

MINISTRY OF HEALTH OF UKRAINE  
ZAPORIZHZHIA STATE MEDICAL UNIVERSITY  
Department of Pathophysiology with Course of Normal Physiology

# **GENERAL PATHOPHYSIOLOGY**

**MANUAL FOR THE STUDENTS OF THE 3<sup>RD</sup> COURSE**

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

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

Zaporizhzhia

2023

UDC 616-092(075.8)

G34

*Approved on meeting of Central methodical council-board of ZSMU  
and recommended for application in the process of study  
(protocol № 6 dated 19.01.2023)*

**Authors:**

*Olga Valeriivna Melnikova* – associate professor, PhD  
*Tatyana Anatolivna Grekova* – associate professor, PhD  
*Taras Vasylevich Ivanenko* – associate professor, PhD  
*Yelizaveta Vitalivna Kadzharyan* – associate professor, PhD  
*Maksim Viktorovich Danukalo* – associate professor, PhD  
*Maria Igorivna Isachenko* – associate professor, PhD

**Reviewers:**

*I. F. Belenichev* - MD, PhD, DSc, Professor, Head of the Department of Pharmacology and Medical Formulation with Course of Normal Physiology

*S. I. Tertyshnii*, Professor, MD, PhD, DSc, Professor, Head of the Department of Pathologic Anatomy and Forensic Medicine

G34

**General Pathophysiology:** Manual for the students of the 3<sup>rd</sup> course of international faculty speciality “General medicine” English medium of instruction / O.V. Melnikova [et al.]. – Zaporizhzhia : [ZSMU], 2023. – 76 p.

**UDC 616-092(075.8)**

©Melnikova O. V., Ivanenko T. V., Grekova T. A., Kadzharyan Y. V., Danukalo M.V., Isachenko M.I. 2023.  
©Zaporizhzhia State Medical University, 2023.

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

## LECTURE PLAN (PART 1, 5<sup>th</sup> semester)

**5<sup>th</sup> semester - 75 hours: lectures – 16, pr.classes – 30, independent work - 29**

	TOPIC	Hours
1.	Pathophysiology as a science. General etiology and pathogenesis. General mechanisms of cell injury and death.	2
2.	Allergy: classification, etiology, stages and mechanisms of development, clinical manifestation. Pathogenesis of autoimmune processes.	2
3.	Inflammation: local and general signs, pathogenesis of vascular and cellular events. Principles of classification and biological importance of inflammation.	2
4.	Thermoregulation pathology. Hyperthermia and hypothermia. Fever: etiology, pathogenesis, stages of development. Biological importance of fever.	2
5.	Pathology of tissue growth. Tumor etiology, pathogenesis, stages of development. Benign and malignant tumors.	2
6.	Disturbances of carbohydrates metabolism. Diabetes mellitus: definition, etiology, pathogenesis, classification, clinical manifestation and complications.	2
7.	Alterations of acid-base balance and water-electrolyte metabolism. Acidosis and alkalosis pathogenesis, mechanisms of compensation. Mechanisms of edema development. Disturbance of proteins and lipids metabolism.	2
8.	RBC pathology. Anemia and erythrocytosis	2

## PRACTICAL CLASSES PLAN (PART 1, 5<sup>th</sup> semester)

	TOPIC	Hours
1.	General etiology and pathogenesis of diseases.	2
2.	Radiant energy influence on the organism. Radiation sickness	2
3.	Pathology of reactivity. Disturbances of immunological reactivity: immunodeficiency	2
4.	Disturbances of immunological reactivity: allergy, autoimmune reactions.	2
5.	Disturbances of peripheral bloodflow and microcirculation.	2
6.	Alteration and microcirculation changes during inflammation.	2
7.	Phagocytosis and proliferation in inflammation	2
8.	Thermoregulation pathology. Fever. Hypothermia, hyperthermia.	2
9.	<b>Section 1 Intermediate Control “General nosology, Typical pathological processes”</b>	2
10.	Tissue growth pathology. Tumors.	2
11.	Hypoxia.	2
12.	Disturbance of carbohydrate metabolism. Diabetes mellitus.	2
13.	Pathology of ABB and water-electrolyte metabolism. Edema.	2
14.	Disturbance of protein and lipid metabolism. Starvation, obesity, gout.	2
15.	<b>PART 1 FINAL SEMESTER CONTROL</b>	2

**UNIT 1 \_\_\_\_\_(date)**  
**GENERAL ETIOLOGY AND PATHOGENESIS OF DISEASES.**  
**RADIANT ENERGY INFLUENCE ON ORGANISM.**

1. Subject, tasks and methods of pathophysiology. Types and planning of experiment.
2. Nosology – the science about disease; general definitions: health, disease, pathological reaction, pathological process, pathological state.
3. Etiology: definition, classification of etiological factors.
4. Pathogenesis: definition, sequence of events in disease pathogenesis.
5. Disease: definition, classification, disease stages.
6. General principles of diseases treatment.

**1. Give the definitions to the following terms:**

**Pathophysiology** \_\_\_\_\_

**Etiology** \_\_\_\_\_

**Pathogenesis** \_\_\_\_\_

**Pathological reaction (give an example)** \_\_\_\_\_

**Pathological process (give an example)** \_\_\_\_\_

**Pathological state (give an example)** \_\_\_\_\_

**Health** \_\_\_\_\_

**Disease** \_\_\_\_\_

**2. Fill the table «Types of etiologic factors»**

Type of etiologic factor	Examples
physical	
chemical	
biological	
hereditary	
social	
psychogenic/informational	
iatrogenic	

**3. Fill the table “The role of conditions in disease development”**

<b>Internal conditions</b>	<b>External conditions</b>

**4. Fill the table “Disease stages”**

<b>Stage</b>	<b>Clinical manifestation</b>	<b>Examples</b>

**5. Fill the table “General principles of diseases treatment”**

<b>Type of therapy</b>	<b>Examples</b>

**Teacher’s signature**

\_\_\_\_\_



**UNIT 2 \_\_\_\_\_(date)**  
**RADIANT ENERGY INFLUENCE ON ORGANISM. RADIATION SICKNESS**

1. Pathogenic effect of ionizing radiation:
  - a. ionizing and penetrating abilities of different types of ionizing radiation
  - b. water radiolysis, concept of radiotoxins;
  - c. mechanism of direct and indirect radiation damage of biological structures;
  - d. definition of tissues radiosensitivity and mechanisms of it;
2. Acute radiation sickness. Pathogenesis and classification of bone marrow form, intestinal form, toxemia form, and cerebral form.
3. Stages of acute radiation sickness bone marrow form. Its mechanisms of development, mechanisms of main clinical manifestations, blood count.
4. Chronic radiation sickness. Mechanism of clinical manifestations development. Remote consequences effect of big and small doses of ionizing radiation on organism.
5. Pathophysiological basement of radioprotection. Definition of radioprotectors. Principles of their classification.
6. Mechanisms of general and local effects of infra-red rays, ultra-violet rays and visible spectrum section on organism.
7. Definition of photosensitization and photosensitizers. Mechanism of photosensitizers influence on human organism.

**1. Fill the table “Pathogenic effect of ionizing radiation”**

<b>Direct radiation damage</b>	
<b>Water radiolysis</b>	
<b>Indirect radiation damage</b>	
<b>Definition of radiotoxins</b>	
<b>The effects of radiotoxins on the cell structures</b>	proteins lipids nucleic acids
<b>The effects of radiotoxins on the whole cell</b>	

**2. Fill the table “Forms of acute radiation sickness”**



	Bone marrow	Intestinal	Toxemia	Cerebral
radiation dose				
clinical symptoms				
outcome				

**3. Fill the table “Clinical manifestation and laboratory indices of acute radiation sickness bone marrow form”**

Stage	Clinical symptoms	Laboratory indices

**4. Fill the table “Influence of UV and IR rays on the human body”.**

	Positive influence	Negative influence
UV rays		
IR rays		

**Pathophysiological substantiation of radioprotection** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

<b>Enzymatic antioxidants</b>	
<b>Non-enzymatic antioxidants</b>	

### Task 1

The research of organism tissues radio sensitivity has such results. Muscular, nervous, bone tissues are the less radio sensitive; the most sensitive are lymphoid organs, bone marrow, and mucous cover of GIT organs.

1. What is tissues radio sensitivity?
2. What does radio sensitivity of tissues and organs depend on? Explain why it is so?

---



---

### Task 2

Patient D., 30 years old, is a worker at nuclear power plant. He has already been 3 days at the hospital because of acute radiation sickness typical form development. He took radiation dose of 4 Gray. The patient says that he has recovered and doesn't have any complaints.

1. Has the patient recovered?
2. Why does the patient feel better if he hasn't recovered yet?
3. Which blood changes are possible at this stage of acute radiation sickness?

---



---



---

### Task 3

Patient L., 65 years old went to the hospital. He has already been living in the estrangement zone (20 km zone around nuclear power plant). He complains of: AP increase, palpitation, marked weakness, giddiness, weight loss, diarrhea, hemorrhages from nose and gums. Total blood count: erythrocytes  $3,5 \cdot 10^{12}/L$ , leukocytes  $2,1 \cdot 10^9/L$ ; thrombocytes  $80 \cdot 10^9/L$ .

1. Name the pathology that has developed in the patient.
2. What blood analysis changes and clinic symptoms does the patient have? Explain the mechanism of their development.

---



---



---

**Teacher's signature**

---

**THE ROLE OF REACTIVITY IN PATHOLOGY.  
DISTURBANCES OF IMMUNOLOGICAL REACTIVITY.**

1. Reactivity and resistance: definition, their interrelation, types. Mechanisms of reactivity and resistance formation (general, non-specific, specific).
2. Definition of human constitution: its role in pathology, classification of constitutional type. Definition of diathesis, its types.
3. Organs and tissues of immune system. Specific and nonspecific immunity mechanisms.
4. Immunological reactivity: humoral and cellular mechanisms of primary immune response. Antigen presentation. Mononuclear phagocyte function.
5. Mechanism of natural and induced immunological tolerance formation.
6. Primary immunodeficiency. Clinical manifestation, examples of diseases.
7. Secondary immunodeficiency: causes and mechanisms of development. Pathogenesis of immune deficiency in HIV infection. Clinical manifestation of HIV infection.

**1. Fill the table “Characteristics of immune system organs and tissues”**

	<b>Central</b>	<b>Peripheral</b>
Organ		
Processes		

**2. Fill the table “Primary immunodeficiencies”**

<b>Disease</b>	<b>Altered immunity mechanism. Laboratory findings</b>	<b>Clinical manifestation hallmarks</b>
Bruton’s disease		
Di George syndrome		
Louis-Bar syndrome		
Wiskott-Aldrich syndrome		
Chediak Higashi syndrome		
Severe Combined Immune Deficiency		

--	--	--

**Task 1**

During winter epidemic period of influenza 25% of students had the severe form of disease, 55% - moderate clinical manifestation of it and 20% remained clinically healthy. Laboratory data of the students' examination: virus of influenza was revealed in 95% of students, in 5% - wasn't detected.

1. Which type of reactivity was studied?
2. Explain this situation. Which factor determines the reaction of the organism to infectious pathogen?

---

---

---

---

**Task 2**

The parents of a 6 year-old-girl complain of her frequent viral and bacterial infections. They are also concerned about her unstable gait. The dilation of small vessels is observed on the skin of face, ears and conjunctiva.

Which disorder is observed in the patient?

---

**Task 3**

Persons with impaired cellular immunity may not respond to the tuberculin test (Mantoux reaction) even when infected with *Mycobacterium tuberculosis*.

1. Explain the meaning of positive and negative result of Mantoux reaction.
2. Explain the phenomenon which is described

---

---

---

**Task 4**

The lack of antibody production to the antigen can occur in the following experimental cases:

1. if the administration of antigen is followed with injection of glucocorticoids;
2. if antigen is administered in an excessively big dose;
3. if the experimental animal was irradiated before the introduction of antigen;
4. if the antigen was administered in combination with immunosuppressive drugs;
5. if the antigen is injected into the embryo;
6. if the system of mononuclear phagocytes was blocked or overloaded before the introduction of the antigen;

1. Define which of these cases will result in the development of immune deficiency \_\_\_\_\_  
or immune tolerance \_\_\_\_\_
2. What is the difference between immune deficiency and immune tolerance?

---

**Teacher's signature** \_\_\_\_\_

**DISTURBANCES OF IMMUNOLOGICAL REACTIVITY. ALLERGY**

1. Classification of allergic reactions according to Coombs and Gell. Etiology of allergy, types of allergens. Distinctive and common features of allergy and immunity.
2. Type 1 allergic reactions (anaphylactic): mechanisms, main clinical forms.
3. Type 2 allergic reactions (cytotoxic): mechanisms of development, main clinical forms.
4. Type 3 allergic reactions (immunocomplex): mechanisms, main clinical forms. Immune complexes pathogenic effect. Serum disease.
5. Type 4 allergic reactions (delayed hypersensitivity): mechanisms, main clinical forms. The role of lymphokines. Immune mechanisms of transplant rejection. Mechanism and ways of transplant rejection prevention.
6. Pseudoallergic reactions. Causes and mechanisms of development.
7. Autoallergic diseases. Causes and mechanisms of development.

