of main cells proliferation

6. Patient who suffers from rheumatic polyarthritis was treated by aspirin and prednisolon for a long time. Now he complains of pain in the stomach, nausea, flatulence. Gastrosocopia examination- erosion (0.5cm x 0.5 cm) of the stomach's mucosa was found. What is the most probable cause of defect formation?

- Development of cytotoxic immune reaction
- Development of the dysbacteriosis
- Age changes of the mucous membrane
- Ulcer action of the *Helicobacter pylori*
- Treatment with NSAIDs

7. Patient L. who professionally contacting with lead, complains of weakness, dryness of the skin, increased frailness of nails. Blood count: hypoglycemia, hypochromic anemia. Examination: atrophic changes of the small intestine's mucosa. What is the name of this phenomenon?

- Malabsorption syndrome
- Disturbance of stomach digestion
- Formation of a stomach tumor
- Development of leukemia
- Insufficient exogenous receipt of nutrients

8. At the child of 5 years swelling of the stomach, spastic pain and diarrhea are happened after milk taking. What enzyme's lack causes these symptoms?

- glucose-metabolizing enzymes
- lactose-metabolizing enzymes
- maltose- metabolizing enzymes
- saccharose- metabolizing enzymes
- fructose- metabolizing enzymes

9. Patient 50 years old complains of bad appetite, weight loss, weakness, pain in the field of the stomach and eructation. Laboratory examination: Hb 90 g/l, erythrocytes 2,0T/l, erythrocyte color index 1,4; gastric secretion 0,4 l, pH gastric juice - 7,0. B₁₂-deficiency anemia was diagnosed. What substance's deficiency is the cause of anemia in this patient?

- pepsin
- renin
- secretin
- intrinsic factor
- hydrochloric acid

10. In the patient with chronic cholecystitis light-colored feces and drops of the neutral fat in feces are found. What is the most probable cause of these disturbances?

- Decrease of intestinal juice secretion
- Increased acidity of gastric juice
- Activation of absorption in intestines
- Increased secretion of pancreatic juice
- Decrease of bile entry into intestines

11. De-nol and metronidazole are prescribed for the man of 42 years who suffers from duodenal and stomach ulcer. Therapy appeared effective. What is the mechanism of these medicines' high efficiency?

- Depression of *Helicobacter pylori*
- Decrease of the intestines pathogenic flora influence
- Improvement of microcirculation
- Stimulation of duodenum mucosa's resistance
- Stimulation of prostaglandins' synthesis

12. Which factor from the given is the most potentially lethal for the patient with intestinal obstruction?

- bowel distension
- loss of fluid
- electrolyte disorders
- absolute constipation
- production of endotoxins by anaerobes

13. Which substance from the listed is not playing role in the development of intestinal autointoxication?

- ethanol
- hydrogen sulphide
- skatole

- indole
- phenol

14. Patient was treated by aspirin and prednisolon for a long time. Now he complains of pain in the stomach, nausea, flatulence. Gastrosocopia found erosion of the stomach's mucosa. What is the most probable cause of defect formation?

- Increased bloodflow in the stomach
- Enhanced mucus secretion
- Decreased HCl secretion
- Increased HCl secretion
- Decreased secretion of prostoglandines

15. Prostoglandins play an important role in protecting the gastrointestinal mucosa from injury. Which from the named effects IS NOT caused by prostoglandins?

- increased bloodflow in stomach
- decreased bloodflow in stomach
- increased bicarbonate ion secretion
- enhanced mucus production

16. What is the result of *Helicobacter pylori* action on the mucosal layer of stomach and duodenum?

- increase pepsin secretion
- increase HCl secretion
- increase bicarbonate secretion
- increase bicarbonate secretion
- decrease bloodflow in the stomach

17. Which pathological process underlies the mechanism of chronic gastritis type A development?

- decrease of HCl secretion
- decrease of prostoglandins formation
- production of autoantibodies to parietal cells
- production of autoantibodies to epithelial cells
- production of autoantibodies to gastrin-producing cells

18. Which pathological process underlies the mechanism of chronic gastritis type C development?

- production of autoantibodies to parietal cells
- reflux of duodenal contents and bile into the stomach
- Helicobacter pylori* infection
- environmental influences
- decreased parietal cells function

19. Gastric intubation was done to the patient with stomach discomfort. The following results were obtained: volume of fasting secretion 47 ml, general acidity of basal secretion 50, pepsin content in stimulated secretion 45 . Describe the state of gastric secretion in the patient.

- neutral acidity
- increased acidity
- normal acidity
- decreased acidity
- alkaline reaction of acidity

20. Gastric intubation was done to the patient with stomach discomfort. The following results were obtained: volume of fasting secretion 69 ml, general acidity of basal secretion 74, pepsin content in stimulated secretion 49 . Describe the state of gastric secretion in the patient.

- neutral acidity
- increased acidity
- normal acidity
- decreased acidity
- alkaline reaction of acidity

21. Gastric intubation was done to the patient with stomach discomfort. The following results were obtained: volume of fasting secretion 10 ml, general acidity of basal secretion 0 units, pepsin content in stimulated secretion 7 units . Describe the state of gastric secretion in the patient.

- neutral acidity
- increased acidity
- normal acidity
- decreased acidity
- alkaline reaction of acidity

22. A 54-year-old male alcoholic presents with the sudden onset of severe, constant epigastric pain that radiates to his midback. Further evaluation finds fever, steatorrhea, and discoloration around his flank and umbilicus. Laboratory tests find elevated serum levels of amylase and lipase. What is the most likely cause of these findings?

- a. acute appendicitis
- b. acute cholangitis
- c. acute cholecystitis
- d. acute diverticulitis
- e. acute pancreatitis

LIVER PATHOLOGY

23. Patient G. was delivered into resuscitation department with poisoning. His condition is heavy, patient unconscious, has weak pulse about 40 bpm, BP 75/40 mmHg. Examination - Bioth type periodic breath. Blood count: decreased protein's level (16 g/l), conjugated bilirubin - 155 mkmol/l. Urine analysis: high amount of ammonia and conjugated bilirubin. What is the basic pathogenic mechanism of the patient's state?

- a. Cardiac shock
- b. Hepatic failure
- c. Respiratory failure
- d. Cardiac failure
- e. Renal failure

24. In the patient with a jaundice it is revealed: increased non-conjugated bilirubin plasma level, conjugated bilirubin level within the limits of norm, in faeces - the high maintenance of stercobilin, in urine increased level of urobilin. What is the reason of such changes?

- a. Damage of hepatocytes
- b. Lack of enzymes
- c. Erythrocytes increased hemolysis
- d. Disturbance of bile outflow
- e. Functional failure of hepatocytes

25. The jaundice was marked in the newborn from 3rd to 10th day of a life. The general condition is satisfactory. A maximum level of bilirubin in blood during this period - 102 mkmol/l, 8,2 mkmol/l due to conjugated bilirubin. What condition development is most probable at this baby?

- a. Fetal hepatitis
- b. Hemolytic illness of newborns
- c. Hereditary hemolytic microspherocytic anemia
- d. Physiological jaundice
- e. Atresia of bile vessels

26. The teenager 12 years old, complains of periodically appearing weakness, dizziness, pains in left subcostal region. Skin and mucous membranes are icteric. A tower skull and liver and spleen enlargement are observed. In blood: erythrocytes-2,7 T/l, Hb-88 g/l, leukocytes-5,6 G/l, ESR -15mm/hour. What most probable bilirubin level change can be observed in this patient?

- a. Increased non-conjugated and conjugated bilirubin
- b. Increased conjugated bilirubin
- c. Decreased free bilirubin
- d. Decreased the connected bilirubin
- e. Increased non-conjugated bilirubin

27. Patient D., 38 years. During 5 years suffers from chronic cholecystitis. 2 day ago after disturbances in a feed the pain in the right subcostal region has appeared. For 3 day icteric coloring of skin and sclera's had appeared. In blood: 35 mkmol/l of non-conjugated bilirubin and 147 mkmol/l of conjugated bilirubin. Urine is dark colored, faeces colorless. What caused dark coloring of urine in this case?

- a. Increased conjugated bilirubin
- b. Increased non-conjugated bilirubin
- c. Increase if urobilin
- d. Presence of bile acids
- e. Decrease of stercobilin allocation with faeces

28. Patient A., 12 years, complain about nausea, vomiting, a skin itch. He was ill 8 days ago. Clinical examination: scleras and skin are icteric, the liver and a spleen are enlarged. Bilirubin plasma level- 76 mkmol/l (non-conjugated - 20,5 mkmol/l). At urine are present conjugated

bilirubin and urobilin. Faeces- colorless. What is the possible reason of a skin itch at the given type of jaundice?

- a. Increased blood cholesterol level
- b. Increased blood conjugated bilirubin level
- c. Increased blood non-conjugated bilirubin level
- d. Increased blood bile acids level
- e. Increased blood erythrocytes disintegration products level

29. Patient E., 39 years. Disease has developed acutely, after cooling. Acute weakness, short breath, short-term loss of consciousness, moderate icteric skin and scleras have suddenly appeared. Laboratory data: non-conjugated bilirubin of plasma-70 mkmol/l. Urine and faeces contains increased quantity of urobilin and stercobilin. Bilirubin in urine is not defined. What is the most probable mechanism of short breath development and loss of consciousness in the patient?

- a. Toxic action of conjugated bilirubin on CNS
- b. Toxic action of bile acids on CNS
- c. Toxic action of microorganisms on CNS
- d. Toxic action of urobilinogen on CNS
- e. Toxic action of non-conjugated bilirubin on CNS

30. Patient H., 46 years, complain about appetite absence, nausea, pains in the right subcostal region, that are increased after fat food, icteric scleras, dark color of urine. In plasma of blood: non-conjugated bilirubin - 50 mkmol/l and conjugated bilirubin - 71,8 mkmol/l. In urine conjugated bilirubin and urobilin in a plenty is defined. Explain absence of non-conjugated bilirubin in urine?

- a. Impossibility of its filtration in primary urine
- b. Increased inactivation of it by macrophages
- c. Decreased conjugation of it in hepatocytes
- d. Conjugation of bilirubin with blood albumens
- e. Conjugation of bilirubin with immune complexes

31. In a ward there is a patient with an attack of a chronic cholecystitis. He complains of itch and the yellowness of skin, plural small pointed hemorrhages. At laboratory research it is revealed expressed steatorrhea, decreased parameters of blood coagulation. What is pathogenic connection between steatorrhea and development of hemorrhages:

- a. Disturbance of vit A absorption
- b. Disturbance of vit K absorption
- c. Disturbance of vit C absorption
- d. Disturbance of vit B12 absorption
- e. Disturbance of vit B6 absorption

32. Patient C., is treated in the clinic with diagnosis chronic hepatitis complicated by liver cirrhosis. The patient is weak, complaints about appetite loss and waste of weight. His skin is dry and pale with yellow tint and small hemorrhages. His belly is enlarged because of ascites. Subcutaneous veins are enlarged and well seen on the skin of belly. Concentration of proteins in the blood is lower than normal. What pathological condition has developed in the patient?

- a. Inflammation of mesenteries vessels
- b. DIC-syndrome (phase of hypocoagulation)
- c. Portal hypertension syndrome
- d. Hemophilia
- e. Cholemia syndrome

33. At patient P., 25 years, the diagnosis of a chronic hepatitis is established. The patient complains of loss of weight (10 kg during 2 months), pallor of a skin with a yellow shade, small pointed haemorrhages on a skin, gum bleeding.

Disturbance of which liver function results in skin haemorrhages and gum bleeding?

- Chromogenic
- Synthesis of glycogen
- Detoxification
- Synthesis of albumens
- Deposition of substances

34. Patient T., 47 years, develops quickly increasing jaundice. Blood contains 82 $\mu\text{mol/l}$ conjugated bilirubin. In urine – great amount of bilirubin, faeces are non-colored. What type of a jaundice is present at this patient?

- Hepatic jaundice (cholestatic stage)
- Acquired hemolytic (prehepatic) jaundice
- Parenchymatous (hepatic) jaundice (necrotic stage)
- Mechanical (posthepatic) jaundice
- Hereditary hemolytic jaundice

35. Patient K. arrived to clinic with complaints about general weakness, pain in left subcostal region. Icteric skin had appeared in her from the childhood. Three months ago jaundice has strengthened and pains in liver region appeared. Blood analysis showed increased level of non-conjugated bilirubin, urine and faeces are darkly colored. What type of jaundice is present in this patient?

- Hepatic jaundice (cholestatic stage)
- Acquired hemolytic (prehepatic) jaundice
- Parenchymatous (hepatic) jaundice (necrotic stage)
- Mechanical (posthepatic) jaundice
- Hereditary hemolytic jaundice

36. In the patient with jaundice irritability, a headache, insomnia is marked. Objectively: heart rate - 54 bpm, BP - 90/60 mmHg, blood coagulation is decreased. What substance increased level leads to described symptoms?

- Bile acids
- Bilirubin
- Cholesterol
- Bile pigments
- Fat acids

37. In the patient with acholia low heart rate (60 bpm) was found during clinical examination. What bile component can cause this phenomenon?