**1. Fill the table “Types of allergic reactions”**

Type of reaction	Antigen way of entrance and location	Ig or effector cells	Mediators, factors causing cell injury	Examples of diseases
1				
2				
3				
4				
5				

**2. Fill the table «Mechanisms of autoimmune diseases development»**

<b>Mechanism</b>	<b>Reason</b>	<b>Example of disease</b>
Sequestered antigens contact with immune cells		
Alteration of the self antigens		
Molecular mimicry		
Alteration of MHC molecules expression on the cells' membrane		

**3. Fill the table «The difference between allergic and pseudoallergic reactions»**

<b>Sign</b>	<b>Allergic reaction (1<sup>st</sup> type)</b>	<b>Pseudoallergic reaction</b>
Atopic diseases in patient and his family		
Dependence of clinical symptoms from the dose of antigen		
IgE blood level		

**Task 1.**

Patient was injected with Novocaine solution in order to provide local anesthesia during tooth extraction. In 1 minute after injection the patient turned pale and unconscious. ABP – 90/60 mmHg, heat rate – 128 bpm.

1. What has happened to the patient? Define the disease.
2. Which type of allergic reaction can be the reason of the patient's state?
3. Describe the pathogenesis of the described clinical signs.

---



---



---



---

**Task 2**

A 32-year-old man presents in the allergy clinic with complaints of allergic rhinitis or hay fever. His major complaints are 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.”

1. Explain the immunologic mechanisms that are responsible for this man's symptoms.
2. What type of diagnostic tests might be used?

---



---



---

**Task 3.**

Patient complains of the skin rashes, which appear after cooling the skin (cold water or cold air exposure). After returning from the street in the winter the opened areas of the skin turn red (hyperemia) and itches appear.

1. Is it an allergic reaction, or no? Prove your answer.
2. Explain the pathogenesis of the described clinical signs.

---

---

---

**Task 4**

A patient 22 years old is ill with diphtheria. Skin rashes, itching, pain in the joints and high fever (up to 39<sup>0</sup> C) appeared in the patient in 9 days after the injection of diphtheria antitoxin serum. The level of complement in the blood serum is decreased.

1. Define the pathology which is observed after diphtheria antitoxin serum injection.
2. Is low blood complement level typical for this disease? Why?
3. Which substances provide the development of the described clinical signs?

---

---

---

**Task 5**

A nurse complains of the rashes on the skin of the hands. Her usual work is to do injection of antibiotics and other medicines to the patients. The symptoms of the skin irritation usually disappear during summer vacations. In 7-10 days after working with the solutions of medicines the symptoms of rashes appear again.

1. Define the type of allergic reaction.
2. Explain the pathogenesis of the described clinical signs.
3. Which substances provide the development of the described clinical signs?

---

---

---

---

**Task 6**

Patient K., 50 years old with exacerbation of chronic purulent otitis media was treated with Cephalosporins for 3 weeks. He developed symptoms of anemia to the 20-th day of treatment by antibiotics. Blood serum analysis revealed antibodies against erythrocytes.

1. Describe the mechanism that has caused anemia in the patient.
2. How are antibiotics involved in this process?

---

---

---

**Teacher's signature**

---

**DISTURBANCES OF PERIPHERAL BLOODFLOW AND MICROCIRCULATION**

1. Arterial hyperemia: definition, types, mechanisms of development, consequences.
2. Venous hyperemia: definition, types, mechanisms of development, consequences.
3. Ischemia: definition, causes, types, pathogenesis, consequences. Infarction: types and mechanisms of development
4. Stasis: definition, causes, pathogenesis, consequences. Types and mechanisms of stasis.
5. Thrombosis: definition, types, mechanism of thrombus formation.
6. Embolism: definition, types of embolism. Embolism of pulmonary and systemic blood circulation.

**Experimental work. Demonstration of peripheral blood circulation changes in human.**

Put the rubber tourniquet on the arm of student-volunteer until pulse disappearance on arteria radialis. Fixate in such position for 30 seconds. Observe the development of ischemia. Then gradually loose the tourniquet up to pulse appearance and then fixate again. Observe the development of venous hyperemia. After the removal of tourniquet observe the development of arterial hyperemia.

In experimental results: describe the signs of peripheral blood circulation disturbance modeled in experiment.

	color of the skin	temperature of the skin
ischemia		
venous hyperemia		
arterial hyperemia		

**Task 1**

The sportsman felt his extremities hot after body-building exercises; the color of the skin was red and hot to the touch.

1. What kind of peripheral blood circulation disturbance had developed in sportsman? Explain the mechanism of redness and increased skin temperature.
2. What is the possible negative consequence of it?
3. Which other types of this disorder do you know?

---



---



---

**Task 2**

Patient G. has got a wound of the arm. The nurse dressed a wound with a tight bandage. In a few hours he felt pain in the wounded arm, the skin color turn pale, its temperature decreased.

1. Which violation of peripheral blood circulation has developed in patient? Define the type of it.
2. Explain the pathogenesis of pain, low temperature and paleness of the skin.
3. Which other negative consequences can occur if the bandage will not be removed?



---

---

---

---

---

---

**Task 3**

A 45-year-old patient complains of increasing pain in his leg muscles occurring during walking and forcing him to make frequent stops. Objectively: skin of legs is pale, no hair-covering, toenails are with atrophic changes, no pulsation of pedal artery. A doctor proposed him surgical treatment: ganglionic sympathectomy of femoral artery.

1. Which violation of peripheral blood circulation is present in the patient?
2. Explain the clinical signs (absence of hair, nails atrophy).
3. Why proposed type of treatment may be effective in the patient?

---

---

---

---

---

---

**Task 4**

Patient A., 50 years, is suffering from diabetes mellitus for 5 years. He has been working as a salesman for 30 years. The patient complains about pains in the legs. Clinical examination of the legs: edema, skin is cyanotic and cool, small subcutaneous hemorrhages.

1. Which violation of peripheral blood circulation has developed in patient?
2. Explain the mechanism of edema, low skin temperature and subcutaneous hemorrhages.
3. Which complication may develop in this patient
- 4.

---

---

---

---

---

---

**Task 5**

The same disorder of peripheral bloodflow will develop in the following persons:

- in the pilots and passengers in a case of an airplane depressurization during the flight;
- in a diver who is lifted up to the surface very fast.

1. What kind of peripheral blood circulation disorders will develop? Explain the mechanism of it.
2. Define the common condition in the described situations.

---

---

---

---

---

---

**Task 6**

The driver T. has got a trauma of the neck with the damage of jugular vein.

1. Which kind of peripheral blood circulation disturbance will develop in the patient?
2. Explain the mechanism of its development.
3. Can this disturbance be prevented? If yes, how it can be done?

---

---

---

---

**Task 7**

Patient B., 30 years old, has got a fracture of right femur bone. During reposition of bone's parts patient suddenly turned cyanotic, felt an acute pain in the left side of chest, which was enhanced with breathing; palpitation, short breath and feeling of fear. Computer tomography showed lung infarction.

1. What has happened to the patient?
2. Name all the disorders of peripheral bloodflow that has developed in the patient by their sequence of occurrence

---

---

---

---

---

**Task 8**

The experiment was held on laboratory rat: ethyl alcohol was injected into the vessels of mesentery. Right after the injection the speed of bloodflow was decreased, erythrocytes become to aggregate.

1. What kind of peripheral blood circulation disturbance had developed in patient?
2. Define its type and name other possible causes of development

---

---

---

---

**Task 9**

The development of thrombosis was provided in the experiment on laboratory animal.

1. What conditions are favorable for thrombus formation?
2. What type of vessels do thrombi usually form in? Why?
3. What complications of thrombosis do you know?

---

---

---

**Teacher's signature**

---

**UNIT 6** \_\_\_\_\_ (date)

**INFLAMMATION. ALTERATION AND VASCULAR EVENTS.**

1. Inflammation: definition, etiology, characteristic, stages.
2. Primary and secondary alteration: causes and mechanisms. Physical and chemical changes in inflammatory site. The role of alteration in pathogenesis of inflammation.
3. Inflammation mediators, their origin, mechanisms of action. Alteration importance.
4. Local blood circulation disturbance in inflammation. Vascular reactions order under inflammation, their mechanisms and importance.
5. Exudation mechanisms in inflammation center. Causes and mechanisms of blood vessels penetrations extension. Inflammatory edema pathogenesis. Exudation importance.

**1. List the reasons of inflammation:**

		<b>Examples</b>
Exogenous	Infectious	
Exogenous Non-infectious	physical	
	chemical	
	biological	
Endogenous	products of tissue decay	
	chemical agents	

**2. Fill the table “Local signs of inflammation and mechanism of their development”**

<b>Sign (in English)</b>	<b>Mechanism of development</b>
Tumor/	
Rubor/	
Calor/	
Dolor/	
Functio laesa/	

**3. Fill the table “Systemic signs of inflammation”**

<b>Sign</b>	<b>Mechanism of development</b>
Fever	
Leukocytosis	
High globulins level	
High ESR	

**4. Fill the table “The sequence of vascular reactions in inflammation”**

Vascular reaction	Mechanism of development

**5. Explain the mechanisms of:**

Primary alteration \_\_\_\_\_

Secondary alteration \_\_\_\_\_

Exudation: 1) \_\_\_\_\_

2) \_\_\_\_\_

3) \_\_\_\_\_

**6. Fill the table “Basic effects of inflammation mediators”**

	Vascular permeability	Tone of smooth muscles	Pain	Cell injury	Emigration, chemotaxis	Leukocytes adhesion	Opsonization	Fever
Histamine								
Serotonin								
Prostaglandines								
Leukotriens								
Prostacyclin								
Thromboxan								
Lyzosomal enzymes								
Cytokines								
Bradykinine								
C3a, C5a, C5								
NO								
Reactive oxygene species								

### Task 1

Patient A., 35 years old, has got a burn of arm, its size was 2×2 cm. During repeated examination 2 days later it was observed that the size of inflammation site increased up to 4×3 cm, skin around it was cyanotic, painful, with high tension.

1. Why site of inflammation had been increased?
  2. Which factors take part in this process?
- 
- 
- 

### Task 2

Some drops of turpentine (aggressive chemical) were put on the eye conjunctiva of laboratory animal. 15 minutes later expressed inflammation appeared: redness of conjunctiva, dilation of mucosal membrane's capillaries, swelling and pain.

1. Will the inflammation develop if the eye will be under anesthesia? Explain your answer.
  2. What is the mechanism of pain development in the inflammation?
- 
- 
- 

### Task 3

Patient F., 30 years old, had made tuberculin skin test – Mantoux reaction (intracutaneous injection 2 TU of tuberculin) – for diagnostic purpose. 24 hours later in site of injection painful red infiltration appeared, its size was 25 mm. Body temperature was increased to 37,2 °C. A doctor estimates such reaction as positive hyperergic.

1. Which signs are the evidence of inflammation's development in patient? Prove your answer.
  2. What is mechanism of primary alteration in this case?
  3. Explain the mechanism of inflammatory site increase.
- 
- 
- 

### Task 4

Patient S., 20 years old was hospitalized in the surgical department with the complaints about nausea and pain in the right side of the lower abdomen. Body temperature 37,8° C. Blood count: RBC –  $3,9 \cdot 10^{12}/L$ , WBC –  $25 \cdot 10^9/L$ , erythrocytes sedimentation rate – 34 mm/hour.

1. Which typical pathological process has developed in the patient? Try to define the disease.
  2. Which signs of inflammation are observed in the patient? Explain the mechanisms of their development.
- 
- 
- 

Teacher's signature

---

**UNIT 7** \_\_\_\_\_ (date)

**INFLAMMATION. CELLULAR EVENTS AND PROLIFERATION.**

1. Leukocytes emigration mechanisms in inflammation center. Leukocytes marginal standing, its mechanisms.
2. Leukocytes role in development of inflammation local and general manifestation. Phagocytosis importance.
3. Regeneration and repair mechanisms. Difference between regeneration and repair
4. Inflammation classification principles. Role of reactivity, neural and hormonal factors in inflammation development. Inflammation outcomes.
5. The difference between acute and chronic inflammation; their peculiarities

1. Fill the table “Role of the cells in inflammation”

The cell	Which substances secrete and release	Role in inflammation
Macrophages: fixed and mobile		
Mast cells		
Neutrophils		
Eosinophils		
Thrombocytes		
T- and B- lymphocytes		
Fibroblasts		

2. Fill the table “Differences between acute and chronic inflammation”

Sign	Acute inflammation	Chronic inflammation
Reason/causes		
Time of duration		
Vascular reactions		
Exudation and edema		
Local signs		
General signs		
The sequence of stages		
Prevailing stage		
Prevailing cells		

3. Fill the table “Types of exudate”

Exudate	Content
Serous	
Catarrhal	
Fibrinous	Croupous                                  Diphteric
Purulent	
Putrefactive	
Hemprrhagic	

**Task 1**

Patient C., 51 years old, with diagnosis “acute peritonitis”. After paracentesis (puncture of abdominal cavity) liquid was obtained which had the following features: yellow color with green tint, density 1,029; proteins content – 3,9 %. In a sediment: high amount of neutrophils with degenerative forms presence and purulent bodies.

1. What type of liquid was obtained after paracentesis?
2. Explain the mechanism of liquid appearance in abdominal cavity.