- Bile acids
- Cholesterol
- Bile pigments
- Fat acids
- Bilirubin

38. Patient D., 22 years, complains of fever, general weakness and jaundice. The doctor diagnosed viral hepatitis. What blood analysis is necessary for proving hepatic cells acute damage?

- Conjugated and non-conjugated bilirubin
- Activity of aminotransferase enzymes
- Concentration of urobilin
- Cholesterol and bile acids
- Proteins fractions

39. Patient with yellowish discoloration of the skin was examined by the physician. The signs of cholemia were found during examination. Which type of jaundice is usually accompanied by cholestasis and cholemia syndrome?

- prehepatic
- intrahepatic
- mechanical
- neonatal
- hemolytic

40. It is known that jaundice may manifest with the changes in urine and feces coloring. Which pigment will give the dark color of urine in the case of posthepatic jaundice?

- conjugated bilirubin
- non-conjugated bilirubin
- urobilin
- stercobilin

e. hemoglobin

41. It is known that jaundice may manifest with the changes in urine and feces coloring. Which pigment will give the dark color of urine in the case of prehepatic jaundice?

- conjugated bilirubin
- non-conjugated bilirubin
- urobilin
- urobilinogen
- hemoglobin

42. Mechanical jaundice usually results from biliary obstruction is accompanied by acholia and cholemia. Choose the consequence of acholia in the patient from the following:

- increased motility of intestines
- increased absorption of A, D E , K vitamins
- increased absorption of B1, B2, C vitamins
- intestinal autointoxication
- inhibition of proteins putrefaction in intestines

43. Hepatic failure is a serious disorder because liver functions of detoxication, proteins synthesis and others are impaired. The patient with liver failure is usually prescribed a strict diet. Excessive intake of which nutrients may worsen hepatic failure and may lead to hepatic encephalopathy?

- carbohydrates
- lipids
- proteins
- water
- sodium chloride

44. Jaundice is not a disease itself; it is a syndrome of liver affection. Jaundice may accompany many of liver diseases. Which type of jaundice may be accompanied with the appearance of hepatic enzymes (transaminase) in the peripheral blood?

- hemolytic
- intrahepatic
- neonatal
- enzymopathic
- mechanical

45. Hepatic encephalopathy refers to the totality of central nervous system manifestations of liver failure. Which substance is directly causing CNS disorders which occur in the course of hepatic failure?

- ammonia
- urea
- conjugated bilirubin
- non-conjugated bilirubin
- bile acids

46. Portal hypertension is classified into pre-hepatic, intra-hepatic and post hepatic forms due to the level of venous obstruction. Choose the reason of posthepatic portal hypertension from the following:

- liver cirrhosis
- portal vein thrombosis
- hypovolemia
- left-sided heart failure
- right-sided heart failure

47. It is known that portal hypertension may be complicated with ascites. Choose the factor which IS NOT taking part in this case of ascites development:

- obstruction of venous flow through the liver
- salt and water retention by the kidney
- increased salt intake
- decreased blood colloidal pressure
- impaired synthesis of albumens in the liver

48. Mechanical jaundice usually results from biliary obstruction is accompanied by acholia and cholemia. Explain the mechanism of bradycardia which occurs in the patient with cholemia. It happens due to...

- influence of bile acids on SA node
- activation of sympathetic activity
- His bundle branch block

- d. re-entry phenomenon
- e. influence of bilirubin on SA node

49. A 62-year-old male with hepatic failure secondary to cirrhosis develops a pungent odor in his breath (fetor hepaticus). He is also noted to have marked ascites, gynecomastia, asterixis, and palmar erythema. His serum

ammonia levels are found to be elevated. This patient's gynecomastia is the result of

- a. Decreased synthesis of albumin
- b. Defective metabolism of the urea cycle
- c. Deranged bilirubin metabolism
- d. Impaired estrogen metabolism
- e. The formation of mercaptans in the gut

KIDNEY PATHOLOGY

1. Patient R. urine analysis: urine specific gravity 1,034-1,050; daily diuresis 3,8 L. Characterize daily diuresis at the patient.

- a. Oliguria
- b. Hypostenuria
- c. Disuria
- d. Polyuria
- e. Normal diuresis

2. Patient R., urine analysis: color - light yellow, transparent, acid reaction, traces of protein. Urine microscopy: single epithelium cells, leukocytes - 0-2, erythrocytes - 0-1 in the field of vision. Name the cause of protein presence in urine:

- a. Damage of glomerular capillaries basal membrane
- b. Normal processes of a filtration
- c. Damage of tubules
- d. Excessive consumption of proteins with food

3. Patient S., urine analysis: color - light yellow, transparent, acid reaction, traces of protein, glucose-10 g/L. Presence of glucosuria probably testifies about:

- a. Increased glucose concentration in blood
- b. Normal function of kidneys
- c. Disturbance of glomerular capillaries basal membrane permeability
- d. Increased filtration ability of kidneys
- e. Secretion of glucose in renal tubules

4. Patient T., urine analysis: specific gravity 1,034-1,050; daily diuresis 3,8 L. At the analysis of urine it is revealed: protein - traces, glucose - 10 g/L. Nitrogen of blood - 15,2 mmole/L. Name the cause of specific gravity increase:

- a. Presence of protein traces in urine
- b. Change of daily diuresis
- c. Increased filtration ability of kidneys
- d. Presence of glucose in urine
- e. Increased residual nitrogen in blood

5. Patient U. urine analysis: specific gravity 1,003-1,010; daily diuresis 6,8 L. Urine is of yellow color, transparent, subacidic reaction, protein is absent, glucose is absent. What is the reason of decreased urine specific gravity in the given clinical situation?

- a. Increased filtration ability of kidneys
- b. Increased daily diuresis
- c. The increased consumption of water
- d. Absence of protein and glucose in urine
- e. Decreased kidney's reabsorbing ability

6. Patient K., 23 years. A month after flu began to complain of constant thirst, often and abundant urination, insomnia. Urine analysis: urine specific gravity 1,003-1,010; daily diuresis 6,200 L, pathological components of urine are not revealed. What is the most probable mechanism that had led to poliuria at the patient?

- a. Increased glomerular capillaries basal membrane permeability
- b. Decreased vasopressin secretion
- c. Increased daily consumption of water
- d. Injury of kidneys tubules
- e. Inflammation of urinary bladder

7. Patient M., 16 years, was delivered to the hospital in the hard shock condition. ABP - 80/60 mmHg. Daily diuresis 60-80 ml. Urine analysis: protein - 0,66 g/L, specific gravity 1,029. Estimate patient's diuresis:

- a. polyuria
- b. oliguria

- c. disuria
- d. anuria
- e. hypostenuria

8. Patient M., 16 years, was delivered to the hospital in the extremely shock condition after car accident. There are plural fractures of both legs. ABP - 80/60 mmHg. Daily diuresis 60-80 ml. What is the mechanism of decreased diuresis at this patient?

- a. decreased hydrostatic pressure in capillaries of glomerules
- b. increased colloid-osmotic pressure in capillaries of glomerules
- c. increased pressure of primary urine in Bowman's capsule
- d. increased concentration of vasopressin in blood
- e. traumatic violation of urinary bladder innervation

9. Patient M., 16 years, delivered in the hospital in the shock condition. ABP - 80/60 mmHg. Daily diuresis 60-80 ml. Urine analysis: protein - 0,66 g/L, urine specific gravity 1,029. Residual blood nitrogen - 120 mmol/L; blood urea - 35 mmol/L. What is the mechanism of azotemia in the patient?

- a. decreased glomerular filtration rate in kidneys
- b. violation of urea secretion in kidneys
- c. violation of protein metabolism in liver
- d. increased catabolism of proteins in the damaged tissues
- e. increased reabsorption in kidneys

10. Patient M., 16 years, with craniocerebral trauma was delivered to the hospital in the shock condition. ABP - 80/60 mmHg. Excretes 60-80 ml of urine for a day. In urine: protein - 0,66 g/L, urine specific gravity 1,029. What is the most possible cause of development of proteinuria at patient?

- a. ischemic affection of kidneys
- b. traumatic affection of kidneys
- c. inflammatory affection of kidneys
- d. inflammatory affection of urinary bladder
- e. traumatic affection of urinary bladder

11. In the analysis of urine of patient K., 3 years, is glycosuria, diurnal excretion of glucose with urine is 1,2 g, degree of glycosuria is the same in day and night portions of urine; glucose of blood - 3 mmol/L, glycemic line at sugar loading or injection of insulin is normal. What is the cause of glycosuria at patient?

- a. excess of glucose in blood concentration
- b. increased filtration of glucose in kidneys
- c. deficiency of enzyme glucose transport systems in the tubules
- d. high income of glucose with food
- e. violation of glucose consumption by tissues

12. Patient K., 3 years, complaints about quick fatiguability, constant hunger, high thirst. There are no objective changes in the internal organs. Urine analysis: urine specific gravity 1,020 - 1,038 at daily diuresis 3,0 l. Diurnal excretion of glucose with urine is 1,2 g. What pathogenetic mechanism caused changes of diurnal diuresis at patient?

- a. increased hydrostatic pressure in capillaries of glomerules
- b. decreased colloid-osmotic pressure in capillaries of glomerules
- c. decreased hydrostatic pressure in Bowman capsule
- d. increased osmotic pressure of urine
- e. decreased secretion of vasopressin in blood

13. Patient A., 38 years, at 3-d year of disease of systemic lupus erythematosus it is revealed diffuse affection of kidneys, with massive edema, expressed proteinuria. What has caused the development of proteinuria at a patient?

- a. inflammatory affection of kidneys
- b. ischemic affection of kidneys
- c. autoimmune affection of kidneys
- d. inflammatory affection of urinary bladder
- e. inflammatory affection of urinary tracts

14. Patient A., 38 years, at 3-d year of disease of systemic lupus erythematosus revealed diffuse affection of kidneys, with massive edema, expressed proteinuria, hyperlipidemia, disproteinemia. Which mechanism of proteinuria development is the most possible at the patient?

- a. violation of proteins reabsorption in tubules
- b. diffuse kidneys parenchyma destruction
- c. increased concentration of proteins in the urinary tracts
- d. increased permeability of Bowman's capsule basal membrane
- e. excess of blood proteins amount

15. Patient A., 38 years, at 3-d year of disease of systemic lupus erythematosus revealed diffuse affection of kidneys, with massive edema, expressed proteinuria, hyperlipidemia, disproteinemia. Suppose the possible changes in blood protein content in this patient. There will be ...

- a. increased concentration of albumins in blood
- b. decreased concentration of proteins in blood
- c. increased concentration of globulins in blood
- d. decreased concentration of albumins in blood
- e. decreased concentration of globulins blood

16. Patient N., 36 years, is on inpatient treatment in nephrological department. Urine analysis: specific gravity - 1,004-1,015, diurnal diuresis 2600 ml. What do indexes of urine specific gravity indicate?

- a. isohyposthenuria
- b. hypersthenuria
- c. hyposthenuria
- d. dysuria
- e. polyuria

17. Patient N., 36 years. Analysis of urine: urine is stramineous in colour, limpid, acid reaction, protein 0,8 g/L, glucose is absent. In urinal sediment: single epithelial cells, leukocytes - 1-5, RBC - 2-3 in field of vision, fresh and modified; hyaline casts - single in field of vision. What index from pathological components of urine testifies about the violation of filtration function of kidneys at a patient?

- a. protein
- b. fresh RBC
- c. cylinders
- d. leukocytes
- e. pH of urine

18. Patient H., 36 years, in urine - 0,8 g/L of protein, in urinal sediment - single epithelium and hyaline cylinders, leukocytes - 1-5, fresh and modified RBC - 2-3 in field of vision. Urine analysis: specific gravity 1,004-1,015, diurnal diuresis 2600 ml. What index from the given can suggest about the violation of kidneys ability to concentrate the urine?

- a. polyuria
- b. proteinuria
- c. cylinderuria
- d. microhematuria
- e. pH of urine

19. Patient N., 36 years. Analysis of urine: urine is stramineous in colour, limpid, acid reaction, protein 0,8 g/L, glucose is absent. Urine analysis: specific gravity 1,004-1,015, diurnal diuresis 2600 ml. In blood: urea- 5,1 mmol/L, creatinine- 70 micromol/L. Affection of which part of kidneys caused the violation of kidneys ability to concentrate the urine?

- a. kidney parenchyma

- b. basal membrane of Bowman capsule
- c. tubular part of nephron
- d. collective tubules
- e. glomerular part of nephron

20. Patient A., 27 years, delivered in the hospital with the profuse gastric bleeding in severe condition. ABP - 80/60 mmHg. Patient excretes 60 - 80 ml of urine for a day with urine specific gravity 1,028-1,036. How can you describe diurnal diuresis at patient in this clinical situation?

- a. pollakiuria
- b. anuria
- c. oliguria
- d. dysuria
- e. hyposthenuria

21. Patient A., 24 years, delivered in the hospital with the profuse gastric bleeding in severe condition. ABP - 80/60 mmHg. Patient excretes 60 - 80 ml of urine for a day with urine specific gravity 1,028-1,036. Residual nitrogen of blood - 62 mmol/L, urea of blood - 36 mmol/L, creatinine of plasma - 260 micromole/L. What pathogenetic mechanism caused changes of diurnal diuresis at a patient?

- a. increased osmotic pressure of urine
- b. high level of residual nitrogen in blood
- c. increased colloid-osmotic pressure in capillaries of glomerules
- d. decreased hydrostatic pressure in capillaries of glomerules
- e. increased hydrostatic pressure in Bowman capsule

22. Patient A., 27 years, delivered in the hospital with the profuse gastric bleeding in severe condition. ABP - 80/60 mmHg. Patient excretes 60 - 80 ml of urine for a day with urine specific gravity 1,028-1,036. Residual nitrogen of blood - 62 mmol/L, urea of blood - 36 mmol/L, creatinine of plasma - 260 micromol/L. What pathogenetic mechanism caused the increased products of nitrogenous metabolism in blood of patient?

- a. violation of urea excretion in kidneys
- b. violation of protein metabolism in liver
- c. decreased amount of functioning nephrons
- d. decreased filtration function of kidneys
- e. increased reabsorbing function of kidneys

23. Patient A., 27 years, delivered in the hospital with the profuse gastric bleeding in severe condition. ABP - 80/60 mmHg. Daily diuresis 60 - 80 ml, urine specific gravity 1,028-1,036. Residual nitrogen of blood - 62 mmol/L, urea of blood - 36 mmol/L, creatinine of plasma - 260 μ mol/L. Define kidney's pathology?

- a. acute renal failure
- b. chronic renal failure
- c. nephritic syndrome
- d. nephrotic syndrome
- e. hematuria

24. Patient R., 39 years, was delivered to nephrological department in precoma condition. The patient is ill with glomerulonephritis for 8 years. Complaints about increased fatigue, apathy, pain in muscles and joints, skin itching, ammonia smell from mouth. Clinical examination: edema of legs and face, enlarged liver. ABP - 190/120 mmHg. Residual nitrogen of blood - 148 mmol/L. Glomerular filtration rate - 12,0 ml/min. Urine analysis: specific gravity 1,003 - 1,005, daily diuresis - 360 ml. What syndrome of kidneys affection is the reason of the patient's severe condition?

- a. nephritic
- b. nephrotic
- c. hypertensive
- d. chronic renal failure
- e. acute renal failure

25. Patient R., 39 years, was delivered to nephrological department in precoma condition. The patient is ill with glomerulonephritis for 8 years. Complaints about increased fatigue, apathy, pain in muscles and joints, skin itching,

ammonia smell from mouth. Clinical examination: edema of legs and face, enlarged liver. ABP - 190/120 mmHg. Residual nitrogen of blood - 148 mmol/L. Glomerular filtration rate - 12,0 ml/min. Urine analysis: urine specific gravity 1,003 - 1,005, daily diuresis - 360 ml. Characterize the concentrating ability of the kidney's according to the indices of urine specific gravity:

- a. hyposthenuria
- b. proteinuria
- c. hypersthenuria
- d. dysuria
- e. polyuria

26. Patient R., 39 years, was delivered to nephrological department in precoma condition. The patient is ill with glomerulonephritis for 8 years. Complaints about increased fatigue, apathy, pain in muscles and joints, skin itching, ammonia smell from mouth. Clinical examination: edema of legs and face, enlarged liver. ABP - 190/120 mmHg. Residual nitrogen of blood - 148 mmol/L. Glomerular filtration rate - 12,0 ml/min. Urine analysis: specific gravity 1,003 - 1,005, daily diuresis - 360 ml. What is the initial mechanism that has caused the increase of ABP in the patient?

- a. increased secretion of glucocorticoids
- b. increased secretion of aldosterone
- c. increased secretion of catecholamines
- d. increased secretion of renin
- e. increased concentration of angiotensin in blood

27. Patient R., 39 years, delivered in nephrological department in precoma condition as a result of chronic renal failure. Residual nitrogen of blood - 148 mmol/L. Glomerular filtration rate - 12,0 ml/min. What chemical substance is not related to the waste products of protein metabolism?

- a. urea
- b. ketone bodies
- c. phenols
- d. creatinine
- e. ammonia

28. Patient V., 19 years, complains of general asthenia, headaches, decreased appetite, thirst, frequent quinsies in anamnesis. Blood analysis: low RBC. Urea of blood - 10,7 mmol/L. ABP - 130/90 mmHg. Daily diuresis - 2600 ml. Urine specific gravity - 1,009 - 1,018, the amount of protein in the urine - 0,2 g/L. In urine sediment: single epithelial cells, leukocytes - 1-2 in field of vision, single RBC and hyaline cylinders. Glomerular filtration rate - 50 ml per minute. Name the pathology of kidneys.

- a. acute nephritic syndrome
- b. nephritic syndrome
- c. chronic renal failure
- d. acute renal insufficiency
- e. hypertensive syndrome

29. Patient V., 10 years, complains of general asthenia, headaches, decreased appetite, thirst, frequent quinsies in anamnesis. Clinical examination revealed lag in physical development, pale and dry skins. Blood analysis: RBC - $2,5 \cdot 10^{12}/L$. Urea of blood - 10,7 mmol/L. ABP - 130/90 mmHg. Daily diuresis - 2600 ml. Urine specific gravity - 1,009 - 1,018, the amount of protein in the urine - 0,2 g/L. In urine sediment: single epithelial cells, leukocytes - 1-2 in field of vision, single RBC and hyaline cylinders. What pathogenetic mechanism caused the development of anaemia in the patient?

- a. decreased iron absorption
- b. intravascular hemolysis of RBC
- c. decreased erythropoietin synthesis
- d. loss of RBC with urine
- e. toxic influence of urea on the red marrow

30. Patient V., 40 years, complains of general asthenia, headaches, decreased appetite, thirst, frequent quinsies in anamnesis. Urea of blood - 10,7 mmol/L. ABP - 130/90 mmHg. Daily diuresis - 2600 ml. Urine specific gravity - 1,009

- 1,018, the amount of protein in the urine - 0,2 g/L. In urine sediment: single epithelial cells, leukocytes - 1-2 in field of vision, single RBC and hyaline cylinders. What pathogenetic mechanism caused the increased concentration of urea in the blood of patient?

- a. decreased urea excretion in tubules
- b. decreased urea filtration in kidneys
- c. increased urea synthesis in organism
- d. increased urea reabsorption in tubules
- e. predominance of night diuresis

31. What is the most likely cause of the combination of generalized edema, hypoalbuminemia, hypercholesterolemia, marked proteinuria, and fatty casts and oval fat bodies in the urine?

- a. Nephritic syndrome
- b. Nephrotic syndrome
- c. Acute renal failure
- d. Renal tubular defect
- e. Urinary tract infection

32. Immunological mechanisms are participating in pathogenesis of different diseases. Which kidney disease from the given is caused by immunologic mechanisms?

- a. urinary stones
- b. glomerulonephritis
- c. pyelonephritis
- d. polycystic kidney
- e. kidney tumor

33. In the patients with kidney diseases pathological components may be found in the urine. Which finding in urine analysis from the given reflects the disturbance of glomerular filtration?

- a. isosthenuria
- b. leached RBC
- c. aminoaciduria
- d. glucosuria
- e. decreased secretion of H⁺ ions

34. Quantitative changes of diuresis are frequently accompanying kidney pathology. Which mechanism from the given can result in polyuria?

- a. decrease of systolic BP lower than 60 mmHg
- b. dehydration due to diarrhea
- c. decreased vasopressin secretion
- d. increased colloid and osmotic blood pressure
- e. decreased number of functioning nephrons

35. Kidney pathology sometimes is divided to glomerular and tubular pathology. Which finding in urine analysis from the given reflects the disturbed function of renal tubules?

- a. azotemia
- b. oliguria
- c. poorly-selective proteinuria
- d. leached RBC in urine
- e. polyuria

36. Acute renal failure is a severe life-threatening condition. Choose pre-renal mechanism of acute renal failure development from the given:

- a. acute glomerulonephritis
- b. thrombosis of renal vessels
- c. acute pyelonephritis
- d. cardiogenic shock
- e. strictures of lower urinary ways

37. Acute renal failure is a partial loss of renal function due to damage to the kidneys. Choose intra-renal mechanism of acute renal failure development from the given:

- a. cardiogenic shock
- b. disturbance in urine outflow
- c. acute glomerulonephritis
- d. dehydration due to fluid loss
- e. crush syndrome

38. Acute renal failure is a rapid loss of renal function due to damage to the kidneys. Choose post-renal mechanism of acute renal failure development from the given:

- tumor of urine bladder
- acute glomerulonephritis
- thrombosis of renal vessels
- acute pyelonephritis
- decreased ABP

39. Protein can be found in the urine because of glomerular and tubular reasons. Which pathology from the given can cause tubular type of proteinuria?

- acute glomerulonephritis
- chronic glomerulonephritis
- pyelonephritis
- diabetic nephropathy
- systemic collagenous diseases

40. Immune mechanisms are taking part in pathogenesis of kidney diseases. Decreased content of which blood component can prove immune mechanism of acute glomerulonephritis pathogenesis?

- complement
- Ig A
- Ig M
- Ig G
- albumin

41. Index of which laboratory finding can help you to differentiate between nephritic and nephrotic syndromes of kidney affection?

- edema
- hypertension
- oliguria
- proteinuria
- leukocyturia

PATHOLOGY OF ENDOCRINE SYSTEM. STRESS

1. Patient L. 30 years, in 3 months after childbirth gained weight - 7 kg per month and her attention was drawn by unusual location of fat: in the neck and face. X-ray examination revealed increased size of Turkish saddle. The patient has high blood glucose level, glucose is also present in the urine. What endocrine pathology can be suggested?

- Diabetes mellitus 1st type
- Diabetes mellitus 2nd type
- Cushing's disease
- Cushing's syndrome
- Diabetes insipidus

2. Patient L. 30 years, in 3 months after childbirth gained weight - 7 kg per month and her attention was drawn by unusual location of fat: in the neck and face. X-ray examination revealed increased size of Turkish saddle. The patient has high blood glucose level, glucose is also present in the urine. What is the reason of the patient's increased body weight?

- Hypersecretion of glucocorticoids
- Increased food consumption
- Hypersecretion of insulin
- Development of diabetes mellitus
- Postpartum obesity

3. Patient L. 30 years, in 3 months after childbirth gained weight - 7 kg per month and her attention was drawn by unusual location of fat: in the neck and face. X-ray examination revealed increased size of Turkish saddle. ABP – 150/85 mmHg. The patient has high blood glucose level; glucose is also present in the urine. Secondary diabetes mellitus is diagnosed. What is the mechanism of ABP increase?

- Development of hyperglycemia because of decreased insulin secretion
- Increased amount of blood volume because of vasopressin hypersecretion
- Increased secretion of catecholamines by adrenal medulla
- Increased secretion of renin because of kidneys ischemia
- High blood levels of cortizol and aldosterone

4. Patient L. 30 years, in 3 months after childbirth gained weight - 7 kg per month and her attention was drawn by unusual location of fat: in the neck and face. X-ray examination revealed increased size of Turkish saddle. ABP – 150/85 mmHg. The patient has high blood glucose level, diabetic type of sugar line at glucose tolerance test; glucose is also present in the urine. What causes change of glucose tolerance test?

- increased glycogenolysis in liver under glucocorticoids influence
- increased gluconeogenesis in liver under glucocorticoids influence
- inhibition of insulin secretion by beta-cells under glucocorticoids influence

- decreased sensitivity of muscle and adipose tissue to insulin under glucocorticoids influence
- increased glycogenolysis in muscles under glucocorticoids influence

5. Patient L. 30 years, in 3 months after childbirth gained weight - 7 kg per month and her attention was drawn by unusual location of fat: in the neck and face. X-ray examination revealed increased size of Turkish saddle. ABP – 150/85 mmHg. The patient has high blood glucose level; glucose is also present in the urine. What hormones blood level should be researched in order to more accurate diagnosing?

- Cortizol and insulin
- Insulin and glucagon
- GH and insulinsimilar growth factor I
- renin and angiotensin II
- ACTH and cortizol

6. Patient D., 35 years, complaints about general asthenia, drowse, apathy, headache, pains in back, hands and legs, violation of menstrual cycle, increased body weight. At examination: "moon" face, truncal obesity, purple striae on the skin of abdomen, thin extremities and fingers. Why the patient has thin extremities together with truncal obesity?

- increased catabolism of protein in muscles
- development of insulin resistance in muscles
- development of "buffalo hump"
- violation of proteins absorption in GIT
- development of aminoaciduria

7. Boy, 14 years, of proportionally build figure, growth 104 cm, secondary sex signs are not expressed. Gap in growth and physical development was noticed when he was 4 years old. About what endocrine pathology should you think?

- Cushing's disease
- hypothyroidism
- diabetes insipidus
- hypophysial nanism
- hypophysial cachexia

8. Boy, 14 years, of proportionally build figure, growth 104 cm, second sex signs are not expressed. Gap in growth and physical development was noticed when he was 4 years old. Hyposecretion of which hormone can cause the development of this pathology?