---



---



---



---

**Task 2**

Patient U. was brought to the hospital with the suspicion of diphtheria. The following signs were observed after examination: the mucosal membrane of throat was red and covered with grey thin coating, which was tightly connected with underlying tissues. Body temperature was 39°C, tachycardia, tachypnea, skin was pale and humid.

1. What type of inflammation (alterative, exudative, proliferative) is present in this case?  
Prove your answer.
2. Explain the mechanism of thin coating formation on the mucosal membrane of the throat.
3. Which factor determines the type of exudative inflammation?

---



---



---



---

**Task 3**

Patient B., 65 years old, with diagnosis “heart failure”. During patient’s examination it had been revealed accumulation of liquid in abdominal cavity (ascites). After diagnostic puncture liquid obtained that had the following features: transparent, color was light-yellow, density – 1,014; proteins content 1,8 %. In sediment: single cells (most of them are lymphocytes).

1. What type of liquid was obtained after paracentesis?
2. Does the patient have signs of inflammation?
3. Suppose the mechanism of liquid accumulation in abdominal cavity

---

---

---

---

**Task 4**

The experiment was held on laboratory mice: 0,2 ml of bacterial solution with  $5 \times 10^8$  pneumococci was injected intraperitoneally. The average life span after injection was about 8 hours. The same amount of bacterial solution was injected to another group of laboratory mice, which were previously (2 hours) injected with 0,5 ml of neutral dust particles sterile solution. The average life span in this was about 3 hours.

1. Explain the mechanism of life span shortening in the second group of experimental animals.

---

---

---

---

**Task 5**

Two rabbits with experimental inflammation modelled by burn on the right hind leg were injected with the same dose of lethal toxin. The injection of lethal toxin was made into the site of inflammation in one rabbit and out of the inflammatory site – in another rabbit. In 20 hours it was revealed that one rabbit has died.

1. Which of the animals has died and why?

---

---

---

---

**Task 6**

Patient C, 48 years, complains of the pain and limitation of movements in the right leg, periodical temperature increase ( $37,2- 37,7$  °C). Clinical examination: enlargement of the right knee, pain during palpation, decreased volume of the muscles. Puncture of the knee joint: obtained 5 ml of the serous liquid with high amount of monocytes and lymphocytes, single neutrophils, single tubercle bacilli.

1. Define the type of inflammation in the patient.
2. Why this infectious agent causes chronic inflammation development?

---

**Teacher's signature**

---



**THERMOREGULATION PATHOLOGY. FEVER**

1. Normal thermoregulation mechanisms.
2. Definition of fever. Etiology and types of fever.
3. The role of primary and secondary pyrogens in fever development.
4. Fever pathogenesis. Changes of organs' functions and metabolism in different fever stages.
5. Hyperthermia: stages, mechanism of development.
6. The difference between fever and hyperthermia. Biological importance of fever
7. Pathogenesis of heatstroke and sunstroke.
8. Hypothermia stages, mechanism of development.

**1. Fill the table “Thermoregulation in Fever stages”**

<b>1</b>	<b>2</b>	<b>3</b>
Heat loss		
Heat production		

**2. Describe the differences between fever and hyperthermia**

<b>Feature</b>	<b>Fever</b>	<b>Hyperthermia</b>
Reason		
Main link of pathogenesis		
Thermoregulation state		
Symptoms		
Ways of treatment		
Biological meaning		

**Task 1**

Patient V., 32 years old had complaints about headache, weakness, muscle pains, stuffiness in nose in the morning. In 3 hours the temperature raised to 38,4<sup>0</sup>C, heart rate – 98 bpm, breaths frequency – 26 per minute. Diagnosis: acute respiratory viral infection.

1. What is the source of the primary pyrogens in this case?
2. Explain the mechanism of increased heart rate, breaths frequency and the meaning of it.
3. Should this case of fever be treated with medicines? Why?

---



---



---

### Task 2

Patient T, 47 years old, delivered to the hospital by ambulance complains of increasing pain behind sternum and in the epigastrical area during a day. During patient's examination were found: paleness of skin, increased sweating, acrocyanosis, body's temperature 37,6°C, ABP 100/65 mmHg, heart rate – 100 bpm. The analysis of ECG revealed acute myocardial infarction.

1. What is the cause of temperature increase in this case? Name the source of primary pyrogens.
2. Should this patient be prescribed antipyretic medicines? Why?

---

---

---

### Task 3

Patient M., 52 years old. Diagnosis: bronchial asthma. Patient is treated with glucocorticoids. Fever reaction appeared as a result of post-injective abscess development. Subfebrile temperature didn't correspond to severity of inflammatory process.

1. Why patient has low fever reaction?
2. Which factor determines the level of body temperature increase in the fever?

---

---

### Task 4

A child 5 years old spent several hours in the closed car which was staying under the sun. When the child was found his body temperature was 39,7°C, heart rate – 145 bpm, breaths quantity 33 per minute; he was wet of sweating and had single convulsions. The doctor prescribed a dropper with saline and adrenaline.

1. Define the pathology and stage of its development. Define the vicious circles in pathogenesis.
2. Explain the prescriptions of the doctor

---

---

---

---

### Task 5

Patient T, 27 years old, was operated for mitral insufficiency. Systemic controlled hypothermia was conducted and his body's temperature was decreased to 34°C after narcosis. The operation on the dry heart, which lasted for 40 minutes, was effective.

1. Explain, why hypothermia was conducted to the patient?
2. Explain, why organism is less sensitive for intoxication, infection, hypoxia, and other injuries during hypothermia.

---

---

---

---

Teacher's signature

---

## UNIT 9 \_\_\_\_\_(date)

### SECTION 1 INTERMEDIATE CONTROL Checking of practical skills and theoretical knowledge

#### «GENERAL NOSOLOGY. PATHOGENIC INFLUENCE OF THE ENVIRONMENTAL FACTORS. PATHOLOGY OF REACTIVITY. TYPICAL PATHOLOGICAL PROCESSES ».

To be allowed to pass INTERMEDIATE CONTROL 1 the student should:

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

#### PRACTICAL SKILLS

##### 1. Students should be able to analyze:

- basic definitions of the general nosology (health, disease, remission, relapse complication, pathological reaction, pathological process, pathological state, etiology, pathogenesis, reactivity, resistance, adaptation, compensation );
- etiological factors influence on the organism (causes, risk factors, conditions of diseases development);
- mechanisms of pathogenic and sanogenic influence of physical, chemical and biological factors;
- causality-effective relations in pathogenesis (to define local and general changes, pathogenic and adaptive, specific and non-specific events, the leading event in the pathogenesis of disease);
- causes, mechanisms of development, signs and consequences of cell's injury;
- disturbances of immune system function (immune deficiency, allergy);
- mechanisms of cells, tissues and organs allergic injury (due to Gell and Coombs classification);
- the role of reasons and conditions in typical pathological processes onset and development;
- typical pathological processes due to the principles of their classification, clinical manifestation and outcomes;
- the role of typical pathological processes in different diseases onset, development and outcomes;
- stages of typical pathological processes development (inflammation, fever, tumor);
- local and general events, pathogenic and adaptive mechanisms of development, specific and non-specific changes, leading pathogenic mechanism of typical pathological processes;
- urgent (adaptive) and long-term (compensatory) mechanisms in typical pathological processes development.

##### 2. To obtain practical skills:

- in solving problem tasks and tests – definition of etiology, pathogenesis, mechanisms of clinical signs development, principles of diagnosing, prophylaxis and treatment in such states: electrical current affection, burns and frostbites, excessive influence of ultraviolet and infrared rays (sunstroke and heat stroke), radiation sickness, decompression and compression sickness, intoxication, congenital and inborn diseases, immune deficiency, allergy, autoimmune diseases, pseudoallergic reactions.
- to explain the main principles of diseases prophylaxis and treatment on the basis of analysis of etiology, pathogenesis and clinical manifestation of the disease.
- in solving problem tasks and tests – definition of etiology, pathogenesis, mechanisms of clinical signs development, principles of diagnosing, prophylaxis and treatment in the case of: arterial and venous hyperemia, ischemia, thrombosis, embolism, stasis, sludge syndrome, inflammation, fever, tumor, hypoxia.

- to describe mechanisms of pathogenesis of the given states, to reveal the leading event in the pathogenesis, to make a prognosis of development, to explain the main principles of diseases prophylaxis and treatment on the basis of etiology, pathogenesis and clinical manifestation of the disease analysis.

**UNIT 10** \_\_\_\_\_ (date)

**TISSUE GROWTH PATHOLOGY. TUMORS.**

1. Growth factors. Genes controlling cell growth (proto-oncogenes, oncogenes, anti-oncogenes)
2. Tumors etiology. Mutational and epigenetic carcinogenesis.
3. Definition of “tumor”. General characteristics of tumor growth.
4. Anaplasia definition and types (morphological, biochemical, physical, chemical, functional).
5. Invasion and metastasis of malignant tumor cells: mechanisms of development.
6. The differences between benign and malignant neoplasms.
7. Stages of tumors pathogenesis. Mechanisms of tumor cells escape from immune control.
8. Mechanisms of anti-tumor defense (anticarcinogenic, antimutational, anticellular).
9. Interrelations between the host organism and the tumor. Cancer cachexia.

**1. Fill the table “Chemical carcinogens”**

<b>Group</b>	<b>Compound</b>	<b>Source</b>	<b>Affected organs</b>
	aminoazotoluene		
	melphalan		
	naphtylamine		
	benzopyrene		
	arsenic		
	cadmium		
	nickel		
	aflatoxin B (mycotoxin)		
	N-nitroso- dimethylamine		
	dichloroethane		

**2. Fill the table «Pathogenesis of cancer growth»**

	<b>Transformation</b>	<b>Promotion</b>	<b>Progression</b>
--	-----------------------	------------------	--------------------

stage description	mutational carcinogenesis		
	epigenetic carcinogenesis		
stage result			

**3. Fill the table «Types of tumor cells' anaplasia»**

Anaplasia type	Example
morphological	
biochemical	
functional	

**4. Fill the table “Differences between benign and malignant tumors”**

Sign	Benign tumor	Malignant tumor
level of differentiation		
autonomy		
structure		
type of growth		
metastases		
cancer cachexia		
capsule		
possibility of relapse		

**Task 1**

Patient R., 52 years old, complains of weakness, abdominal pain, digestion disorders, and 40% weight loss. Laparotomy: pancreas tumor with metastases in mesentery of intestines, liver and spleen. Carbohydrate, protein and lipid metabolisms disorders were found. Blood analysis: hypoglycemia, hyperlipidemia, hyponitrogenemia, negative nitrogen balance.

1. What are possible mechanisms of cancer cachexia in this patient?
2. Explain the mechanism of hypoglycemia, hyperlipidemia, hyponitrogenemia, negative nitrogen balance.
3. Which type of growth is typical for this tumor? Explain the mechanism of it

---



---



---

---

---

---

### Task 2

Patient G., 35 years old. Leukemia was found in 3 months after he has got a 7 Gy dose of ionizing radiation. He has 15 kg weight loss, there are a lot of hemorrhages of different size on the skin. Roentgenogram revealed double-sided pneumonia.

1. What is a possible mechanism of patient's tumor development?
  2. What is cell division limit (Hayflick's limit)? How does it change in tumor cells?
  3. Is there any interrelation between leukemia and pneumonia? Explain it.
- 
- 
- 

### Task 3

Patient E. Breast tumor without pain was found, skin around it wasn't hyperemied, skin temperature is normal. Histology research: tumor is in capsule, there is no inflammation around the tumor, expansive growth, tumor cells are equal in size and form, tumor metastases in other organs and tissues were not found.

1. Which type of tumor does the patient have? Prove your answer.
  2. Explain the mechanism of capsule formation.
  3. Is relapse possible in this type of tumor?
- 
- 
- 

### Task 4

Cells clone was cultivated in vitro (in Petri dish). If oxygen is added, lactate is secreted, if glucose solution is added, glucose concentration in the clone equals to 0.

1. Determine the character of cellular clone, which was cultivated in the experiment.
  2. Which type of anaplasia is described? Which other types of anaplasia do you know?
  3. What was a cause of glucose absence and lactate formation in the cellular clone?
- 
- 
- 

### Task 5

The patient with malignant tumor of the thyroid gland was treated with cytostatic drugs. The treatment limited growth of the cells in the primary tumor node, but not in metastases.

1. Define the stage of tumor development in the patient.
  2. Why malignant tumors are able to give metastases?
  3. Why cells of tumor metastases are more resistant to anti-tumor therapy?
-

---

---

---

---

**Teacher's signature**

---

**UNIT 11** \_\_\_\_\_ (date)

**HYPOXIA**

1. Hypoxia definition. Classifications of hypoxia.
2. Etiology and pathogenesis of the following hypoxia types:
  - a) hypoxic hypoxia
  - b) respiratory hypoxia
  - c) circulatory hypoxia
  - d) hemic hypoxia
  - e) tissue hypoxia
  - f) overload and substrate hypoxia
3. Hypoxia manifestation in different organs and physiological systems.
4. Protective adaptive (urgent) and compensatory (long-term, permanent) reactions under hypoxia.
5. Clinical application of adaptation to hypoxia. Interval hypoxic trainings.