- vasopressin
- gonadotropins
- ACTH
- glucocorticoids
- growth hormone

9. Mother of a boy of 14 years complains of gap in growth and physical development since he was 4 years old. Boy is of proportionally build figure, growth 104 cm, secondary sex signs are not expressed. What has caused the gap in growth?

- a. Decreased GH concentration in blood
 - b. Violation of synthesis of insulin-like growth factor I
 - c. Increased secretion of somatostatin
 - d. Decreased affinity of cell receptors to GH
 - e. Decreased concentration of gonadotropins in blood
- 10.** Patient V., 46 years, during 2 years complains of headache, numbness in hands, asthenia, pain in joints, thirst. Clinical examination: non-proportionally increased hands, feet, nose, ears. Blood analysis - hyperglycemia, violation of glucose tolerance test, high cholesterol level. What endocrine pathology should you suggest?
- a. hypophysial gigantism
 - b. diabetes insipidus
 - c. Cushing's disease
 - d. acromegaly
 - e. diabetes mellitus 1 type
- 11.** Patient V., 46 years, during 2 years complains of headache, numbness in hands, asthenia, pain in joints, thirst. He has noticed that he needed buy shoes and gloves of bigger size three times. Blood analysis - hyperglycemia, violation of glucose tolerance test, high cholesterol level. What is the main reason of this pathology development?
- a. hypersecretion of growth hormone
 - b. hypersecretion of anterior pituitary hormones
 - c. hypersecretion of insulin
 - d. hyposecretion of insulin
 - e. hypersecretion of glucocorticoids
- 12.** Patient V., 46 years, during 2 years complains of headache, numbness in hands, asthenia, pain in joints, thirst. He has noticed that he needed buy shoes and gloves of bigger size three times. Blood analysis - hyperglycemia, violation of glucose tolerance test, high cholesterol level. What is the reason of non-proportional increase of single parts of a body of a patient?
- a. increased sensitivity of bones's tissue to GH
 - b. development of age-specific osteodystrophy
 - c. increased sensitivity of separate tissues to insulin
 - d. development of chronic inflammation of cartilages and joints
 - e. cartilage tissue proliferation under influence of GH
- 13.** Patient V., 46 years, during 2 years complains of headache, numbness in hands, asthenia, pain in joints, thirst. He has noticed that he needed buy shoes and gloves of bigger size three times. Blood analysis - hyperglycemia, violation of glucose tolerance test, high cholesterol level. What causes the development of peripheral neuropathy at patient, that is manifested by numbness of extremities?
- a. compression of peripheral nerves by proliferating cartilaginous tissue
 - b. hyperglycemia, that leads to diabetic neuropathy
 - c. ischemic injury of extremities' tissues
 - d. microcirculation block in the region of peripheral nerve tissue
 - e. violation of blood supply of extremities because of atherosclerosis
- 14.** Patient K., 35 years, 2 months ago had a flu with the expressed intoxication. Now he complains of constant thirst, decreased appetite, headache, irritability. He drinks about 6 L of water per a day. Daily diuresis is increased, urine is discoloured, without pathologic components, urine specific gravity - 1,005. About what endocrine pathology should you think?
- a. Cushing's disease
 - b. hypothyroidism
 - c. hyperthyroidism
 - d. diabetes mellitus of 1 type
 - e. diabetes insipidus
- 15.** Patient K., 35 years, 2 months ago had flu with the expressed intoxication. Now he complains of constant thirst, decreased appetite, headache, irritability. He drinks about 6 L of water per a day. Daily diuresis is increased, urine is discoloured, without pathologic components, urine specific gravity - 1,005. Pathology of what endocrine gland can you suggest?
- a. posterior pituitary
 - b. anterior pituitary
 - c. adenohipophysis
 - d. adrenal glands
 - e. thyroid gland
- 16.** A 20-year-old man complains of excessive thirst and abundant urination (up to 10 L for 24 hours). Urine specific gravity -1005. Blood glucose concentration is normal, glucose is absent in the urine. What is the reason of polyuria development?
- a. increased blood glucose concentration
 - b. decreased blood oncotic pressure
 - c. decreased sensitivity of epithelium of renal tubules to influence of ADH
 - d. increased osmotic pressure of urine
 - e. decreased concentration of vasopressin on blood
- 17.** A 20-year-old man complains of excessive thirst and abundant urination (up to 10 L for 24 hours). Urine specific gravity -1005. Blood glucose concentration is normal, glucose is absent in the urine. What is the reason of low urine specific gravity?
- a. Excess of water intake
 - b. Decreased electrolytes concentration in blood
 - c. Violation of water reabsorption in kidneys
 - d. Increased filtration pressure in kidneys
 - e. Decreased oncotic pressure of plasma
- 18.** A 34-year-old woman complains of increased irritability, perspiration, weakness, loss of body weight, tremor of the limbs, increased heart rate and exophthalmia. Clinical examination: body temperature 37,5°C, heart rate 122 bpm, thyroid gland is increased in size. What endocrine pathology can be suggested?
- a. hypothyroidism
 - b. hyperthyroidism
 - c. diabetes insipidus
 - d. Cushing's basophilism
 - e. diabetes mellitus type 1
- 19.** A 34-year-old woman complains of increased irritability, perspiration, weakness, loss of body weight, tremor of the limbs, increased heart rate and exophthalmia. Clinical examination: body temperature 37,5°C, heart rate 122 bpm, thyroid gland is increased in size. Choose the level of hormones typical for this endocrine disorder?
- a. high TSH, T3 and T4
 - b. high TSH, low T3 and T4
 - c. low TSH, high T3, low T4
 - d. low TSH and T3, high T4
 - e. low TSH, high T3 and T4
- 20.** Patient K., 47 years, is delivered with complaints about increased nervous excitability, violation of sleep, palpitation, sudden attacks of muscle weakness, hyperhidrosis. Clinical examination: exophthalmia, skin is humid and hot; there is tremor of hands, increased reflexes. Temperature of body is 37,5 C, heart rate is 150 bpm. ECG revealed the signs of sinus tachycardia. What is the mechanism of sinus tachycardia development?
- a. Stimulation of myocardial adrenoreceptors under influence of T3 and T4
 - b. Stimulation of myocardial adrenoreceptors under influence of catecholamines
 - c. Decreased tone of n.vagus under influence of T3 and T4
 - d. Increased tone of sympathetic innervation of heart under influence of catecholamines

- e. Increased level of catecholamines under influence of T3 and T4
- 21.** Patient M., 49 years, in 1 year after surgical treatment of thyrotoxicosis presents with weight gain, subjective memory loss, dry skin, and cold intolerance. On examination, she is found to have a goiter, body temperature is 35,2 C. What endocrine pathology should you suggest?
- diabetes insipidus
 - Cushing's disease
 - hypophysial cachexia
 - Addison's disease
 - myxedema
- 22.** Patient S., 59 years, complains of weakness, weight gain despite a loss of appetite and cold intolerance. Clinical examination: dry and rough skin, husky voice, puffy look of the face, diffuse edema, body temperature – 34.7 C, ABP 110/70 mmHg. What is the reason of edema development in the following clinical situation?
- Accumulation of mucopolysaccharides in tissues
 - Development of regional lymphostasis
 - Decreased synthesis of albumins in liver
 - Increased water retention due to kidneys affection
 - Increased penetration of capillaries
- 23.** Patient S., 59 years, complains of weakness, weight gain despite a loss of appetite and cold intolerance. Clinical examination: dry and rough skin, husky voice, puffy look of the face, diffuse edema, body temperature – 34.7 C, ABP 110/70 mmHg, heart rate 60 bpm. What is the reason of low body temperature?
- violation of glucocorticoids synthesis
 - anterior pituitary affection
 - posterior pituitary affection
 - decrease of basal metabolic rate
 - decrease of ABP
- 24.** Patient S., 32 years, complains of asthenia, fatiguability, decreased capacity for work, increased body weight, violation of menstrual cycle. Heart rate 65 bpm, ABP 105/60 mmHg. Thyroid gland is evenly enlarged, dense, and painless. Diagnosis: Hashimoto's thyroiditis. Name the main reason of thyroid gland enlargement in this pathology.
- Autoimmune inflammation
 - Hormone-producing tumour development
 - Sclerotic processes in thyroid gland
 - Regional lymphadenitis
 - Iodine deficiency
- 25.** A woman with primary hyperparathyroidism has periodically repeated attacks of renal colic. Ultrasound examination shows presence of small stones in her kidneys. Name the cause of stones formations.
- Hypercholesterolemia
 - Hyperuricemia
 - Hyperkalemia
 - Hyperphosphatemia
 - Hypercalcemia
- 26.** Patient F. ill with goiter for a long period of time was operated. The attacks of convulsions appeared in the patient after subtotal resection of thyroid gland. What hormone deficiency may cause this complication?
- Growth hormone
 - T3
 - T4
 - Parathyroid hormone
 - Calcitonin
- 27.** Patient S., 32 years, complains about asthenia, fatiguability, decreased capacity for work, increased body weight, violation of menstrual cycle. Heart rate 65 bpm, ABP 105/60 mmHg. Thyroid gland is evenly enlarged, dense, painless. The same disease of thyroid gland was diagnosed in her mother and sister. What changes of concentration of

- biologically active substances will be revealed in the patient's blood?
- increased concentration of T3
 - decreased concentration of iodine
 - decreased concentration of TSH
 - decreased concentration of TRH
 - anti-thyroid antibodies
- 28.** Patient S., 32 years, complains about asthenia, fatiguability, decreased capacity for work, increased body weight, violation of menstrual cycle. Heart rate 65 bpm, ABP 105/60 mmHg. Thyroid gland is evenly enlarged, dense, painless. The same disease of thyroid gland was diagnosed in her mother and sister. What is the reason of decreased ABP?
- Decreased metabolism in myocardium because of lack of thyroid hormones
 - Increased tone of parasympathetic nervous system
 - Decreased metabolism of proteins because of glucocorticoids hyposecretion
 - Violation of ABB due to hypoaldosteronism
 - Decreased secretion of catecholamines
- 29.** Patient S., 32 years, complains about asthenia, fatiguability, decreased capacity for work, increased body weight, violation of menstrual cycle. Heart rate 65 bpm, ABP 105/60 mmHg. Thyroid gland is evenly enlarged, dense, painless. The same disease of thyroid gland was diagnosed in her mother and sister. What caused the violation of menstrual cycle and infertility in the patient?
- Early beginning of climax
 - Violation of secretion of gonadotropic hormones
 - Violation of secretion of gonadotropin-releasing hormone
 - Autoimmune affection of ovaries
 - Violation of thyroid hormones secretion
- 30.** Patient N., 51 years, has been ill with tuberculosis for 10 years. He is abusing alcohol. He complains about irritability, quick fatiguability, muscle asthenia, decreased body weight, orthostatic faints. Objectively: hyperpigmentation of skin, ABP 90/60 mmHg. Laboratory data: glucose of blood 2,2 mmol/L, K - 6,1 mmol/L; Na - 110 mmol/L. About what pathology should you think?
- Diabetes insipidus
 - Addison's disease
 - Hypophysial cachexia
 - Hypothyroidism
 - Alcoholic affection of liver
- 31.** Patient N., 51 years, for the past 10 years is ill with miliary pulmonary tuberculosis. His latest complaints were irritability, quick fatiguability, muscle asthenia, decreased body weight, orthostatic faints. Nutrition is decreased, hyperpigmentation of skin in natural wrinkles, ABP 90/60 mmHg. Laboratory data: glucose of blood 2,2 mmol/L, K - 6,1 mmol/L; Na - 110 mmol/L. What has caused the development of the disease at this patient?
- Alcoholic affection of liver
 - Metastases or undiagnosed tumour
 - Chronic alcoholic intoxication
 - Tuberculous affection of adrenal glands
 - Autoimmune affection of liver
- 32.** Patient N., 51 years, for the past 10 years is ill with miliary pulmonary tuberculosis. His latest complaints were irritability, quick fatiguability, muscle asthenia, decreased body weight, orthostatic faints. Nutrition is decreased, hyperpigmentation of skin in natural wrinkles, ABP 90/60 mmHg. Laboratory data: glucose of blood 2,2 mmol/L, K - 6,1 mmol/L; Na - 110 mmol/L. The causes of muscle weakness development are the following factors EXCEPT:
- hypoglycemia
 - decreased muscular mass
 - decreased secretion of ACTH
 - violation of electrolyte balance