**1. Sketch the scheme of oxygen transport from the air to mitochondria**

**2. Fill the table «Classification of hypoxia»**

Type of hypoxia	The mechanism of development

**3. Fill the table “Pathogenesis of hypoxic cell injury”**

	Pathogenetic events	Consequences
--	---------------------	--------------

<b>reversible injury</b>		
<b>irreversible injury</b>		
<b>reperfusion</b>		

**4. Fill the table «Protective and compensatory reactions against hypoxia»**

	<b>Lungs</b>	<b>CVS</b>	<b>Blood</b>	<b>Cell</b>
Adaptive reactions (acute hypoxia)				
Compensatory reactions (chronic hypoxia)				

**Task 1**

Patient K., 43 years old, complains of breathlessness during physical work. Clinical examination: pale skin, acrocyanosis, hard breathing, dry, dissipated crepitation is auscultated over the lungs. Roentgenogram: diffuse pneumosclerosis. Arterial blood saturation by oxygen is 74%. Anamnesis: the patient has been working at the asbestosis plant during 10 years.

1. What type of hypoxia does the patient have?
2. What mechanism underlies patient hypoxia development? Prove your answer.

---



---



---

**Task 2**



Geologist went to the mountains. He felt worse on the 2<sup>nd</sup> day of being there and presented with mountain disease symptoms: breathlessness, skin cyanosis, tachycardia, headache, appetite loss, general weakness, insomnia.

1. What is the cause of mountain disease? Which type of hypoxia is present in the patient
2. What pathogenic mechanism underlies symptoms which developed in the patient?
3. Which other subtype of this hypoxia type do you know? How it can occur?

---

---

---

---

### Task 3

Patient K., 45 years old. Diagnosis: prolonged stomach ulcer. He was hospitalized because of stomach bleeding. The patient complains of weakness, nausea, giddiness, tinnitus, flashing in the eyes. He is pale and has expressed breathlessness, moderate pain in epigastric region. Arterial blood pressure – 90/60 mm Hg. Heart rate – 105 beats per minute.

1. Which type of hypoxia does patient have? Prove your answer.
2. Explain the pathogenesis of all mentioned signs and symptoms

---

---

---

---

### Task 4

Patient K., 32 years old, was intoxicated by carbon monoxide. His complaints about headache, nausea, cough. Clinical examination: mental confusion, red skin, respiration is frequent and superficial, tachycardia, arterial pressure – 145/100 mm of mercury.

1. What type of hypoxia does patient have? Prove your answer.
2. Explain the mechanism of hypoxia development in this case
3. Why patient's skin is red?

---

---

---

---

### Task 5

Poisoning with cyanide or sodium fluoride may cause fulminant hypoxia that causes an instant death of the organism.

1. Which type of hypoxia will develop in this case? What is the mechanism of it?
2. Why this type of hypoxia is fatal for the patient?

---

---

---

---

### Task 6

Hypoxia can accompany different disorders of the person's health:

- |                                  |                                  |  |
|----------------------------------|----------------------------------|--|
| 1. after intensive muscular work | 6. diabetes mellitus             | 10. myocardial infarction                |
| 2. anaphylactic shock            | 7. hydrogen sulfide intoxication | 11. poisoning with hemolysing substances |
| 3. barbiturate overdose          | 8. hypovitaminosis B1,B2,PP      | 12. poisoning with nitrates              |
| 4. bronchial asthma              | 9. intoxication with aniline     | 13. starvation                           |
| 5. systemic vasculitis           |                                  | 14. thyrotoxicosis                       |

Define the type of hypoxia in each case:


Teacher's signature \_\_\_\_\_

UNIT 12 \_\_\_\_\_ (date)

### CARBOHYDRATE METABOLISM DISTURBANCES DIABETES MELLITUS

1. Disturbance of nervous and hormone regulation of carbohydrate metabolism. Definition of insulin-dependent and insulin-independent tissues of the organism.

2. Diabetes mellitus classification. Etiology of type 1 and type 2 diabetes mellitus. The difference between these types.

3. Disturbance of carbohydrate, protein, lipid, water-electrolyte metabolism and acid-base balance during diabetes mellitus.

4. Mechanisms of diabetes mellitus clinical manifestation and complications development.

5. Principles of diabetes mellitus diagnosis: fasting blood glucose level, glucose tolerance test, hemoglobin A1C, urine analysis.

6. Pathogenesis of diabetic comas: hyperglycemic, hypoglycemic, hyperosmolar, hyperlactacidemic.

#### 1. Explain the mechanism of diabetes symptoms

Symptom	Mechanism of development
fasting hyperglycemia	
glucosuria	
polyuria	
polydipsia	

hyperphagia	
weight loss	
ketonemia	
hyperlipidemia	
hyperazotemia	
hyperlactatacidemia	

2. List the chronic complications of diabetes mellitus and explain the mechanism of their development.

---



---



---



---

3. Fill the table “Diagnosis of diabetes mellitus with oral glucose tolerance test”

	Fasting glucose	In 2 hours after glucose intake
Healthy person		
Impaired glucose tolerance		
Diabetes mellitus		

### Task 1

A 52-year-old woman working in the bakery is complaining of skin disease which manifests as itching and numerous pustules on the legs. Additional complaints are about dryness in the mouth and increased fatigue. She has been suffering from skin disease for about 2 years. The patient weighs 97 kg. The local treatment of the skin is not effective. Blood glucose level – 8,4 mmol/L.

1. Which disease can you suppose in this patient?
2. Is overweight of the patient somehow connected with this disease pathogenesis?
3. Explain the mechanism of skin disease development in the patient.

---



---



---



---

### Task 2

A 56-year-old man, height – 170 sm, body weight 115 kg has no complaints. Fasting blood glucose level – 5,1 mmol/L. Both of his parents had type 2 diabetes mellitus that disturbs him.

Oral glucose tolerance test results: fasting glucose level: 5,3 mmol/L, in 2 hours after 75 g glucose intake – 9,8 mmol/l.

1. What do the test results indicate?
2. What are indications and contraindication for oral glucose tolerance test?
3. What would you recommend for this patient?

---

---

---

---

**Task 2**

A boy 7 years old 2 months ago was ill with severe form of infectious parotitis. Now his mother complains of 3 kg weight loss despite increased appetite, increased fatigue. Clinical examination: a boy is underweight, blood glucose level – 12 mmol/L.

1. Which disease can you suppose in this patient? What is the etiology of the disease?
2. How can you explain weight loss in spite of increased appetite in the boy?
3. Which type of treatment is necessary for this patient?

---

---

---

---

**Task 3**

A person in unconscious state was found by the ambulance team. The card of diabetic patient was found in his pocket. Clinical examination of the patient: increased muscle tone, moist skin, BP - 80/40 mmHg, heart rate – 123 bpm.

1. How can you characterize the state of this patient and his prognosis?
2. Try to define the diagnosis. Which laboratory findings can prove the diagnosis?
3. Which type of treatment is necessary for this patient? What can happen if the patient would not be properly treated?

---

---

---

---

**Task 4**

A man 30 years old was delivered to the hospital in the state of unconsciousness. Clinical examination: Kussmaul breathing, acetone smell from the mouth. BP- 90/70 mmHg, heart rate – 135 bpm. Blood glucose – 35 mmol/L, urine glucose – 250 mmol/L

1. Which disease can you suppose in this patient?
2. Explain the mechanism of the patient condition development.

---

---

---

**Teacher's signature**

---

**PATHOLOGY OF ACID-BASE BALANCE AND WATER-SALT METABOLISM**

1. Mechanisms of ABB maintenance in the organism: blood buffer systems, physiological mechanisms of ABB regulation.
2. Typical disturbances of ABB: acidosis and alkalosis. Classification, definitions.
3. Gas acidosis, causes and mechanisms of development, compensation mechanisms.
4. Metabolic acidosis, kinds, causes and mechanisms of development, compensation mechanisms.
5. Gaseous and non-gaseous alkalosis, causes and mechanisms of development, compensation mechanisms.
6. Fluid balance alteration: dehydration, hypohydration, their types, reasons and mechanisms of development
7. Edema: definition, classification, etiology, pathogenesis of different edema types.

**Normal indices of ABB:** Standard bicarbonate (SB) 20-24 mmol/L  
 Buffer base(BB) 44-46 mmol/L  
 Buffer excess/shift (BE) ±2 mmol/L

Index	Arterial blood	Venous blood
pH	7,35-7,45	7,26-7,38
pO <sub>2</sub>	85-95 mm Hg	40-45 mm Hg
pCO <sub>2</sub>	35-45 mm Hg	40-50 mm Hg

**1. Describe the mechanisms of ABB maintenance**

Buffer blood system	Physiological mechanisms

**2. Fill the table «ABB disturbances in pathologic states and mechanism of compensation»**

Pathology	ABB shift	Mechanism	Compensatory reactions
vomiting			
diarrhea			
hyperventilation of lungs			
hypoventilation of lungs			
diabetic coma (ketonemia)			

**3. Describe the alterations of water and electrolyte balance**

Dehydration

isoosmolar	hypoosmolar	hypersomolar

Hyperhydration

isoosmolar	hypoosmolar	hypersomolar

**4. Explain the mechanism of edema formation**

Mechanism	Reason	Examples
Hydrodynamic		
Oncotic		
Osmotic		
Membranogenous		
Lymphogenous		

**Task 1**

Patient C, is suffering from lungs emphysema and respiratory insufficiency. ABB indices: pH=7,36; pCO<sub>2</sub>=56 mmHg; BB=50 mmol/L; SB=29 mmol/L; BE=+8 mmol/L.

1. Estimate ABB and explain the reason of possible changes.

---



---



---



---

**Task 2**

A child 4 years old was delivered to the hospital on the suspicion of acute intestinal infection: high body temperature, frequent watery stool (8-10 times a day). The child is slightly dehydrated, short breath is observed. ABB indices: pH=7,34; pCO<sub>2</sub>=28 mmHg; BB=34 mmol/L; SB=16 mmol/L; BE=8 mmol/L.

1. Estimate ABB and explain the reason of possible changes.
2. Define the state of water-electrolyte balance and explain the mechanism of it.

---



---

---

---

**Task 3**

While ascending mountains frequency and breathing depth were acutely increased in an alpinist. After some time breathing was depressed and loss of consciousness occurred suddenly.

1. Estimate ABB and explain the reason of possible changes.
  2. Why did breathing activation change to its depression?
  3. What does this patient need to inhale: oxygen or carbon dioxide?
- 
- 
- 
- 

**Task 4**

Patient got a head trauma, which was accompanied with repeated vomiting and frequent breathing. ABB indices: pH - 7,56; pCO<sub>2</sub> = 30 mm Hg; SB = 28 mmol/L; BB = 50 mmol/L; BE = +5 mmol/L.

1. Estimate ABB and explain the reason of possible changes.
  2. What is the possible mechanism of compensation in this case?
- 
- 
- 
- 

**Task 5**

Patient with diabetes mellitus drinks a lot of water per day. Daily urination is 3,5 L, glucose content in urine – 3%. Blood analysis: pH – 7,36, pCO<sub>2</sub> – 36 mm Hg, SB – 19,5 mmol/L, BB – 39 mmol/L.?

1. Estimate ABB and explain the reason of possible changes.
  2. Define the state of water-electrolyte balance and explain the mechanism of it.
- 
- 
- 
- 

**Task 6**

A 0,1% solution of adrenalin was injected to the white rat intraabdominally in dose - 1 mg/100g of body weight. In 30 minutes, breathing became frequent and superficial, then foamy liquid appeared from the nasal cavity, cyanosis of nose and paws appeared in experimental animal. After a while the animal died as a result of lung edema.

1. What is pathogenetic mechanism of edema development in this case?
  2. Define the state of water-electrolyte balance in this case.
- 
- 
- 
- 

**Teacher's signature** \_\_\_\_\_

**DISTURBANCE OF PROTEIN AND LIPID METABOLISM.**

1. Mechanisms of protein metabolism maintenance. Laboratory indices of protein metabolism.
2. Starvation and undernutrition: etiology, pathogenesis, types, clinical manifestation, complications. Medical starvation.
3. Gout: etiology, pathogenesis, clinical manifestation, complications, diagnosis and treatment principles.
4. Mechanisms of lipid metabolism maintenance. Laboratory indices of lipid metabolism.
5. Obesity: etiology, pathogenesis, types, clinical manifestation, complications, diagnosis and treatment principles.

**Experimental work. To calculate body mass index.**

The body mass index (BMI) uses height and weight to determine healthy weight. It is calculated by dividing the weight in kilograms by the height in meters squared (BMI = weight [kg]/height [m]<sup>2</sup>)

**Classification of Overweight and Obesity by BMI, Waist Circumference, and Associated Disease Risk**

	BMI(kg/m <sup>2</sup> )	Obesity Class	Disease Risk Relative to Normal Weight and Waist Circumference	
			Men ≤102 cm Women ≤88 cm	Men >102 cm Women >88 cm
Underweight	<18.5			
Normal	18.5–24.9			
Overweight	25.0–29.9		Increased	High
Obesity	30.0–34.9	I	High	Very high
	35.0–39.9	II	Very high	Very high
Extreme obesity	≥40	III	Extremely high	Extremely high

Increased waist circumference also can be a marker for increased risk, even in persons of normal weight.