- e. deficit of aldosterone
- 33.** Patient N., 51 years, for the past 10 years is ill with miliary pulmonary tuberculosis. His latest complaints were irritability, quick fatigability, muscle asthenia, decreased body weight, orthostatic faints. Nutrition is decreased, hyperpigmentation of skin in natural wrinkles, ABP 90/60 mmHg. Laboratory data: glucose of blood 2,2 mmol/L, K - 6,1 mmol/L; Na - 110 mmol/L. What is the reason of ABP decrease in the patient?
- decreased synthesis of glucocorticoids
 - hypovolemia
 - affection of brain vasomotor center
 - asthenia
 - alcohol abuse
- 34.** Patient F., 26 years, complains about muscle asthenia, headaches, thirst, night urination, convulsions of muscles of extremities and feeling of crawling, pain in the heart region. ABP 190/110 mmHg. Borders of heart are widened to the left. Examination of the eye grounds has revealed spasm of arterioles and expanded venules. Blood analysis: low renin activity, K - 2,9 mmol/L, Na - 165 mmol/L. About what endocrine pathology should you think?
- diabetes insipidus
 - Addison's disease
 - Graves' disease
 - pheochromocytoma
 - Konn's disease
- 35.** Patient F., 26 years, complains about muscle asthenia, headaches, thirst, night urination, convulsions of muscles of extremities and feeling of crawling, pain in the heart region. ABP 190/110 mmHg. Borders of heart are widened to the left. Examination of the eye grounds has revealed spasm of arterioles and expanded venules. Blood analysis: low renin activity, K - 2,9 mmol/L, Na - 165 mmol/L. What is the reason of the disease caused the development of this disease?
- autoimmune affection of kidneys
 - ischemic disease of heart
 - affection of pancreatic islets
 - tumour of adrenal medulla
 - tumour of adrenal cortex
- 36.** Patient F., 26 years, complains about muscle asthenia, headaches, thirst, night urination, convulsions of muscles of extremities and feeling of crawling, pain in the heart region. ABP 190/110 mmHg. Borders of heart are widened to the left. Examination of the eye grounds has revealed spasm of arterioles and expanded venules. Blood analysis: low renin activity, K - 2,9 mmol/L, Na - 165 mmol/L. How can you explain the increase of ABP together with decreased activity of renin in the patient's plasma?
- hypernatremia
 - hypokalemia
 - hypertension
 - polydipsia
 - spasm of arteriole
- 37.** Patient F., 26 years, complains about muscle asthenia, headaches, thirst, night urination, convulsions of muscles of extremities and feeling of crawling, pain in the heart region. ABP 190/110 mmHg. Borders of heart are widened to the left. Examination of the eye grounds has revealed spasm of arterioles and expanded venules. Blood analysis: low renin activity, K - 2,9 mmol/L, Na - 165 mmol/L. What is the reason of ABP increase in the patient?
- hypersecretion of catecholamines
 - hyperactivation of angiotensin-converting enzyme
 - increased formation of angiotensin II
 - increased Na ions concentration
 - hypersecretion of aldosterone
- 38.** Patient F., 26 years, complains about muscle asthenia, headaches, thirst, night urination, convulsions of muscles of extremities and feeling of crawling, pain in the heart

- region. ABP 190/110 mmHg. Borders of heart are widened to the left. Blood analysis: low renin activity, K - 2,9 mmol/L, Na - 165 mmol/L. What is the reason of unnormal concentration of Na in the patient's blood?
- violation of its filtration in kidneys
 - decreased reabsorption in kidneys because of aldosterone deficiency
 - increased reabsorption in kidneys due to excess of aldosterone
 - increased Na intake with food
 - increased reabsorption in kidneys due to aldosterone deficiency
- 39.** Patient V, 19 years, is delivered to the hospital with syndrome of acute stomach. She has troublesome pains in stomach without clear localisation for 1 year. Pains are not connected with food consumption and are accompanied by tachycardia, headache. ABP 250/110 mmHg, after palpation of kidneys ABP increased to 300/130 mmHg. Intravenous introduction of phentolamine caused the normalisation of ABP. Concentration of glucose in blood 7,5 mmol/L, Na - 135 mmol/L. About what endocrine pathology should you think?
- acute adrenal failure
 - Cushing's syndrome
 - tumour of adrenal medulla
 - hypothyroidism
 - Conn's disease
- 40.** Patient V, 19 years, is delivered to the hospital with syndrome of acute stomach. She has troublesome pains in stomach without clear localisation for 1 year. Pains are not connected with food consumption and are accompanied by tachycardia, headache. ABP 250/110 mmHg, after palpation of kidneys ABP increased to 300/130 mmHg. Intravenous introduction of phentolamine caused the normalisation of ABP. Concentration of glucose in blood 7,5 mmol/L, Na - 135 mmol/L. Name the pathology.
- pheochromocytoma
 - perforated stomach ulcer
 - hypertension stroke
 - myocardial infarction
 - acute appendicitis
- 41.** Patient V, 19 years, is delivered to the hospital with syndrome of acute stomach. She has troublesome pains in stomach without clear localisation for 1 year. Pains are not connected with food consumption and are accompanied by tachycardia, headache. ABP 250/110 mmHg, after palpation of kidneys ABP increased to 300/130 mmHg. Intravenous introduction of phentolamine caused the normalisation of ABP. Concentration of glucose in blood 7,5 mmol/L, Na - 135 mmol/L. What diagnostic test should be done for more accurate diagnosis?
- scanning of thyroid gland
 - electrocardiogram
 - tomography of hypophysis
 - angiography of brain vessels
 - tomography of adrenals
- 42.** Patient V, 19 years, is delivered to the hospital with syndrome of acute stomach. She has troublesome pains in stomach without clear localisation for 1 year. Pains are not connected with food consumption and are accompanied by tachycardia, headache. ABP 250/110 mmHg, after palpation of kidneys ABP increased to 300/130 mmHg. Intravenous introduction of phentolamine caused the normalisation of ABP. Concentration of glucose in blood 7,5 mmol/L, Na - 135 mmol/L. What is the reason of the increased ABP in the patient?
- hypersecretion of renin
 - hypersecretion of aldosterone
 - hypersecretion of glucocorticoids
 - hypersecretion of catecholamines
 - hypernatremia

43. Patient V, 19 years, is delivered to the hospital with syndrome of acute stomach. She has troublesome pains in stomach without clear localisation for 1 year. Pains are not connected with food consumption and are accompanied by tachycardia, headache. ABP 250/110 mmHg, after palpation of kidneys ABP increased to 300/130 mmHg. Concentration of glucose in blood 7,5 mmol/L, Na - 135 mmol/L. What caused the increase of blood glucose in the patient?

- a. hyposecretion of insulin
- b. hypersecretion of glucocorticoids
- c. hypersecretion of glucagon
- d. hypersecretion of somatotropin
- e. hypersecretion of catecholamines

44. Patient N., 52 years is ill with severe type of bronchial asthma. On prescription by a doctor had a hormone therapy for a long time, in the last month - 30 mg of prednisolon per day. Following an advice of her relatives she began to use herbal pills instead of drug therapy. On the second day condition suddenly worsened: expressed weakness, pains in stomach, liquid stool, attacks of asthma; ABP 90/50 mmHg. What is the main pathogenetic mechanism of this condition development?

- a. Decreased synthesis of endogenous glucocorticoids
- b. Increased bronchospasm because of long use of glucocorticoids
- c. Development of gastric bleeding because of long use of glucocorticoids
- d. Development of acute cardiac insufficiency due to glucocorticoid therapy
- e. Violation of glomerular filtration rate due to decreased ABP

45. Patient N., 52 years is ill with severe type of bronchial asthma. Doctor had prescribed hormonal therapy for a long time, in the last month - 30 mg of prednisolon per day. What complications can result from the long-term therapy with glucocorticoids?

- a. peptic ulcer
- b. Cushing's disease
- c. primary immunodeficiency
- d. arterial hypotension
- e. acute adrenal failure

46. Patient N., 52 years is ill with severe type of bronchial asthma. Doctor had prescribed hormonal therapy for a long time, in the last month - 30 mg of prednisolon per day. Why was the glucocorticoid therapy prescribed to a patient?

- a. For increased antitoxic effect of basic therapy
- b. For antibacterial effect of basic therapy
- c. For stimulation of immunity
- d. For immunosuppression
- e. For stimulation of endogenous steroids secretion

47. Patient N., 52 years is ill with severe type of bronchial asthma. Doctor had prescribed hormonal therapy for a long time, in the last month - 30 mg of prednisolon per day. Which changes in blood picture may appear due to long-term use of glucocorticoids?

- a. anaemia
- b. eosinopenia
- c. lymphocytosis
- d. pancytopenia
- e. agranulocytosis

48. Why a patient, who was prescribed prednisolon for rheumatoid arthritis treatment for a long time should avoid contacts with infectious patients?

- a. Because of secondary immunodeficiency development
- b. Because of arthritis exacerbation risk
- c. Because of thromboembolic complications risk
- d. Because of lymphocytosis development
- e. Because of interferon blockade

49. Conn's syndrome was diagnosed in a patient who complained of muscular weakness, increased urination in the night and increased ABP. What correlation between the given blood parameters is typical for this syndrome?

- a. High rennin, high aldosterone, high potassium level
- b. Low rennin, high aldosterone, high potassium level
- c. Low rennin, high aldosterone, low potassium level
- d. Low rennin, low aldosterone, low potassium level
- e. High rennin, low aldosterone, high potassium level

50. A female patient aged 44 complains of general malaise, rapidly increased body weight, growth of hair on the face, amenorrhea, ABP - 165/100 mm Hg. What kind of endocrine disorder can lead to obesity in this case?

- a. Hypercortizolism
- b. Hypofunction of adrenal glands
- c. Hyperparathyroidism
- d. Hypergonadism
- e. Hyperaldosteronism

51. Arterial hypotension, muscular weakness and periodic convulsions appeared in the patient who suffers from cirrhosis with ascites. Na blood level is higher; K blood level is lower than normal. What kind of endocrine disorder can you suppose in the given clinical situation?

- a. Secondary hyperaldosteronism
- b. Hypofunction of adrenal glands
- c. Hyperparathyroidism
- d. Hypergonadism
- e. Primary hyperaldosteronism

52. Patient M., 64 years, ill with hyperthyroidism. Now she is in cardiological ward with complaints about asthenia, high irritability, swelling of jugular veins, painfulness in the region of liver. How may main disease be connected with the cardiac insufficiency?

- a. Increased excitability of myocardium
- b. Development of functional overload of heart
- c. Damage of myocardium by excess of thyroid hormones
- d. Development of stable spasm of coronary arteries
- e. Violation of heart energy supply

53. A laboratory rat was immobilized for 6 hours daily for 5 days. Presence of ulcers on mucous membrane of a stomach and a duodenum, loss of weight and presence of dystrophic changes in the thymus tissue, hypertrophy of adrenal glands cortex are revealed. Development of what process does the revealed changes verify.

- a. Complications of Cushing syndrome
- b. Development of Cushing illness
- c. General adaptation syndrome
- d. Acute adrenal failure
- e. Autoimmune pathology

54. A laboratory rat was immobilized for 6 hours daily for 5 days. Presence of ulcers on mucous membrane of a stomach and a duodenum, loss of weight and presence of dystrophic changes in the thymus tissue, hypertrophy of adrenal glands cortex are revealed. Name the reason of mucous membrane ulcer development?

- a. Toxic action of glucocorticoids metabolites on a vessels wall
- b. Toxic action of catecholamines metabolites on a vessels wall
- c. Excessive production of proteolytic enzymes
- d. Excessive production of reaginic type antibodies
- e. Excessive production of glucocorticoids and adrenaline

55. A laboratory rat was immobilized for 6 hours daily for 5 days. Presence of ulcers on mucous membrane of a stomach and a duodenum, loss of weight and presence of dystrophic changes in the thymus tissue, hypertrophy of adrenal glands cortex are revealed. Blood analysis revealed high

cortizol level. Choose the probable change of leukocytic formula in this case.

- a. lymphocytosis
- b. neutrophilia
- c. eosinophilia
- d. eosinopenia
- e. monocytosis

56. A porpoise was immobilized for 5 hours. After 2 hours of experiment the arterial hypotension, hypothermia, skin hemorrhages were observed. In blood: low glucose level, negative nitrogenous balance, eosinopenia. Name the stage of stress:

- a. Alarm
- b. Resistance
- c. Exhaustion
- d. Long-term adaptation
- e. Urgent adaptation

57. A porpoise was immobilized for 5 hours. After 2 hours of experiment the arterial hypotension, hypothermia, skin hemorrhages were observed. In blood: low glucose level, negative nitrogenous balance, eosinopenia. Name the cause of negative nitrogenous balance :

- a. Reduction of exogenous proteins intake due to immobilization
- b. Strengthening of anabolic activity
- c. Strengthening of neutrophiles' phagocytes activity
- d. Strengthening of glucocorticoids catabolic activity
- e. Decrease of phagocytes activity

58. A porpoise was immobilized for 5 hours. After 2 hours of experiment the arterial hypotension, hypothermia, skin hemorrhages were observed. In blood: low glucose level, negative nitrogenous balance, eosinopenia. Name the reason of hemorrhages development:

- a. Strengthening of catabolism in a vascular wall
- b. Increased vessels wall permeability by catecholamines
- c. Destruction of a vascular wall by glucocorticoids metabolites
- d. Development of cytotoxic allergic reaction with development of a thrombocytopenia
- e. destruction of vessels walls by complexes antigen/antibody

59. A porpoise was immobilized for 5 hours. After 2 hours of experiment the arterial hypotension, hypothermia, skin hemorrhages were observed. In blood: low glucose level,

negative nitrogenous balance, eosinopenia. Name the cause of eosinopenia:

- a. Increased blood hemolysis
- b. Destruction of eosinophiles in blood
- c. Eosinophiles migration to the tissues
- d. Depression of granulocytes maturation
- e. Disturbance of eosinophiles output from a bone marrow

60. Employees of space flights control centre showed increased number of stenocardias and heart attacks cases. 63 % employees have moderate hyperglycemia, 17% have ulcer of a stomach and a duodenum. Surveyed people had no risk factors increasing probability of a heart attack, such as smoking, obesity, diabetes, increased blood cholesterol level. What is the most probable mechanism that causes myocardium injury at employees?