**Experimental results**

Student name	Height, m	Weight, kg	BMI	Conclusion

**CONCLUSION**

---



---



---



---



**1. Fill the table «Manifestation of lipid and protein metabolism disturbances»**

Protein metabolism disturbances	Lipid metabolism disturbances

**2. Describe the stages of starvation pathogenesis**



**Task 1**

A 25-year-old woman is 165 centimetres tall and weighs 136 kilograms. She works as a receptionist in an office, brings her lunch to work with her, spends her evenings watching television, and gets very little exercise. She reports that she has been fat ever since she was a little girl, she has tried “every diet under the sun,” and when she diets she loses some weight, but gains it all back again.

1. How would you classify patient’s obesity?
2. What are her risk factors for obesity?
3. What would be one of the first steps in helping her develop a plan to lose weight?

---



---



---



---



---

**Teacher’s signature**

---

## **PART 1 FINAL SEMESTER CONTROL**

### **General nosology.**

#### **Typical pathological processes. Typical metabolism disturbances.**

To be allowed to pass final module control the student should:

1. successfully pass Section 1 and Section 2 control;
2. attend all the lectures and practical classes to the current date;
3. get positive mark on each practical classes;
4. have all the practical classes' protocols (completed and signed by the teacher) and conspects of all lectures notebook.

Final module control consists of computer testing. In order to pass final module control successfully, student should obtain such theoretical and practical skills:

- to analyze basic definitions of general nosology, etiologic factors influence on the human organism;
- to analyze the role of reasons and conditions, causality-effective relations in pathogenesis;
- to define and classify typical pathological processes and typical metabolism disturbances;
- to define the role of typical pathological processes and typical metabolism disturbances in the pathogenesis of different diseases;
- to reveal protective and pathogenic features of typical pathological processes, short-term and long term adaptive and compensatory reactions in the pathogenesis of typical pathological processes and typical metabolism disturbances ;
- to analyze the reasons, mechanisms of development, consequences of cell injury and to define their role in typical pathological processes and diseases pathogenesis;
- to define and analyze the disturbances in immune system function (immunodeficiency and allergy) and tissues injury mechanism during allergic reaction development;
- to define and analyze etiology, pathogenesis clinical manifestations and complications of diabetes mellitus;
- be able to solve situational problems – to define etiology, pathogenesis, mechanisms of clinical signs development, principles of diagnosing, prophylaxis and treatment of such conditions: electrical current affection, burns and frostbites, excessive influence of ultraviolet and infrared rays (sunstroke and heat stroke), radiation sickness, decompression and compression sickness, intoxication, congenital and inborn diseases, immune deficiency, allergy, autoimmune diseases, pseudoallergic reactions; arterial and venous hyperemia, ischemia, thrombosis, embolism, stasis, sludge syndrome, inflammation, fever, tumor, hypoxia. carbohydrate metabolism disturbances, diabetes mellitus, ABB imbalances, misbalances of water and salt metabolism, edema, disturbances of energy metabolism, disturbances of lipid metabolism and obesity, disturbances of protein metabolism and gout, disturbances of vitamins metabolism, starvation.
- to explain principles of typical pathological processes and typical metabolism disturbances experimental modeling;
- to analyze laboratory findings and be able to use them in diagnosing different pathological processes and diseases

### **Questions for independent study**

1. The role of barometric factors and electric current influence on the human organism.
2. Chemical factors local and general influence on the organism.
3. Etiology of cell injury Cell injury features: specific and non-specific, morphological and functional.
4. Types of cell response to injury: cell injury and cell adaptation. Intracellular and intercellular mechanisms of cell adaptation to injury.
5. Types of cell death: necrosis and apoptosis. The difference between them.
6. The role of heredity and constitution in pathology development.
7. The role of biological factors influence on the human organism. Infectious process.
8. Hypovitaminosis A, E, K. Mechanisms of development. Clinical manifestations.
9. Hypovitaminosis C, vitamins B group. Pathogenesis, clinical manifestations.
10. Ageing. Theories of ageing. Factors which determine the life –time. Manifestations of ageing.
11. The role of mother’s health state and environmental influences on fetus development. Teratogenic factors. Critical terms in fetus development
12. Disturbances of sodium metabolism. Reasons of origin, mechanisms of development, consequences.
13. Disturbances of potassium metabolism. Reasons of origin, mechanisms of development, consequences.
14. Disturbances of calcium metabolism. Reasons of origin, mechanisms of development, consequences.
15. Disorders of energy metabolism.

## 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.

## TESTS FOR PART 1 COMPUTER CONTROL

### SECTION 1 “GENERAL NOSOLOGY. TYPICAL PATHOLOGICAL PROCESSES”

#### General nosology. Pathophysiology general principles.

1. What is the modern definition of DISEASE? Disease is a disturbance of living activity of the organism under the effect of pathogenic factor...
  - a. with development of pathological process
  - b. with development of functional and structural changes in the organism
  - c. with decrease or loss of ability for work
  - d. with clinical features of disease
  - e. with disturbance of adaptation to environment conditions and ability for work
2. What is the modern definition of PATHOLOGICAL PROCESS? Pathological process is:
  - a. sum of protective and pathological reactions of the organism
  - b. reaction of organs and tissues to the pathological irritant
  - c. inadequate reaction of organs and tissues to the pathological irritant
  - d. decrease or loss of ability for work
  - e. inadequate reaction of the organism to the adequate irritation
3. What is the modern definition of PATHOGENESIS? Pathogenesis is:
  - a. causes and conditions of disease's onset
  - b. the mechanism of onset, development, course and outcome of the disease
  - c. internal and external mechanisms of disease's onset
  - d. conditions of onset, development, course and outcome of the disease
  - e. reaction of organs and tissues to the pathological irritant
4. What is the modern definition of PATHOLOGICAL REACTION? Pathological reaction is:
  - a. adequate reaction of the organism to the adequate irritant
  - b. inadequate reaction of the organism to the inadequate irritant
  - c. inadequate reaction of the organism to the adequate irritant
  - d. adequate reaction of organs and tissues to the pathological irritant
  - e. internal and external reactions of the organism due to the disease onset
5. What is the modern definition of ETIOLOGY? Etiology is a science about...
  - a. factors of environment that take part in the onset of disease
  - b. internal and external causes of disease onset
  - c. conditions of the organism during the disease onset
  - d. reasons and conditions of disease onset
  - e. main causes of the disease onset
6. Which of the examples listed below is PATHOLOGICAL REACTION?
  - a. fever
  - b. erythema on the skin after thermal influence
  - c. allergic reaction
  - d. inflammatory reaction
  - e. dilation of the pupil to the light
7. Which of the processes listed below is a TYPICAL PATHOLOGICAL PROCESS?
  - a. inflammation
  - b. burn
  - c. poisoning
  - d. birth defect
  - e. acquired trauma
8. Which of the processes listed below is a TYPICAL PATHOLOGICAL PROCESS?
  - a. burn
  - b. poisoning
  - c. birth defect
  - d. trauma
  - e. hypoxia
9. The knowledge about which period of disease is important for prophylaxis of infectious diseases?
  - a. incubation period
  - b. prodromal period
  - c. manifestation of disease
  - d. outcome of the disease
  - e. convalescence
10. The patient complains of irritability, pain in bones and muscles, loss of appetite, headache. No specific signs of the disease are observed. Which period of disease is described?
  - a. incubation period
  - b. prodromal period
  - c. manifestation of disease
  - d. outcome of the disease
  - e. convalescence
11. Choose the example of etiological therapy from the given:
  - a. infectious disease treatment with antibiotics
  - b. allergic disease treatment with anti-histamine medicines
  - c. diabetes mellitus treatment with insulin
  - d. arthritis treatment with glucocorticoids
  - e. arthritis treatment with analgetics
12. Choose the example of pathogenetic therapy from the given:
  - a. infectious disease treatment with antibiotics
  - b. allergic disease treatment with anti-histamine medicines
  - c. headache treatment with analgetics
  - d. hepatic colic treatment with spasmolytics
  - e. arthritis treatment with analgetics
13. Choose the example of substitutive therapy from the given:
  - a. infectious disease treatment with antibiotics
  - b. allergic disease treatment with anti-histamine medicines
  - c. diabetes mellitus treatment with insulin
  - d. hepatic colic treatment with spasmolytics
  - e. arthritis treatment with analgetics
14. Choose the example of symptomatic therapy from the given:
  - a. infectious disease treatment with antibiotics
  - b. allergic disease treatment with anti-histamine medicines
  - c. diabetes mellitus treatment with insulin
  - d. arthritis treatment with glucocorticoids
  - e. arthritis treatment with analgetics
15. Which mechanism forms general reactivity and resistance of the organism?
  - a. activation of mononuclear phagocytes system
  - b. cascade of complement reactions
  - c. activation of autonomic nervous system
  - d. immunological mechanisms
  - e. activation of the respiratory system
16. Typical disease development includes certain stages. Choose the correct sequence of events in disease development:

- a. prodromal period => latent (incubative) period => manifestation of disease => outcome of disease
  - b. manifestation of disease => prodromal period => outcome of disease => latent (incubative) period
  - c. latent (incubative) period => prodromal period => manifestation of disease => outcome of disease
  - d. latent(incubative) period => period of hidden signs => prodromal period => manifestation of disease
  - e. latent period(incubative) => prodromal period => outcome of disease
- 17.** Patient with stomach peptic ulcer disease after the treatment felt better. Digestion was normalized, pains disappeared. However in a few weeks pain and heartburn appeared again. How will you describe such course of disease?
- a. Remission and exacerbation
  - b. Complication of disease
  - c. Relapse of disease
  - d. Prodromal period
  - e. Latent period
- 18.** The stenosis of pylorus was found during the X-ray examination of a patient with peptic ulcer disease. How can you characterize the presence of stenosis of the pylorus in this patient?
- a. Pathological state
  - b. Pathological process
  - c. Disease
  - d. Pathological reaction
  - e. Compensatory reaction
- 19.** Patient was admitted to a hospital with a peptic ulcer disease of stomach. He has been ill for 3 years. Now he complains of pain in epigastrium, heartburn, nausea, black color of the stool. How can you describe such state of the patient?
- a. relapse
  - b. complication
  - c. remission
  - d. pathological reaction
  - e. pathological condition
- 20.** A student has got pneumonia after overcooling at the end of the winter. He had a nervous overstrain. Which was the reason of the disease?
- a. Nervous overstrain
  - b. Overcooling
  - c. Undernutrition
  - d. Hypovitaminosis
  - e. Pathogenic microorganism
- 21.** Which type of protective mechanism provides the resistance of human organism against effects both specific and wide range of non-specific pathogenic agents?
- a. individual resistance
  - b. active resistance
  - c. cross-resistance
  - d. passive resistance
  - e. specific resistance
- 22.** The patient arrived to the hospital from the steelmaking workshop in the condition of hyperthermia. Which is the direct cause of unconsciousness during the heat stroke?
- a. decrease of the brain blood supply
  - b. arterial pressure drop
  - c. increased water loss with sweating
  - d. decrease of cardiac output
  - e. dilatation of peripheral vessels
- 23.** Electrodes were implanted into rabbit's hypothalamic area. During several weeks hypothalamus' activity was studied under the condition of chronic inflammation. Which one from the following types of experiment is described?
- a. acute experiment
  - b. chronic experiment
  - c. physiological experiment
  - d. biological experiment
  - e. vivisection
- 24.** The researcher has to investigate an effect of a profound bleeding on the cardiovascular system function. Which one from the following types of experiment should be performed?
- a. acute experiment
  - b. chronic experiment
  - c. physiological experiment
  - d. biological experiment
  - e. vivisection
- 25.** When a 5-year-old child was brought home from the kindergarten he presented with weakness, headache, body temperature rise up to 37,5oC. What period of disease development is observed in this case?
- a. prodromal
  - b. latent
  - c. incubative
  - d. recovery
  - e. disease outcome
- 26.** A man aged 49, who was 12 years ago sick with rheumatic myocarditis and endocarditis now has mitral valve insufficiency. Studies have shown that inflammatory process is not present, cardiac output is sufficient. Describe the condition of the patient:
- a. pathological state
  - b. pathological reaction
  - c. pathological process
  - d. model of pathological process
  - e. compensatory response

### Physical factors influence on human body (UV rays, ionizing radiation)

- 27.** The ultraviolet radiation is used in medicine with the different aims. Which mechanism from listed below underlies the positive therapeutic effect of ultraviolet radiation upon the organism?
- a. activation of medicine effects
  - b. melanin synthesis increases in the skin
  - c. activation of vitamin D synthesis
  - d. activation of cellular division
  - e. activation of lipid peroxidation
- 28.** The UV radiation causes both negative and positive influences on the human organism. Choose the sign of UV-rays deficiency from the following:
- a. early ageing
  - b. reduction of skin elasticity
  - c. sunburns
  - d. vitamin D deficiency
  - e. skin tumors development
- 29.** The UV radiation causes both negative and positive influences on the human organism. Choose the sign of UV-rays overdose from the following:
- a. vitamin D deficiency
  - b. skin tumors development
  - c. immune deficiency
  - d. disturbance of psychic activity
  - e. increase of skin elasticity
- 30.** Each kind of radiant energy can cause both positive and negative effect. Which tissue is the most sensitive to ultraviolet radiation affection?
- a. epidermis
  - b. red marrow
  - c. vascular endothelium
  - d. retina
  - e. subcutaneous fat
- 31.** Which is the most dangerous long-term consequence after ionizing radiation influence?