- a. Injury of a myocardium by glucocorticoids
- b. Injury of heart valves by antigenic complexes
- c. Increased glucocorticoids secretion
- d. Coronary vessels spasm under catecholamines influence
- e. A high level of glycemia with damage of vessels

61. Employees of space flights control centre showed increased number of stenocardias and heart attacks cases. 63 % employees have moderate hyperglycemia (glucose level - 8,5 mmol/L). What is the most probable mechanism that provides hyperglycemia development at employees?

- a. Increased exogenous glucose intake
- b. Increase of gluconeogenesis and glycolysis
- c. Development of a 1st type diabetes
- d. Development of a 2nd type diabetes
- e. Increased tissue resistance to glucose

62. Employees of space flights control centre showed increased number of stenocardias and heart attacks cases. 63 % employees have moderate hyperglycemia, 17% have ulcer of a stomach and a duodenum. The others 20 % of employees complained about decreased work capacity, progressing weakness. What is most probable reason of the immune status of employees' changes?

- a. Increased of T-helpers quantity
- b. Increased T-lymphocytes cytotoxic activity
- c. Increased B-lymphocytes quantity in blood
- d. Increased IgG concentration in blood
- e. Decreased IgM and IgG concentration in blood

PATHOLOGY OF NERVOUS SYSTEM

1. Patient N., 49 years, is delivered in hospital with complaints on headache, vomiting. Psychataxia, ABP 140/90 mmHg, there is limitation of voluntary movements in the left extremities. Tone of muscles in the left hand and leg is increased according to spastic type. There are increased local tendinous reflexes, pathologic reflexes. Choose the most possible diagnosis of the pathology at the patient.

- a. Hemorrhagic stroke
- b. Meningitis
- c. Cardiac infarction
- d. Ischemic stroke
- e. Gastric bleeding

2. Patient N., 49 years, is delivered in neurology unit. There is limitation of voluntary movements in the left extremities, more in a hand. Tone of muscles in the left hand and leg is increased according to spastic type. There are increased local tendinous reflexes, pathologic reflexes. How can you characterise the neurologic disorders at a patient?

- a. Peripheral paresis
- b. Extrapyramidal paresis
- c. Myasthenia
- d. Ataxia
- e. Central paresis

3. Patient N., 49 years, with stroke. There is limitation of voluntary movements in the left extremities, increased tone of muscles in the left hand and leg according to spastic type, increased local tendinous reflexes, and pathologic reflexes. What mechanism caused the development of muscle hypertonus and hyperreflexia at a patient?

- a. activation of motoneurons cause of stroke
- b. activation of excitatory influences from the nidus of stroke
- c. activation of synaptic impulse transmission
- d. decreased impeding descending influences
- e. inhibition of cerebral cortex motoneurons

4. Patient C., 22 years, came to neuropathologist with complaints about diplopy of text when reading for a long time, quick fatigability of mimic muscles, problems with chewing and swallowing. Diagnostic tests revealed asthenia of oculomotor and masticatory muscles. At electromyography there is decreased amplitude of action potential. How can you characterise the neurologic disorders at a patient?

- a. Central paresis
- b. Peripheral paresis
- c. Extrapyramidal paresis
- d. Myasthenia
- e. Ataxia

5. Patient C., 22 years, diagnostic tests revealed asthenia of oculomotor and masticatory muscles. At electromyography there is decreased amplitude of action potential. After proserin injection (blocker of acetylcholinesterase) there is regressing of all symptoms in 30 minutes. What affection of nervous system has caused this pathology at a patient?

- affection of pyramidal neurones or their axons
- violation of synaptic impulse transmission
- affection of motoneurones of spinal cord or their axons
- affection of extrapyramidal neurones
- affection of cerebral cortex neurones

6. Patient C., 22 years, came to neuropathologist with complaints about diplopy of text when reading for a long time, quick fatiguability of mimic muscles, problems with chewing and swallowing. Diagnostic tests revealed asthenia of oculomotor and masticatory muscles. After proserin injection (blocker of acetylcholinesterase) there is regressing of all symptoms in 30 minutes. At electromyography there is decreased amplitude of action potential. What mechanism has caused the development of muscle asthenia in this clinical situation?

- activation of impeding descending influences
- inhibition of motoneurones of spinal cord or their axons
- violation of contractile muscle function
- inhibition of synaptic impulse transmission
- inhibition of motoneurones of cerebral cortex

7. Patient C., 22 years, at diagnostic tests there is asthenia of oculomotor and masticatory muscles. At electromyography there is decreased amplitude of action potential. After injection of proserin (blocker of acetylcholinesterase) there is regressing of all symptoms in 30 minutes. What caused the development of this pathology at a patient?

- block of acetylcholine receptors
- damage of motoneurones
- violation of conduction by the nervous cells
- violation of muscle membrane polarisation
- lack of ATP in muscles

8. Patient L., 40 years, a month ago got the trauma of right thigh. At the examination of the neurologic status: active movements in right leg are limited because of severe pain, volume of muscles on the right leg is on 2 cm lesser, then on the left, Achilles and knee reflexes on the right side are absent. There is decreased proprioceptive sensitivity on the right leg in the region of foot. How can you characterise the neurologic disorders at a patient?

- Central paresis
- Peripheral paresis
- Extrapyramidal paresis
- Myasthenia
- Ataxia

9. At the examination of the neurologic status at patient L., 40 years, it is revealed that volume of muscles on the right leg is on 2 cm lesser, then on the left, Achilles and knee reflexes on the right side are absent, there is termhypesthesia and hypalgesia on the external side of right leg, loss of proprioceptive sensitivity in the region of foot. What part of motor analyser is damaged at a patient?

- Pyramidal neurones or their axons
- Motoneurones of spinal cord or their axons
- Extrapyramidal neurones
- Neurones of cerebral cortex
- Peripheral nerves

10. Patient L., 40 years, a month ago got the trauma of right thigh. At the examination of the neurologic status: active movements in right leg are limited because of severe pain, volume of muscles on the right leg is on 2 cm lesser, then on

the left, Achilles and knee reflexes on the right side are absent, right leg is cyanotic. There is decreased proprioceptive sensitivity on the right leg in the region of foot. What mechanism has caused the absence of normal reflexes?

- inhibition of motoneurones of spinal cord
- violation of synaptic impulse transmission
- violation of excitation conduction
- activation of excitatory influences
- violation of irritation perception

11. Patient L., 40 years in a month after the trauma of right thigh volume of muscles on the right leg is on 2 cm lesser, then on the left one, active movements in all joints of right leg are limited because of expressed pain syndrome, there is decreased pulsation and cyanosis on the right leg. What mechanism caused the decreased volume of muscles on the affected extremity?

- Posttraumatic violation of blood supply
- Detraining of muscles
- Absence of tonic impulsion from motoneurones
- Decreased trophic influence of nervous system
- Pain syndrome

12. At the examination of the neurologic status at patient L., 40 years, it is revealed that active movements in all joints of right leg are limited because of expressed pain syndrome, termhypesthesia and hypalgesia on the external side of right leg, loss of proprioceptive sensitivity in the region of foot. What mechanism caused the violations of sensitivity at a patient?

- Posttraumatic violation of activity of receptors
- Violation of impulse transmission by sensitive nervous fibres
- Pain inhibition of sensitive nervous centres
- Violation of sensitive receptors blood supply
- Activation of protective antinociceptive system of brain

13. Patient S., 37 years, in the last time notice progressing increased weakness in the lower extremities, pains in sural muscles. Active movements in lower extremities are absent, muscular tone and tendoperiosteal reflexes are increased. How can you characterise the neurologic disorders in the patient?

- Extrapyramidal paralysis
- Myasthenia
- Central paralysis
- Peripheral paralysis
- Ataxia

14. At the examination of the neurologic status at patient S., 37 years, it is revealed absence of active movements in lower extremities, increased muscular tone, pathologic reflexes, expansion of reflexogenic zones. What mechanism caused the muscular hypertonus?

- decreased impeding descending influences on neurones of spinal cord
- activation of cerebral cortex neurones
- increased excitability of sensitive receptors
- activation of synaptic impulse transmission
- inhibition of cerebral cortex neurones

15. Half spinal cord transection was done at frog at the level of thoracic part of on the right. What violation of central nervous system develops at this damage?

- Spinal shock
- Brown-Sequard syndrome
- Peripheral paralysis
- Inflammatory edema of spinal cord
- Pain syndrome

16. Half spinal cord transection was done at frog at the level of thoracic part of on the right. What neurological signs are on the side of affection?

- Central paralysis
- Hyperesthesia

- c. Absence of pain and temperature sensitivity
 - d. Areflexia
 - e. Hypesthesia
17. Half spinal cord transection was done at frog at the level of thoracic part of on the right. What neurological signs are on the opposite side?
- a. Central paralysis
 - b. Hyperesthesia
 - c. Hyperpathia
 - d. Areflexia
 - e. Absence of pain and temperature sensitivity
18. Modelling of syndrome of Brown-Sequard was done by half spinal cord transection at the level of thoracic part in the frog. What is the reason of different signs of neurological disorders in the lower limbs?
- a. Crossing of sensitive conduction tracts
 - b. Crossing of motor conduction tracts
 - c. Pain irritation on the side of affection
 - d. Violation of impeding descending influences
 - e. Shock inhibition of CNS neurones
19. Patient R., in four months after old stroke is delivered to hospital with the signs of central paralysis. Movements in the right hand and leg are absent, tone of muscles on these extremities is increased, local reflexes are increased. How can you name patient's state?
- a. Monoplegia
 - b. Paraplegia
 - c. Hemiplegia
 - d. Tetraplegia
 - e. Functional paralysis
20. In a month after old stroke there are typical presentations of paralysis of extremities as at hemiplegia at a patient. What clinical signs will prove the affection on the level of peripheral neurones and their axons?
- a. Hypertension and hyperreflexia
 - b. Hypotonia and areflexion
 - c. Atrophy of muscles and atonia
 - d. Areflexia and atonia
 - e. Hypertonia and areflexia

KROK TESTS ON LUNG, GIT, LIVER, KIDNEY, ENDOCRINE, NERVOUS PATHOLOGY AND EXTREMAL STATES

1. When studying the signs of pulmonary ventilation, reduction of forced expiratory volume (FEV) has been detected. What is the likely cause of this phenomenon?
- a. Obstructive pulmonary disease
 - b. Increase of respiratory volume
 - c. Increase of inspiratory reserve volume
 - d. Increase of pulmonary residual volume
 - e. Increase of functional residual lung capacity
2. A patient with marked pneumofibrosis that developed after infiltrating pulmonary tuberculosis has been diagnosed with respiratory failure. What is its pathogenetic type?
- a. Restrictive
 - b. Obstructive
 - c. Dysregulatory
 - d. Reflex
 - e. Apneistic
3. A 30-year-old man has sustained an injury to his thorax in a traffic incident, which caused disruption of his external respiration. What type of ventilatory difficulty can be observed in the given case?
- a. Restrictive extrapulmonary ventilatory impairment
 - b. Restrictive pulmonary ventilatory impairment
 - c. Obstructive ventilatory impairment
 - d. Impaired ventilation regulation dysfunction
 - e. Cardiovascular collapse
4. An unconscious young man in the state of morphine intoxication has been delivered into an admission room. The

patient's respiration is slow and shallow due to suppression of the respiratory center. What kind of respiratory failure occurred in this case?