- a. malignant neoplasm  
b. asthenia syndrome  
c. early aging  
d. liver dysfunction
- 32.** Which medicines from the listed below can be photoreactive?  
a. sulfonamides  
b. non-steroid anti-inflammatory drugs  
c. barbiturates  
d. vitamin B group  
e. all of them
- 33.** The main portion of spectrum of solar radiation belongs to infra-red, visible and ultraviolet rays that have both positive and negative effects. Which causes and conditions lead to the development of sunstroke?  
a. effect of solar radiation upon the retina of the eye  
b. long-term effect of solar radiation upon the head  
c. combination of high temperature and solar radiation  
d. combination of solar radiation with high humidity  
e. in all cases listed above
- 34.** Patients with disturbance of porphyrinic metabolism might have accumulation of photosensitizers in the organism. How do these substances influence the organism?  
a. increase sensitivity of the organism to antibodies  
b. cause development of allergic reaction to the visible light  
c. increase sensitivity of retina photoreceptors to visible light  
d. increase sensitivity of the organism to UV rays  
e. increase sensitivity of the organism to the allergens
- 35.** Which conditions may cause the critical level of hyperthermia– the heat stroke?  
a. intensive infra-red radiation  
b. intensive ultraviolet radiation  
c. ionizing radiation  
d. normal temperature but high humidity of the air  
e. normal temperature but low wind speed
- 36.** During experiment rats were exposed to prolonged direct solar radiation in open chambers and in ones covered by glass. Tumor development at hair uncovered places of skin was marked in animals in open chambers. Which factor influence is this phenomena connected with?  
a. sun heat  
b. ultraviolet radiation  
c. biologic carcinogens  
d. exogenous chemical carcinogens  
e. infrared radiation
- 37.** What is the mechanism of the selective effect of gamma-radiation on the tumor cells that can be used in medical practice?  
a. Affection of tissues with high blood supply  
b. Affection of tissues with high maintenance of water  
c. Activation of the immune system  
d. Affection of tissues with high mitotic rate  
e. Initiation of the mutations in tumor cells
- 38.** What mechanism from listed below form the basis of infrared radiation biological effect on an organism?  
a. Thermal effect  
b. Photochemical effect  
c. Radiolysis of water  
d. Sensitization of organism  
e. Desensitization of organism
- 39.** What mechanism from listed below form the basis of ionizing radiation biological effect on an organism?  
a. Thermal effect  
b. Photochemical effect  
c. Radiolysis of water  
d. Sensitization of organism  
e. Desensitization of organism
- 40.** What mechanism from listed below form the basis of ultraviolet radiation biological effect on an organism?  
a. Thermal effect  
b. Photochemical effect  
c. Radiolysis of water  
d. Sensitization of organism  
e. Desensitization of organism
- 41.** What does primary effect of ionizing radiation upon the organism consists in?  
a. water radiolysis  
b. lipid peroxidation  
c. DNA mutations  
d. cells destruction  
e. intoxication
- 42.** Each tissue of the organism suffers from ionizing radiation, but sensitivity to radiation (radiosensitivity) is different for different tissues. What does tissue's radiosensitivity depend on?  
a. content of water in tissues  
b. proliferative activity of cells  
c. specificity of tissue function  
d. intensity of tissue innervation  
e. partial pressure of oxygen in the blood
- 43.** Pathogenetic mechanism that leads to the increased frequency of malignant tumors appearance under effect of ionizing radiation is:  
a. somatic mutations of the cells  
b. mutations of gametes in reproductive organs  
c. depression of immunological control and changes in DNA  
d. activation of lipid peroxidation in the cells  
e. increased amount of carcinogenic substances
- 44.** Each kind of radiant energy can cause both positive and negative effect. How is X-radiation applied in medicine?  
a. for treatment of oncologic diseases  
b. for endogenous probes  
c. for ultrasound diagnosing  
d. for diagnosis of internal disease  
e. for NMR investigation (nuclear magnetic resonance)
- 45.** A 45-year-old woman has been receiving radiation therapy for breast cancer. Explain the effects of ionizing radiation in eradicating the tumor cells. It is successful because tumor cells:  
a. are rich with water  
b. have high ATP store  
c. have high mitotic rate  
d. have low metabolic activity  
e. have high level of protein synthesis
- 46.** Each kind of radiant energy can cause both positive and negative effect. How is gamma radiation applied in medicine?  
a. for prevention of rickets  
b. for diagnosis of internal diseases  
c. for ultrasound diagnosing  
d. for NMR investigation (nuclear magnetic resonance)  
e. for tumors treatment
- 47.** Which is the main cause of increased frequency and severity of infectious diseases during radiation sickness development?  
a. decrease of antibodies production  
b. depression of haematopoiesis  
c. depression of blood clotting  
d. anemia  
e. disturbance of regeneration capability of epithelial tissues
- 48.** Which kind of ionizing radiation is the most dangerous for people due to the highest ionizing ability?  
a. gamma radiation  
b. beta radiation  
c. alpha radiation  
d. X-radiation  
e. electronic radiation

49. Choose the list in which the tissues of the organism are situated due to their radiosensitivity in the decreasing order:
- epithelial, haematopoietic, cartilages, bone, muscular, nervous
  - nervous, haematopoietic, epithelial, cartilages, bone, muscular
  - bone, muscular, nervous, haematopoietic, epithelial
  - muscular, haematopoietic, bone, nervous, epithelial, cartilages
  - haematopoietic, epithelial, cartilages, bone, muscular, nervous
50. The preventive radioprotector was given to the worker of nuclear power station. Which mechanism from listed below is considered to be the main pathophysiological mechanism of radioprotection?
- prevention of tissue's hypoxia
  - activation of oxidation reactions
  - inhibition of free radicals formation
  - increasing of tissue blood supply
51. Radioprotector was given to the patient who received a dangerous dose of ionizing radiation. Which mechanism is considered to be the main pathophysiological mechanisms of radioprotection?
- prevention of tissue hypoxia
  - increase of intensity of oxidation reactions
  - activation of the cell's anti-oxidative system
  - increase of tissue blood supply
  - stimulation of the organism's energy supply systems
52. Which blood count correctly reflects the period of disease manifestation of acute radiation sickness bone marrow form:
- leukocytosis, lymphocytosis, monocytopenia
  - lymphocytosis, anemia, thrombocytopenia
  - erythrocytosis, leukopenia, thrombocytosis
  - leukopenia, anemia, thrombocytopenia
  - leukocytosis, lymphopenia, anemia
53. In consequence of accident at nuclear power station radioactive products escape occurred. People, who were in zone of increased radiation got dose about 12-14 Gray. Which form of acute radiation sickness will appear in these people?
- bone marrow
  - intestinal
  - toxic
  - haemorrhagic
  - cerebral
54. Which dose of ionizing radiation causes typical bone marrow form of acute radiation sickness?
- less than 0,5 Gray
  - 1-10 Gray
  - 10-20 Gray
  - 20-80 Gray
  - more than 80 Gray
55. Which dose of ionizing radiation causes intestinal form of acute radiation sickness?
- less than 0,5 Gray
  - 1-10 Gray
  - 10-20 Gray
  - 20-80 Gray
  - more than 80 Gray
56. Which dose of ionizing radiation causes toxemia form of acute radiation sickness?
- less than 0,5 Gray
  - 1-10 Gray
  - 10-20 Gray
  - 20-80 Gray
  - more than 80 Gray
57. Which dose of ionizing radiation causes cerebral form of acute radiation sickness?
- less than 0,5 Gray
  - 1-10 Gray
  - 10-20 Gray
  - 20-80 Gray
  - more than 80 Gray
58. A patient was admitted to hospital with complaints about weakness, headache, increase of temperature, diarrhea which have appeared after a single radiation exposure. Leukocytosis with lymphopenia are found in a blood count. Which stage of radiation sickness does the patient have?
- latent period
  - period of primary reactions
  - manifestation
  - prodromal period
  - period of convalescence
59. In the period of illness manifestation the patient had leukopenia, thrombocytopenia, autoinfection, autointoxication, bleeding and fever. Which form of radiation sickness is this clinical picture typical for?
- Bone marrow
  - Intestinal
  - Toxic
  - Cerebral
  - Haemorrhagic
60. The mechanisms of protection and adaptation are activated at reversible cellular injury by ionizing radiation. Name the reactions directed on renewal of changed intracellular homeostasis in this case:
- activation of cell's antioxidant system components
  - activation of calcium channels
  - accumulation of sodium ions in the cells
  - inhibition of adenylate cyclase
  - hypertrophy of mitochondria
61. In the patient with chronic radiation sickness the signs of haemorrhagic syndrome are observed. Which factor is the most important in the pathogenesis of this syndrome?
- thrombocytopenia
  - violation of the structure of vascular walls
  - increased activity of fibrinolysis
  - increase anticoagulant system activity
  - decrease of clotting factors activity
62. A worker of the nuclear power plant took a dose of radiation – 5 Gray. He complains of headache, nausea, dizziness. What kind of changes of blood count will take place in 10 hours after irradiation?
- eosinophila
  - lymphocytosis
  - leukopenia
  - agranulocytosis
  - neutrophilia
63. A person was admitted to a hospital in 3 days after being exposed to a 3 Gray dose of ionizing radiation. Which physiological system will be damaged in this case?
- digestive
  - cardiovascular
  - nervous
  - blood
  - endocrine
64. Ionizing radiation influence can cause many negative consequences in human organism. Choose the form of acute radiation sickness which may result in patient's recovery:
- intestinal
  - toxemia
  - cerebral
  - bone marrow
  - there can't be recovery from the radiation sickness

### Disturbance of immune system function. Immunodeficiency.

65. What is the main task of immune system during human life-time?
- protection of the organism from pathogenic effects of environment
  - providing the genetic homogeneity of the organism
  - increasing of organism resistance to negative factors influence
  - creation of favorable conditions for the living cells
  - antimicrobial activity
66. Which cells are responsible for the high level of immunoglobulins during the secondary immune response?
- plasmatic cells
  - B-cells
  - immune memory cells
  - T suppressors
  - T killers
67. Which possible quantity of antigens is B-cell receptor affine to?
- all known antigens
  - only one antigen
  - group of similar antigens
  - all protein antigens
  - all cellular antigens
68. Which immune reactions do natural killer cells take part in?
- innate immunity
  - cellular immunity
  - humoral immunity
  - immune tolerance
  - adaptive immunity
69. Which cells perform their function by "respiratory burst" with active oxygen radicals formation?
- monocytes
  - basophils
  - eosinophils
  - natural killers
  - neutrophils
70. Which cytokine from listed below can provide systemic (endocrine) effect?
- lymphotoxin
  - alpha interferon
  - gamma interferon
  - interleukin 8
  - interleukin 1
71. Which cells' quantity is markedly decreased in Bruton's disease?
- monocytes
  - plasmatic cells
  - natural killers
  - T helpers
  - T suppressors
72. Preventive vaccination with weakened microorganisms causes the production of antibodies against these microbes. Which cells are considered to be antibody-producing cells of the immune system?
- T-lymphocytes
  - macrophages
  - NK-cells
  - B-lymphocytes
  - plasmocytes
73. Which of the substances from listed below are antibodies in the organism?
- globulins of the plasma
  - albumins of the plasma
  - buffer systems
  - lipoprotein systems
  - plasma fibrinogen
74. Cellular and humoral factors take part in mechanisms of innate immunity. Which of the substances from listed below can be considered a humoral factor of specific immunity?
- complement
  - immunoglobulin M
  - interleukin-1
  - interferon
  - factor of tumor necrosis
75. During the patient examination the signs of immunodeficiency were found. Name the organ where maturation of immune cells related to cellular immunity takes place?
- thymus
  - bone marrow
  - bursa of Fabricius
  - spleen
  - lymphatic nodes
76. During the patient examination the high amount of IgG was found. Where are immunoglobulins synthesized in the human body?
- in the bone marrow
  - in thymus
  - in lymph nodes
  - in bursa of Fabricius
  - in spleen
77. Blood analysis of patient showed signs of HIV infection (human immunodeficiency virus). Affection of which immune cells is typical for AIDS?
- T-killers
  - T-helpers
  - B-lymphocytes
  - macrophages
  - neutrophils
78. The immunization of population with different vaccines is carried out with preventive purposes. It is followed by formation of primary immune response. Which is the longest term for immune memory remaining after the immunization?
- 1 – 5 years
  - 10 – 20 weeks
  - all life
  - several days
  - till 1 year
79. The immune system gives responses to antigen stimulation by 3 specific allergic reactions, humoral and cellular immunity responses and immunological tolerance. In which situation from listed below immunological tolerance can be developed?
- if to irradiate the animal before injection of antigen
  - if to inject antigen and cytostatic agent at the same time
  - if to inject antimacrophage antibodies before injecting antigen
  - if to inject excessive dose of antigen
  - if to hold desensitization before injection of antigen
80. Cooperative interaction of which immune cells is necessary for effective formation of primary humoral immune response ?
- macrophages, plasmatic cells, B-lymphocytes
  - macrophages, T-lymphocytes, B-lymphocytes
  - mast cells, plasmatic cells, B-lymphocytes
  - B-lymphocytes, macrophages, plasmatic cells
  - T-lymphocytes, plasmatic cells, B-lymphocytes
81. Cooperative interaction of which immune cells is necessary for effective formation of primary cellular immune response?
- T-lymphocytes, plasmatic cells
  - macrophages, plasmatic cells
  - mast cells, plasmatic cells
  - T-lymphocytes, B-lymphocytes
  - macrophages, T-lymphocytes



- 82.** What is the main distinction of secondary immune response from primary immune response?
- elongated latent period after antigen administration
  - slower rise of antibody concentration
  - higher level of antibodies amount
  - activation of IgE synthesis
  - shortened latent period after antigen presentation
- 83.** Examination of a patient, who for a long time was taking glucocorticoids, detected lymphopenia. How can the functional state of the patient's immune system be characterized?
- Anaphylaxis
  - Primary immunodeficiency
  - Autoantigen tolerance
  - Congenital immunodeficiency
  - Secondary immunodeficiency
- 84.** Which type of immune reaction is absent in the patients with DiGeorge syndrome?
- humoral
  - reaginic
  - cell-mediated
  - immune complex
  - cytotoxic
- 85.** Decreased blood level of which substance usually accompanies DiGeorge syndrome development?
- sodium
  - potassium
  - aminoacids
  - enzymes
  - calcium
- 86.** It is known that DiGeorge syndrome is characterized by alterations of electrolytes metabolism disorder. Hypoplasia of which gland can result in this disorder?
- thymus
  - thyroid gland
  - parathyroid gland
  - pituitary gland
  - salivary gland
- 87.** A 5-year-old girl has telangiectasias on the skin and conjunctiva. IgA is absent; the amount of T-lymphocytes is reduced. Which type of immunodeficiency is present?
- Di George syndrome
  - Louie-Barr syndrome
  - secondary immunodeficiency syndrome
  - Bruton's disease
  - Chediack-Higasy syndrome
- 88.** What is the role of MHC molecules class I on the surface of body cells?
- to identify self and non-self cells
  - to identify cells with high mitotic activity
  - it is a hormone specific receptor
  - to activate protein synthesis in the cells
  - it is a marker of apoptosis
- 89.** It is known that increase in resistance to hypoxia usually is accompanied with the increased activity of the immune system. Choose the correct definition of the situation when the increased resistance to one factor is accompanied with the increased resistance to other factors:
- active resistance
  - passive resistance
  - cross resistance
  - sensitization
  - reactivity
- 90.** Which substances from listed below can organize immune response and provide the destruction of alien cells?
- Ig A
  - cytokines
  - opsonins
  - plasma albumens
  - plasma globulins
- 91.** The patients after organ transplantation usually receive hormone injections in order to prevent transplant rejection. Which hormones from the listed below should be prescribed for transplant rejection prevention and why?
- mineralocorticoids – to increase inflammatory reaction in transplant
  - glucocorticoids – to inhibit immune system activity
  - glucocorticoids – to decrease vessels permeability
  - mineralocorticoids – to inhibit immune system activity
  - growth hormone – to enhance anabolic processes in the cells
- 92.** Examination of a child who frequently suffers from infectious diseases revealed that IgG concentration in blood serum was 10 times less than normal, IgA and IgM concentration was also significantly reduced. Analysis showed also lack of B-lymphocytes and plasmocytes. Which disease are these symptoms typical for?
- Swiss-type agammaglobulinemia
  - Dysimmunoglobulinemia
  - Bruton's disease
  - Louis-Bar syndrome
  - Di George syndrome
- 93.** In the 12-year-old boy who often has viral and bacterial infections, eczematous lesions are observed. Laboratory data show the decrease of T-lymphocytes and IgM, normal content of IgA and IgG. Which kind of the immune system pathology is observed in the patient?
- combined immunodeficiency
  - hypoplasia of the thymus
  - Bruton's disease
  - Turner's syndrome
  - hereditary deficiency of the complement system
- 94.** In many cases of organ transplantation in 10 days the reaction of transplant rejection is observed. Which types of blood cells are playing the leading role in this process?
- basophils
  - eosinophils
  - erythrocytes
  - macrophages
  - platelets
- 95.** Bruton's disease was diagnosed in a 2-year-old child with frequent severe bacterial infections, lack of B-lymphocytes and plasmatic cells. What changes in serum immunoglobulins content will be observed in this clinical situation?
- increase in IgA, IgM
  - decrease of IgA, IgM
  - without changes
  - decrease in IgD, IgE
  - increase of IgD, IgE
- 96.** The child was diagnosed with primary immunodeficiency after laboratory analysis of immune system function. Which of these reasons may lead to development of primary immunodeficiency in a child?
- hereditary disorders of the immune system
  - teratogenic influences on the fetus
  - disturbances in mother's metabolism during pregnancy
  - violations of reactivity and resistance of the organism
  - toxic damage of B-lymphocytes
- 97.** Factors of non-specific resistance form the first barrier for the foreign antigens penetration into organism. Choose the factor of non-specific resistance from the following:
- immune memory
  - immune tolerance
  - active phagocytosis
  - antibodies synthesis
  - allergic reactions
- 98.** Non-specific resistance is formed by both cellular and humoral factors. Choose the humoral factor of non-specific resistance from the following:

- a. phagocytosis
- b. opsonization
- c. IgM
- d. IgG
- e. complement

**99.** It is known that direct correlation exists between the level of reactivity and resistance. Meanwhile indirect correlation is possible too. In which body state reactivity is increased and resistance is decreased?

- a. immune tolerance
- b. immune deficiency
- c. immune memory
- d. allergy
- e. immunity

**100.** What is the correct term for the phenomenon when the development of resistance to physical activity leads to an increase in resistance to pathogenic microorganisms?

- a. Cross adaptation
- b. Genetic adaptation
- c. Physiologic adaptation
- d. Specific adaptation
- e. Biochemical adaptation

**101.** It is known that direct correlation exists between the level of reactivity and resistance. Meanwhile indirect correlation is possible too. In which body state reactivity is decreased and resistance is increased?

- a. allergy
- b. hibernation
- c. malnutrition
- d. stress reaction
- e. inflammation

### Disturbance of immune system function. Allergy

**102.** What is the common name for allergic reactions that have hereditary predisposition and are observed in the whole families?

- a. reaginic
- b. anaphylactic
- c. cytotoxic
- d. stimulating
- e. atopic

**103.** Which stage of allergic reactions includes synthesis of specific antibodies by plasmatic cells?

- a. hidden
- b. immunologic
- c. biochemical
- d. stage of clinical manifestation
- e. outcome

**104.** Which stage of allergic reactions are allergy mediators synthesized at?

- a. hidden
- b. immunologic
- c. sensitization
- d. biochemical
- e. stage of clinical manifestation

**105.** Which class of immunoglobulins is called “reaginic antibodies”?

- a. IgA
- b. IgD
- c. IgG
- d. IgE
- e. IgM

**106.** Which class of immunoglobulins takes part in development of the 1st type of allergic reactions?

- a. IgA and IgG
- b. IgE and IgD
- c. IgG and IgM
- d. IgE and IgG
- e. IgM and IgA

**107.** Which type of immunoglobulins takes part in development of the 3rd type of allergic reactions?

- a. IgA and IgG
- b. IgG and IgM
- c. IgE and IgM
- d. IgE and IgG
- e. IgM and IgA

**108.** The patient C. developed anaphylactic shock after injection of antitetanus serum. Which cells produce the mediators during the classic variant of anaphylaxis?

- a. T-lymphocytes
- b. neutrophils
- c. mast cells
- d. B-lymphocytes
- e. eosinophils

**109.** The patient R. suffers from bronchial asthma. The attacks rise in the period of ragweed blossoming. Point out the biologically active substances that play the main pathogenic role in development of anaphylactic allergic reaction.

- a. complement
- b. properdin
- c. interleukin
- d. histamine
- e. interferon

**110.** The patient A. developed the signs of anaphylactic shock after a wasp sting. The complex antigen - antibody fixates during development of the 1st type of allergic reaction:

- a. in the plasma of blood
- b. on the surface of macrophage
- c. on the membrane of T-lymphocyte that bears receptor to IgE
- d. on the membrane of mast cell
- e. on the membrane of B-lymphocyte

**111.** The patient R. was diagnosed an autoimmune hemolytic anemia. The complex antigen - antibody fixates during development of the 2nd type of allergic reaction:

- a. on the mast cells membrane
- b. on the B-lymphocytes membrane
- c. on the surface of macrophage
- d. on the surface of target cell
- e. in the blood plasma

**112.** The patient B. passed a tuberculin skin test (Mantoux reaction). In 24 hours the red spot formed in the place of injection. The complex antigen - antibody fixates during development of the 4th type of allergic reaction:

- a. in the blood plasma
- b. on the mast cell membrane
- c. on the surface of macrophage
- d. on the membrane of B-lymphocyte
- e. it doesn't form

**113.** The same mechanisms are used by the organism for development of both immune and allergic reactions. What is the main difference in pathogenesis of allergic and immune reactions?

- a. amount of antigen
- b. peculiarities of antigen structure
- c. way antigen enters the body
- d. development of tissue damage
- e. hereditary predisposition

**114.** The formation of blood circulating immune complexes (antigen – antibody) is typical for allergic reactions of type:

- a. 1<sup>st</sup> type
- b. 2<sup>nd</sup> type
- c. 4<sup>th</sup> type
- d. 5<sup>th</sup> type
- e. 3<sup>rd</sup> type

- 115.** In response to antigen stimulation, the immune system is able to produce several types of immunoglobulins: IgA, IgM, IgG, IgE. Which is a distinctive feature of IgE?
- circulation in the blood
  - ability to activate the complement
  - fixation on the receptor of a mast cell
  - fixation on T-killer
  - ability for binding antigen
- 116.** The patient was given a conductive anesthesia with Novocain before extraction of tooth. After injection edema and hyperemia in the injection region, itching of skin, general weakness, and arterial hypotension developed. Define the complication described:
- immune tolerance
  - fever
  - drug dependence
  - allergy
  - inflammation
- 117.** The immune complex reaction in organism proceeds with participation of IgM and IgG. Which is the common feature both of IgM and IgG?
- fixation on the receptor of mast cell
  - fixation on tissue macrophage
  - fixation on T-killer
  - ability to interact with pollen
  - ability to activate the complement
- 118.** Which disease develops with the 2nd type of allergic reaction?
- atopic bronchial asthma
  - contact allergic dermatitis
  - food allergy
  - autoimmune hemolytic anemia
  - jaundice of the newborns
- 119.** It has been estimated that allergic reactions of the 2nd type play the main role in erythrocytes hemolysis in patients with hemolytic anemia. Which mediators cause cytotoxic effect in this type of allergy?
- histamine
  - lymphokines
  - factor of lymphocytes blast transformation
  - serotonin
  - activated components of the complement
- 120.** Allergic reactions of the 3rd type are typical for pathogenesis of:
- atopic bronchial asthma
  - autoimmune glomerulonephritis
  - contact allergic dermatitis
  - anaphylactic shock
  - tuberculin reaction
- 121.** Type 5 allergic reactions are known as “stimulating reactions”. Choose the example of disease provided with stimulating allergic reactions:
- hay fever
  - Arthus reaction
  - Quincke’s disease
  - autoimmune thyroiditis
  - autoimmune hemolytic anemia
- 122.** Which immune cells contribute to tissue injury in immune complex allergic reactions?
- B –cells
  - plasmatic cells
  - T-cells
  - mast cells
  - phagocytes
- 123.** Exposure to extremes of temperature (hot and cold) and ionizing radiation in some cases may result in pseudoallergy development. Which is the distinctive feature of pseudoallergy?
- absence of immunological stage
  - absence of biochemical stage
  - presence in patients with immune deficiency
  - dependence from the type of allergen
  - independence from the dose of allergen
- 124.** It is known that many cases of “food allergy” are not real allergy, but pseudoallergy. Which is the distinctive feature of pseudoallergy?
- absence of biochemical stage
  - absence of clinical manifestation
  - presence in patients with immune deficiency
  - dependence from the type of allergen
  - dependence from the dose of allergen
- 125.** Which mechanisms are considered to be general mechanisms of autoimmune pathology?
- direct antibody mediated effects
  - T cell mediated effects
  - immune complex mediated effects
  - all of listed
  - none of listed
- 126.** Development of sympathetic ophthalmia (inflammation of a healthy eye after the penetrative injury and subsequent inflammation in another eye) is considered to be an autoimmune disorder. Which mechanism from listed below initiates autoimmune process?
- over expression of MHC 2 class molecules
  - altering of self-antigens
  - similarity of antigens
  - contact with sequestered antigens
  - primary changes of immune system.
- 127.** Prevention of which type of allergic reactions can be provided with the hyposensitization (specific immunotherapy)?
- 1<sup>st</sup> type
  - 2<sup>nd</sup> type
  - 3<sup>rd</sup> type
  - 4<sup>th</sup> type
  - 5<sup>th</sup> type
- 128.** Patient was injected with Novocaine solution in order to provide local anesthesia during tooth extraction. In 1 minute after injection the patient turned pale and unconscious. ABP – 90/60 mmHg, heat rate – 128 bpm. Name the condition that has developed in the patient:
- Acute heart failure
  - Orthostatic collapse
  - Anaphylactic shock
  - Bronchial asthma attack
  - Pulmonary embolism
- 129.** Allergic reactions are characterized by increased sensitivity to various substances. Which substance amount can prove the presence of hypersensitivity state in the patient?
- histamine
  - IgE
  - IgA
  - prostaglandins
  - complement
- 130.** Patient complains of the skin rashes, which appear after cooling the skin (cold water or cold air exposure). After returning from the street in the winter the opened areas of the skin turn red (hyperemia) and itches appear. Which substance from the listed can cause such clinical symptoms?
- histamine
  - IgE
  - IgM and IgG
  - prostaglandins
  - complement
- 131.** A nurse complains of the rashes on the skin of hands. Her usual work is performing injections of antibiotics and other medicines to the patients. The symptoms of skin irritation usually disappear after summer vacations. In 7-10 days after working with the solutions of medicines the symptoms of rashes appear again. Which type of allergic reaction possibly causes her allergic disease?
- 1<sup>st</sup> type

- b. 2<sup>nd</sup> type
- c. 3<sup>rd</sup> type
- d. 4<sup>th</sup> type
- e. 5<sup>th</sup> type

**132.** The autoimmune hemolytic anemia is diagnosed in the patient. The pathogenetic mechanism of it is cytotoxic type of allergic reaction. Which antigens antibodies are synthesized in this clinical situation to?