- a. Ventilatory disregulation
 - b. Ventilatory obstruction
 - c. Ventilatory restriction
 - d. Perfusion
 - e. Diffusion
5. A 23-year-old patient has been admitted to a hospital with a craniocerebral injury. The patient is in a grave condition. Respiration is characterized by prolonged convulsive inspiration followed by a short expiration. What kind of respiration is it typical for?
- a. Apneustic
 - b. Gasping breath
 - c. Kussmaul's
 - d. Cheyne-Stokes
 - e. Biot's
6. A patient with bronchial asthma has developed acute respiratory failure. What kind of respiratory failure occurs in this case?
- a. Obstructive disturbance of alveolar ventilation
 - b. Restrictive ventilatory defect
 - c. Perfusion
 - d. Diffusion
 - e. Dysregulation of alveolar ventilation
7. A 46-year-old patient suffering from the diffuse toxic goiter underwent resection of the thyroid gland. After the surgery the patient presents with appetite loss, dyspepsia, increased neuromuscular excitement. The body weight remained unchanged. Body temperature is normal. Which of the following has caused such a condition in this patient?
- a. Reduced production of parathormone
 - b. Increased production of thyroxin
 - c. Increased production of calcitonin
 - d. Increased production of thyroliberin
 - e. Reduced production of thyroxin
8. A coprological survey revealed light colored feces containing drops of neutral fat. The most likely reason for this condition is the disorder of:
- a. Bile inflow into the bowel
 - b. Gastric juice acidity
 - c. Pancreatic juice secretion
 - d. Intestinal juice secretion
 - e. Intestinal absorption
9. The secretion of which hypophysial hormones will be inhibited after taking the oral contraceptives containing sex hormones?
- a. Gonadotropic hormone
 - b. Vasopressin
 - c. Thyrotrophic hormone
 - d. Somatotrophic hormone
 - e. Oxytocin
10. As a result of continuous starvation the glomerular filtration rate has increased by 20%. The most probable cause of the glomerular filtration alteration under the mentioned conditions is:
- a. Decrease in the oncotic pressure of blood plasma
 - b. Increase in the systemic arterial pressure
 - c. Increase in the permeability of the renal filter
 - d. Increase of the filtration quotient
 - e. Increase of the renal blood flow
11. Blood analysis of a patient with jaundice reveals conjugated bilirubinemia, increased concentration of bile acids. There is no stercobilinogen in urine. What type of jaundice is it?
- a. Obstructive jaundice
 - b. Hepatocellular jaundice
 - c. Parenchymatous jaundice
 - d. Hemolytic jaundice

- e. Cythemolytic jaundice
- 12.** According to the results of glucose tolerance test a patient has no disorder of carbohydrate tolerance. Despite that glucose is detected in the patients's urine (5 mmol/l). The patient has been diagnosed with renal diabetes. What renal changes cause glucosuria in this case?
- Decreased activity of glucose reabsorption enzymes
 - Increased activity of glucose reabsorption enzymes
 - Exceeded glucose reabsorption threshold
 - Increased glucose secretion
 - Increased glucose filtration
- 13.** A concentrated solution of sodium chloride was intravenously injected to an animal. This caused decreased reabsorption of sodium ions in the renal tubules. It is the result of the following changes of hormonal secretion:
- Aldosterone reduction
 - Aldosterone increase
 - Vasopressin reduction
 - Vasopressin increase
 - Reduction of atrial natriuretic factor
- 14.** Diabetic nephropathy with uremia has developed in a patient with pancreatic diabetes. The velocity of glomerular filtration is 9 ml/min. What mechanism of a decrease in glomerular filtration velocity and chronic renal failure development is most likely in the case of this patient?
- Reduction of active nephron mass
 - Decrease in systemic arterial pressure
 - Obstruction of nephron tubules with hyaline casts
 - Tissue acidosis
 - Arteriolar spasm
- 15.** A 49-year old female patient has limitation of left limbs arbitrary movements. Muscular tonus of left hand and leg is overstrained and spasmodic, local tendon reflexes are strong, pathological reflexes are presented. What is the most likely development mechanism of hypertension and hyperreflexia?
- Reduction of descending inhibitory influence
 - Motoneuron activation induced by stroke
 - Activation of excitatory influence from the focus of stroke
 - Activation of synaptic transmission
 - Inhibition of cerebral cortex
- 16.** The patient with complaints about permanent thirst applied to the doctor. Hyperglycemia, polyuria and increased concentration of 17-ketosteroids in the urine were revealed. What disease is the most likely?
- Steroid diabetes
 - Insulin-dependent diabetes mellitus
 - Myxedema
 - Type I glycogenosis
 - Addison's disease
- 17.** A 32-year-old patient consulted a doctor about the absence of lactation after parturition. Such disorder might be explained by the deficit of the following hormone:
- Prolactin
 - Somatotropin
 - Vasopressin
 - Thyrocalcitonin
 - Glucagon
- 18.** A 41-year-old man has a history of recurrent attacks of heartbeats (paroxysms), profuse sweating, headaches. Examination revealed hypertension, hyperglycemia, increased basal metabolic rate, and tachycardia. These clinical presentations are typical for the following adrenal pathology:
- Hyperfunction of the medulla
 - Hypofunction of the medulla
 - Hyperfunction of the adrenal cortex
 - Hypofunction of the adrenal cortex
 - Primary aldosteronism
- 19.** A patient complains of hydruria (7 liters per day) and polydipsia. Examination reveals no disorders of carbohydrate metabolism. These abnormalities might be caused by the dysfunction of the following endocrine gland:
- Neurohypophysis
 - Adenohypophysis
 - Islets of Langerhans (pancreatic islets)
 - Adrenal cortex
 - Adrenal medulla
- 20.** A patient presents with icteritiousness of skin, scleras and mucous membranes. Blood plasma the total bilirubin is increased, stercobilin is increased in feces, urobilin is increased in urine. What type of jaundice is it?
- Haemolytic
 - Gilbert's disease
 - Parenchymatous
 - Obturatorial
 - Cholestatic
- 21.** A patient with massive burns developed acute renal insufficiency characterized by a significant and rapid deceleration of glomerular filtration. What is the mechanism of its development?
- Reduction of renal blood flow
 - Damage of glomerular filter
 - Reduction of functioning nephron number
 - Rise of pressure of tubular fluid
 - Renal artery embolism
- 22.** A 15-year-old boy has been diagnosed with acute viral hepatitis. What blood value should be determined to confirm acute affection of hepatic cells?
- Aminotransferase activity (AST, ALT)
 - Erythrocytes sedimentation rate (ESR)
 - Protein fraction content
 - Cholesterol content
 - Unconjugated and conjugated bilirubin content
- 23.** A newborn develops dyspepsia after the milk feeding. When the milk is substituted by the glucose solution the dyspepsia symptoms disappear. The newborn has the subnormal activity of the following enzyme:
- Lactase
 - Invertase
 - Maltase
 - Amylase
 - Isomaltase
- 24.** A child has abnormal formation of tooth enamel and dentin as a result of low concentration of calcium ions in blood. Such abnormalities might be caused by deficiency of the following hormone:
- Parathormone
 - Thyrocalcitonin
 - Thyroxin
 - Somatotropic hormone
 - Triiodothyronine
- 25.** A man has a considerable decrease in diuresis as a result of 1,5 l blood loss. The primary cause of such diuresis disorder is the hypersecretion of the following hormone:
- Vasopressin
 - Corticotropin
 - Natriuretic
 - Cortisol
 - Parathormone
- 26.** A patient with a history of chronic glomerulonephritis presents with azotemia, oliguria, hypo- and isosthenuria, proteinuria. What is the leading factor in the pathogenesis of these symptoms development under chronic renal failure?
- Mass decrease of active nephrons
 - Intensification of glomerular filtration
 - Tubular hyposecretion
 - Disturbed permeability of glomerular membranes
 - Intensification of sodium reabsorption
- 27.** A 20 year old patient complains of morbid thirst and hyperdiuresis (up to 10 l daily). Glucose concentration in blood

is normal but it is absent in urine. The patient has been diagnosed with diabetes insipidus. What hormonal drug is the most appropriate for management of this disorder?

- a. Vasopressin
- b. Cortisol
- c. Thyroxin
- d. Oxytocin
- e. Insulin

28. A 42 year old patient complains of pain in the epigastral area, vomiting; vomit masses have the colour of "coffee-grounds", the patient has also melaena. Anamnesis records gastric ulcer. Blood formula: erythrocytes - $2,8 \cdot 10^{12}/L$, leukocytes - $8 \cdot 10^9/L$, Hb- 90 g/L. What complication is it?

- a. Haemorrhage
- b. Penetration
- c. Perforation
- d. Canceration
- e. Pyloric stenosis

29. Blood analysis of a patient with jaundice reveals conjugated bilirubinemia, increased concentration of bile acids. There is no stercobilinogen in urine. What type of jaundice is it?

- a. Obstructive jaundice
- b. Hepatocellular jaundice
- c. Parenchymatous jaundice
- d. Hemolytic jaundice
- e. Cythemolytic jaundice

30. A 5-month-old boy was hospitalized for tonic convulsions. He has a lifetime history of this disease. Examination revealed coarse hair, thinned and fragile nails, pale and dry skin. In blood: calcium - 1,5 millimole/L, phosphor - 1,9 millimole/L. These changes are associated with:

- a. Hypoparathyroidism
- b. Hyperparathyroidism
- c. Hyperaldosteronism
- d. Hypoaldosteronism
- e. Hypothyroidism

31. Examination of a 42 year old patient revealed a tumour of adenohypophysis. Objectively: the patient's weight is 117 kg, he has moon-like hyperemic face, red-blue striae of skin distension on his belly. Osteoporosis and muscle dystrophy are present. AP is 210/140 mm Hg. What is the most probable diagnosis?

- a. Cushing's disease
- b. Cushing's syndrome
- c. Conn's disease
- d. Diabetes mellitus
- e. Essential hypertension

32. A 38-year-old female patient complains of general weakness, cardiac pain, increased appetite, no menstruation. Objectively: the height is 166 cm, weight 108 kg, the patient has moon-shaped face, subcutaneous fat is deposited mainly in the upper body, torso and hips. There are also blood-red streaks. Ps- 62/min, AP- 160/105 mm Hg. Which of the following diseases is the described pattern of obesity most typical for?

- a. Cushing pituitary basophilism
- b. Alimentary obesity
- c. Myxedema
- d. Insulinoma
- e. Babinski-Frohlich syndrome

33. A female patient with bronchial asthma had taken prednisolone tablets (1 tablet 3 times a day) for 2 months. Due to a significant improvement of her condition the patient suddenly stopped taking it. What complication is likely to develop in this case?

- a. Withdrawal syndrome
- b. Cushing's syndrome
- c. Gastrorrhagia

- d. Upper body obesity
- e. Hypotension

34. A patient with jaundice has high total bilirubin that is mainly indirect (unconjugated), high concentration of stercobilin in the stool and urine. The level of direct (conjugated) bilirubin in the blood plasma is normal. What kind of jaundice can you think of?

- a. Hemolytic
- b. Parenchymal (hepatic)
- c. Mechanical
- d. Neonatal jaundice
- e. Gilbert's disease

35. 14 days after quinsy a 15-year-old child presented with morning facial swelling, high blood pressure, "meat slops" urine. Immunohistological study of a renal biopsy sample revealed deposition of immune complexes on the basement membranes of the capillaries and in the glomerular mesangium. What disease developed in the patient?

- a. Acute glomerulonephritis
- b. Acute interstitial nephritis
- c. Lipoid nephrosis
- d. Acute pyelonephritis
- e. Necrotizing nephrosis

36. Due to the use of poor-quality measles vaccine for preventive vaccination, a 1-year-old child developed an autoimmune renal injury. The urine was found to contain macromolecular proteins. What process of urine formation was disturbed?

- a. Filtration
- b. Reabsorption
- c. Secretion
- d. Reabsorption and secretion
- e. Secretion and filtration

37. A patient with signs of osteoporosis and urolithiasis has been admitted to the endocrinology department. Blood test revealed hypercalcemia and hypophosphatemia. These changes are associated with abnormal synthesis of the following hormone:

- a. Parathyroid hormone
- b. Calcitonin
- c. Cortisol
- d. Aldosterone
- e. Calcitriol

38. A patient has been admitted to the contagious isolation ward with signs of jaundice caused by hepatitis virus. Which of the symptoms given below is strictly specific for hepatocellular jaundice?

- a. Increase of ALT, AST level
- b. Hyperbilirubinemia
- c. Bilirubinuria
- d. Cholemia
- e. Urobilinuria

39. A 41-year-old man has a history of recurrent attacks of heartbeats (paroxysms), profuse sweating, headaches. Examination revealed hypertension, hyperglycemia, increased basal metabolic rate, and tachycardia. These clinical presentations are typical for the following adrenal pathology:

- a. Hyperfunction of the medulla
- b. Hypofunction of the medulla
- c. Hyperfunction of the adrenal cortex
- d. Hypofunction of the adrenal cortex
- e. Primary aldosteronism

40. An unconscious patient was delivered by ambulance to the hospital. On objective examination the patient was found to present no reflexes, periodical convulsions, irregular breathing. After laboratory examination the patient was diagnosed with hepatic coma. Disorders of the central nervous system develop due to accumulation of the following metabolite:

- a. Ammonia
- b. Urea

- c. Glutamine
d. Bilirubin
e. Histamine
41. A 50-year-old man, who has been suffering from chronic hepatic failure for several years, has developed ascites. What is the main mechanism of this disorder development?
a. Increased pressure in portal vein system
b. Decrease of albumin and globulin synthesis in liver
c. Increased content of low-density and very low-density lipoproteins in blood
d. Neurotoxins appearing in blood
e. Increase of blood oncotic pressure
42. A 43-year-old patient suffers from acute pancreatitis with disrupted common bile duct patency. What condition can develop in this case?
a. Mechanical jaundice
b. Hemolytic jaundice
c. Hepatocellular jaundice
d. Hepatic coma
e. Portal hypertension
43. A 42-year-old patient complains of pain in the epigastric area, vomiting; vomit masses have the color of coffee-grounds; the patient suffers from melena. Anamnesis records gastric ulcer disease. Blood formula: erythrocytes - $2,8 \cdot 10^{12}/L$, leukocytes - $8 \cdot 10^9/L$, Hb- 90 g/L. What complication is it?
a. Hemorrhage
b. Penetration
c. Perforation
d. Canceration
e. Pyloric stenosis
44. Administration of doxycycline hydrochloride has caused an imbalance of the symbiotic intestinal microflora. Specify the kind of imbalance caused by the antibiotic therapy:
a. Dysbacteriosis
b. Sensibilization
c. Idiosyncrasy
d. Superimposed infection
e. Bacteriosis
45. Cholesterol content in blood serum of a 12-year-old boy is 25 mmol/L. Anamnesis states hereditary familial hypercholesterolemia caused by synthesis disruption of receptor-related proteins for:
a. Low-density lipoproteins
b. High-density lipoproteins
c. Chylomicrons
d. Very low-density lipoproteins
e. Middle-density lipoproteins
46. A patient presents with steatorrhea. This disorder can be linked to disturbed supply of the intestine with the following substances:
a. Bile acids
b. Amylase
c. Carbohydrates
d. Trypsin
e. Chymotrypsin
47. A patient with jaundice has high total bilirubin that is mainly indirect (unconjugated), high concentration of stercobilin in the feces and urine. The level of direct (conjugated) bilirubin in the blood plasma is normal. What kind of jaundice can be suspected?
a. Hemolytic
b. Parenchymal (hepatic)
c. Mechanical
d. Neonatal jaundice
e. Gilbert's disease
48. Poisoning caused by mercury (II) chloride (corrosive sublimate) occurred in the result of safety rules violation. In 2 days the patient's diurnal diuresis became 620 ml. The patient developed headache, vomiting, convulsions, dyspnea; moist crackles are observed in the lungs. Name this pathology:
a. Acute renal failure
b. Chronic renal failure
c. Uremic coma
d. Glomerulonephritis
e. Pyelonephritis
49. A 30-year-old woman exhibits signs of virilism (growth of body hair, balding temples, disturbed menstrual cycle). This condition can be caused by overproduction of the following hormone:
a. Testosterone
b. Prolactin
c. Relaxin
d. Oestriol
e. Oxytocin
50. After a severe stress a patient was found to have eosinopenia. In this case the decreased number of eosinophils can explain changes in the level of the following hormones:
a. Glucocorticoids
b. Adrenaline
c. Insulin
d. Mineralocorticoids
e. Vasopressin
51. A 46-year old woman suffering from cholelithiasis developed jaundice. Her urine became dark yellow, while feces are light colored. What substance will be the most increased in concentration in the blood serum in this case?
a. Biliverdine
b. Conjugated bilirubin
c. Urobilinogen
d. Mesobilirubin
e. Unconjugated bilirubin
52. A 40-year-old woman with Cushing's disease presents with steroid diabetes. On biochemical examination she has hyperglycemia and hypochloremia. What process activates in the first place to such patient?
a. Gluconeogenesis
b. Glycogenolysis
c. Glucose reabsorption
d. Glucose transport to the cell
e. Glycolysis
53. On examination the patient presents with hirsutism, moon-shaped face, stretch marks on the abdomen. BP is 190/100 mm Hg, blood glucose is 17,6 mmol/L. What pathology is such clinical presentation characteristic of/
a. Adrenocortical hyperfunction
b. Hypothyroidism
c. Gonadal hypofunction
d. Hyperthyroidism
e. Hyperfunction of the insular apparatus
54. A 50-year-old inpatient during examination presents with glucosuria and blood glucose of 3,0 mmol/L, which are the most likely to be caused by:
a. Renal disorder
b. Diabetes insipidus
c. Pellagra
d. Myxedema
e. Essential hypertension
55. Exophthalmus observed during thyrotoxicosis is caused by accumulation of highly water-binding substances within the retrobulbar tissues. Name these substances:
a. Phospholipids
b. Glycosaminoglycans
c. ATP
d. Cholesterol
e. Kreatine
56. A patient complaining of pain in the left shoulder-blade region has been diagnosed with myocardial infarction. What kind of pain does the patient have?
a. Radiating
b. Visceral

- c. Phantom
- d. Protopathic
- e. Epicritic

57. A patient got a gunshot wound of hip which damaged the sciatic nerve. Any impact on the affected limb causes severe, excruciating pain. What mechanism of pain is most likely in this case?

- a. Causalgic
- b. Reflex
- c. Phantom
- d. Endorphin hypofunction
- e. Enkephalin hypofunction

58. As a result of a trauma a patient has developed traumatic shock that led to the following disorders: AP is 140/90 mm Hg, Ps is 120 bpm. The patient is fussy, talkative, pale. Such state relates to the following shock phase:

- a. Erectile
- b. Latent period
- c. Terminal
- d. Torpid

59. As a result of a road accident a 26-year-old man is in the torpid phase of shock. Blood count: leukocytes - $3,2 \cdot 10^9/L$. What is the leading mechanism of leukopenia development?

- a. Leukocyte redistribution in the bloodstream
- b. Leukopoiesis inhibition
- c. Faulty release of mature leukocytes from the bone marrow into the blood
- d. Leukocyte destruction in the hematopoietic organs
- e. Increased excretion of the leukocytes from the organism

60. After a road accident a victim has tachycardia, arterial blood pressure 130/90 mm Hg, tachypnoe, the skin is pale and dry, excitation of central nervous system is observed. What shock stage is the patient most likely in?

- a. Erectile
- b. Terminal
- c. Torpid
- d. Preshock (compensation stage)
- e. Agony

61. A 27-year-old patient with injury to the neck has lost approximately 30% of the blood volume. The patient's condition is severe: blood pressure is 60/40 mm Hg, heart rate is 140/min., respiratory rate is 30/min., conscious. Characterize the condition of the patient's circulatory system:

- a. Hypovolemic shock
- b. Cardiogenic shock
- c. Collapse
- d. Coma
- e. Arterial hypertension

62. A 62-year-old patient has been hospitalized due to massive cerebral hemorrhage. Blood pressure is 70/30 mm Hg, heart rate is 120/min., respiratory rate is 4/min., unconscious, no response to external stimuli. Such condition can be determined as:

- a. Coma
- b. Shock
- c. Collapse
- d. Stress
- e. Agony

63. A victim of a traffic accident was taken to the intensive care unit. The patient is in a grave condition that can be characterized as a severe pathologic process that leads to exhaustion of vital functions and puts the patient into the marginal state between life and death due to critical reduction of capillary circulation in the affected organs. The patient is in the state of:

- a. Shock
- b. Coma
- c. Collapse
- d. Preagony

- e. Agony

64. A woman aged 67, who suffered from cholecystitis for a long time, after a meal suddenly has acute pain in the upper abdomen, nausea, vomiting. Diagnosis - acute pancreatitis. What is the main link of the pathogenesis of this disease?

- a. Premature activation of pancreatic enzymes
- b. Reduced secretion of pancreatic polypeptide
- c. Enhancement of enzymes in the duodenum
- d. Increased cholecystokinin level
- e. Decreased enzymes in pancreatic juice

65. The patient complains of heartburn, frequent constipation. During titration of gastric juice, the following data were obtained: total acidity - 88 t.u., total HCl - 83 t.u., free HCl - 50 t.u., bound HCl - 33 t.u., acidic phosphates and organic acids - 5 t.u. Evaluate the condition of acidity of gastric juice

- a. Hyperacidity
- b. Hypoacidity
- c. Achylia
- d. Normal
- e. Hypersecretion

66. A patient with Zollinger-Ellison syndrome [pancreatic tumor] has an increased secretion, peristalsis of the gastrointestinal tract, as well as diarrhea and peptic ulcer. Which of the following substances, which is secreted by the specified tumor, causes this complex of symptoms?

- a. Gastrin
- b. Vasoactive intestinal peptide
- c. Pepsin
- d. Trypsin
- e. Secretin

67. The gastrointestinal department got a 57-year-old patient suspected of having a Zollinger-Ellison syndrome, as evidenced by acute increase in gastrin levels in serum. What disturbance of the secretory function of the stomach is the most likely?

- a. Hypersecretory hyperacidic
- b. Hyposecretory hyperacidic
- c. Achylia
- d. Hyposecretion hypoacidic
- e. Hypersecretory hypoacidic

68. The patient, who has increased acidity of gastric juice, was recommended to eat boiled, not fried meat. This is due to the fact that the mechanism of extractives substances action consists in:

- a. Stimulation of gastrin production by G cells
- b. Irritation of taste receptors
- c. Irritation of the mechanoreceptors of the oral cavity
- d. Irritation of the mechanoreceptors of the stomach
- e. Stimulation of secretin production in I2-type intestine

69. After the poisoning with mushrooms, the patient has a yellow coloration of the skin and sclera, a dark color of urine appeared. What kind of pigment causes coloring urine in a hemolytic jaundice?

- a. Stercobilin
- b. Monoglycuronide of bilirubin
- c. Unconjugated bilirubin
- d. Verdoglobulin
- e. Biliverdin

70. A patient with chronic hepatitis complains of increased sensitivity to barbiturates, which she previously tolerated without symptoms of intoxication. With a violation of which of the liver function is this the most possible?

- a. Metabolic
- b. Bile formation
- c. Hemodynamic
- d. hemopoietic
- e. phagocytic

71. A woman 57 years after prolonged pain attack in the right subcostal area has jaundice, after which the patient visited the doctor. There was a suspicion of the appearance of acute

calculous cholecystitis. Research of what index of a blood test represents the bile duct obstruction?

- a. Conjugated and unconjugated bilirubin
- b. Protein fractions
- c. Total lipids
- d. Uric acid
- e. Residual nitrogen

72. The patient is 25 years old is diagnosed with chronic hepatitis. The patient complains of losing body weight by 10 kg for 2 hours months. Objectively: the skin is dry, peeling, pale yellowish shade, skin hemorrhage, bleeding gums. Violations of which the function of the liver shows hemorrhage and bleeding gums:

- a. Protein-Synthesizing
- b. Pigment-forming
- c. Glycogen-Synthesizing
- d. Detoxication
- e. Depositive

73. In a patient 24 years and one and a half weeks after severe streptococcal throat infection, facial swelling appeared, arterial pressure increased. Hematuria and proteinuria 1.2 g / L are found. In the blood, antibodies presence and reduction of complement components are detected. In which kidney structure the localization of immune complexes which determine the development of nephropathy is most likely?

- a. Glomerules
- b. Pyramid
- c. Proximal part of tubules
- d. Loop Henle
- e. Distal part of tubules

74. In a woman with primary hyperparathyroidism periodic attacks of the renal colic are repeated. An ultrasound examination showed the formation of small stones in the kidneys, the most likely cause of which is the presence of:

- a. Hypercalcemia
- b. Hyperphosphatemia
- c. Hypercholesterolemia
- d. Hyperuricemia
- e. Hyperkalaemia

75. The right leg of a 40-year-old woman measured at the shin level is by 2 cm smaller in the diameter than the left leg. Ankle-jerk (Achilles) and knee-jerk reflexes are absent on the right. What is the most likely mechanism of hyporeflexia development during peripheral paralysis?

- a. Disturbed conduction of stimulation
- b. Inhibition of pyramidal motoneuron
- c. Disturbed synaptic impulse transmission
- d. Activation of excitatory impulses from CNS
- e. Disturbed perception of stimulation

76. In human organism significant blood loss leads to decreased blood pressure, tachycardia and weakness. Eventually the sensation of thirst appears. What hormone participates in the development of this sensation?

- a. Angiotensin 2
- b. Serotonin
- c. Adrenalin

- d. Cortisol
- e. Dopamine

77. A 16-year-old girl presents with no hair on the pubis and in the armpits, her mammary glands are underdeveloped, no menstruations. What hormone imbalance can it be indicative of?

- a. Ovarian failure
- b. Pancreatic islet failure
- c. Hyperthyroidism
- d. Hypothyroidism
- e. Adrenal medulla hyperfunction

78. A lab rat has subcutaneously received mercury (II) chloride in the amount of 5 mg/kg. 24 hours later the plasma creatinine concentration increased several times. What mechanism of retention azotemia is observed in this case?

- a. Decreased glomerular filtration
- b. Increased creatinine production in the renal tubules
- c. Increased glomerular filtration
- d. Increased creatinine production in the muscles
- e. Increased creatinine reabsorption

79. A 19-year-old male was examined in the nephrology clinic. High potassium level was found in his secondary urine. What hormone excess is likely to cause such change?

- a. Aldosterone
- b. Oxytocin
- c. Adrenaline
- d. Glucagon
- e. Testosterone

80. After a case of sepsis a 27-year-old woman developed "bronzed" skin discoloration, characteristic of Addison's disease. Hyperpigmentation mechanism in this case is based on increased secretion of:

- a. Melanocyte –stimulating hormone
- b. Beta-lipotropin
- c. Gonadotropin
- d. Thyroid stimulating hormone
- e. Somatotropin

81. During removal of the hyperplastic thyroid gland of a 47-year-old woman, the parathyroid gland was damaged. One month after the surgery the patient developed signs of hypoparathyroidism: frequent convulsions, hyperreflexia, laryngospasm. What is the cause of the patient's condition?

- a. Hypocalcemia
- b. Hyponatremia
- c. Hyperchlorhydria
- d. Hypophosphatemia
- e. Hyperkalemia

82. Encephalopathy has developed in a child with hemolytic disease of the newborn. What substance had increased in the child's blood resulting in damage to CNS?

- a. Unconjugated bilirubin
- b. Bilirubin glucuronide
- c. Verdohemoglobin
- d. Bilirubin-albumin complex
- e. Bile acids