- a. modified receptor of RBC membranes
- b. mast cell receptors
- c. hormones
- d. foreign proteins
- e. foreign cells

**133.** Leukopenia followed the treatment with sulfonamides. Antileukocytic antibodies were found in patient's blood. What type of allergic reaction takes place in this situation?

- a. anaphylactic
- b. cytotoxic
- c. stimulating
- d. cell-mediated
- e. immune complex

**134.** An injection of a large dose of antibodies to the glomeruli basal membrane components into the experimental animal led to the development of acute glomerulonephritis. Which type of allergic reaction takes place in this situation?

- a. anaphylactic
- b. cytotoxic
- c. stimulating
- d. cell-mediated
- e. immune complex

## KROK TESTS ON GENERAL NOSOLOGY

**135.** A doctor examined a patient, studied blood analysis, and made a conclusion that of peripheral organs immunogenesis were affected. What organs are the most likely to be affected?

- a. tonsils
- b. red bone marrow
- c. yellow bone marrow
- d. kidneys
- e. thymus

**136.** A 30-year-old patient has dyspnea fits, mostly at night. He has been diagnosed with bronchial asthma. What type of allergic reaction according to the Gell-Coombs classification is most likely in this case?

- a. anaphylactic
- b. delayed type hypersensitivity
- c. cytotoxic
- d. stimulating
- e. immune complex

**137.** During blood transfusion a patient has developed intravascular erythrocyte hemolysis. What type of hypersensitivity does the patient have?

- a. II type (antibody-dependent)
- b. IV type (cellular cytotoxicity)
- c. I type (anaphylactic)
- d. III type (immune complex)
- e. IV type (granulomatosis)

**138.** Several minutes after a dentist administered Novocain for local tooth anesthesia, sudden fatigue and skin itching developed in the patient. Objectively: skin hyperemia, tachycardia, drop of BP to 70/40 mm Hg. What type of allergic reaction can lead to this pathology?

- a. anaphylactic
- b. immune complex
- c. cytotoxic
- d. stimulating
- e. cell-mediated immune reaction

**139.** A 12-year-old child has developed nephritic syndrome (proteinuria, hematuria, cylindruria) 2 week after the case of tonsillitis. Nephritic syndrome is the sign of affected glomerular basement membrane in the kidneys. What mechanism cause the basement membrane damage?

- a. immune complex
- b. granulomatous
- c. cytotoxic
- d. reaginic
- e. antibody-mediated

**140.** Which condition may develop 15-30 minutes after re-administration of an antigen as a result of the increased level of antibodies, mainly IgE, that are absorbed on the surface of tissue basophils (mast cells) and blood basophils?

- a. anaphylaxis
- b. immune complex hyperresponsiveness

- c. antibody-dependent cytotoxicity
- d. serum sickness
- e. delayed-type hypersensitivity

**141.** A pneumonia patient has been administered acetylcysteine as a part of complex therapy. What principle of therapy was taken into consideration when applying this drug?

- a. Pathogenetic
- b. Symptomatic
- c. Etiotropic
- d. Antimicrobial
- e. Immunomodulatory

**142.** A disaster fighter at a nuclear power plant developed hemorrhagic syndrome in acute radiation disease. What is the most important factor of syndrome pathogenesis?

- a. Thrombocytopenia
- b. Vascular wall damage
- c. Increased activity of fibrinolysis factors
- d. Increased activity of anticoagulative system factors
- e. Decreased activity of coagulative factors

**143.** A 10-year-old child had the Mantoux tuberculin test administered. 48 hours later a papule up to 8 mm in diameter appeared on the site of the injection. What type of hypersensitivity reaction developed after the tuberculin injection?

- a. Type IV hypersensitivity reaction
- b. Arthus phenomenon
- c. Seroreaction
- d. Atopic reaction
- e. Type II hypersensitivity reaction

**144.** During surgical manipulations a patient has been given novocaine injection for anesthesia. 10 minutes later the patient developed paleness, dyspnea, hypotension. What type of allergic reaction is it?

- a. Anaphylactic immune reaction
- b. Cellulotoxic immune reaction
- c. Aggregate immune reaction
- d. Stimulating immune reaction
- e. Cell-mediated immune reaction

**145.** A child with a history of frequent angina and pharyngitis has been diagnosed with lymphadenopathy and splenomegaly. His appearance is characterised by pastosity and paleness, muscular tissue is poorly developed. Lymphocytosis is present. What kind of diathesis is it?

- a. Lymphohypoplastic diathesis
- b. Exudative diathesis
- c. Gouty diathesis
- d. Asthenic diathesis
- e. Hemorrhagic diathesis

**146.** A child is pale, pastose, muscular tissue is bad developed, lymph nodes are enlarged. He often suffers from angina and pharyngitis, blood has signs of lymphocytosis. The child is also

predisposed to autoallergic diseases. What type of diathesis can be presumed in this case?

- a. Lymphohypoplastic
- b. Exudative
- c. Gouty
- d. Asthenic
- e. Hemorrhagic

**147.** After an immunoassay a child was diagnosed with immunodeficiency of humoral immunity. What is the reason for the primary immunodeficiency development in the child?

- a. Hereditary abnormality of immune system
- b. Embryonal development abnormalities
- c. Pathometabolism in mother's organism
- d. Immune responsiveness and resistance disorders
- e. Toxic damage of B-lymphocytes

**148.** Examination of a child who frequently suffers from infectious diseases revealed that IgG concentration in blood serum was 10 times less than normal, IgA and IgM concentration was also significantly reduced. Analysis showed also lack of B-lymphocytes and plasmocytes. What disease are these symptoms typical for?

- a. Bruton's disease
- b. Swiss-type agammaglobulinemia
- c. Dysimmunoglobulinemia
- d. Louis-Bar syndrome
- e. Di George syndrome

**149.** A child with suspected tuberculosis was given Mantoux test. After 24 hours the site of the allergen injection got swollen, hyperemic and painful. What are the main components that determine such response of the body?

- a. Mononuclear cells, T-lymphocytes and lymphokines
- b. Granulocytes, T-lymphocytes and IgG
- c. Plasma cells, T-lymphocytes and lymphokines
- d. B-lymphocytes, IgM
- e. Macrophages, B-lymphocytes and monocytes

**150.** A child entering the school for the first time was given Mantoux test in order to determine if there was a need for revaccination. The reaction was negative. What is the meaning of this test result?

- a. No cell-mediated immunity to tuberculosis
- b. Availability of cell-mediated immunity to tuberculosis
- c. No antibodies to the tuberculosis bacteria
- d. No anti-toxic immunity to tuberculosis
- e. Presence of antibodies to the tuberculosis bacteria

**151.** A child cut his leg with a piece of glass while playing and was brought to the clinic for the injection of tetanus toxoid. In order to prevent the development of anaphylactic shock the serum was administered by Bezredka method. What mechanism underlies this method of desensitization of the body?

- a. Binding of IgE fixed to the mast cells
- b. Blocking the mediator synthesis in the mast cells
- c. Stimulation of immune tolerance to the antigen
- d. Stimulation of the synthesis of antigen-specific IgG
- e. Binding of IgE receptors to the mast Cells

**152.** 10 days after having quinsy caused by beta-hemolytic streptococcus a 6-year-old child exhibited symptoms of glomerulonephritis. What mechanism of glomerular lesion is most likely in this case?

- a. Immunocomplex
- b. Cellular cytotoxicity
- c. Anaphylaxis
- d. Atopy
- e. Antibody-dependent cell-mediated cytotoxicity

**153.** A 22-year-old woman ate some seafood. 5 hours later the trunk and the distal parts of limbs got covered with small itchy papules which were partially fused together. After one day, the rash disappeared spontaneously. Specify the hypersensitivity mechanism underlying these changes:

- a. Atopy (local anaphylaxis)
- b. Systemic anaphylaxis

- c. Cellular cytotoxicity
- d. Immune complex hypersensitivity
- e. Antibody-dependent cell-mediated cytotoxicity

**154.** Parents of 5-year-old child report him to have frequent colds that develop into pneumonias, presence of purulent rashes on the skin. Laboratory tests have revealed the following: absence of immunoglobulins of any type, and naked cells are absent from the lymph nodes punctate. What kind of immune disorder is it?

- a. X-linked hypogammaglobulinemia (Bruton type agammaglobulinemia)
- b. Autosomal recessive agammaglobulinaemia (Swiss type)
- c. Hypoplastic anemia
- d. Agranulocytosis
- e. Louis-Barr syndrome

**155.** 30 minutes after drinking mango juice a child suddenly developed a local swelling in the area of the soft palate, which impeded swallowing and, eventually, respiration. Mucosa of the swollen area was hyperemic and painless. Blood test revealed moderate eosinophilia. Body temperature was normal. Anamnesis states that the elder sister of the child has been suffering from bronchial asthma attacks. What kind of edema has developed in the child?

- a. Allergic
- b. Inflammatory
- c. Cardiac
- d. Alimentary
- e. Hepatic

**156.** Ionizing radiation or vitamin E deficiency affects the cell by increasing lysosome membrane permeability. What are the possible consequences of this pathology?

- a. Partial or complete cell destruction
- b. Formation of maturation spindle
- c. Intensive energy production
- d. Restoration of cytoplasmic membrane
- e. Intensive protein synthesis

**157.** A 13-year-old boy presents with eczematous rashes on his shin and torso. Anamnesis states cases of otitis, pneumonia and furuncles in the patient. Blood test: platelets  $70 \times 10^9/L$ , low activity of T-helpers and T-suppressors, low IgM with normal IgA and IgG. What immunodeficient disease does this boy have?

- a. Wiskott-Aldrich syndrome
- b. DiGeorge syndrome
- c. Severe combined immunodeficiency (Swiss type)
- d. Louis-Barr syndrome
- e. Chediak-Higashi syndrome

**158.** A patient with clinical presentations of immunodeficiency has undergone immunological tests. They revealed significant decrease in number of cells that form rosettes with sheep erythrocytes. What conclusion can be done on the ground of the analysis data?

- a. Decrease in T-lymphocyte level
- b. Decrease in B-lymphocyte level
- c. Decrease in natural killer level (NK-cells)
- d. Decrease in complement system level
- e. Lack of effector cells of the humoral immunity

**159.** A child was born with cleft palate. Examination revealed aorta defects and reduced number of T-lymphocytes in blood. What immunodeficient syndrome is it?

- a. DiGeorge
- b. Wiskott-Aldrich
- c. Chediak-Higashi
- d. Louis-Bar
- e. Swiss-type

**160.** A patient with clinical signs of immunodeficiency has no changes of the number and functional activity of T- and B-lymphocytes. Defect with dysfunction of antigen-presentation to the immunocompetent cells was found during examination on the molecule level. Defect of what cells is the most probable?

- 161.** a. Macrophages, monocytes

- b. T-lymphocytes, B-lymphocytes
- c. NK-cells
- d. Fibroblasts, T-lymphocytes, B-lymphocytes
- e. O-lymphocytes

**162.** A woman resting in the countryside has been stung by a bee. Immediately after she developed pain in the stung area. In a few minutes there developed a vesicle, erythema and intense itch; later - urticarial and expiratory dyspnea. What factors resulted in the patient developing expiratory dyspnea?

- a. Histamine
- b. Hageman's factor
- c. Lysosomal enzymes
- d. Noradrenaline
- e. Adrenaline

**163.** It is known that typical pathological processes develop on the same laws in different organs and tissues and in different species of animals. Which of the following phenomena can be attributed to a typical pathological process?

- a. Tumor
- b. Tuberculosis
- c. Hypertonic disease
- d. Intestinal obstruction
- e. Myocardial infarction

**164.** A 49-year-old man, who was ill 12 years ago with a rheumatic myocarditis and an endocarditis, has a mitral valve deficiency. The research have shown that there is no inflammatory process in the heart now, the minute volume of blood circulation is sufficient. What concept of general nosology responds to this condition?

- a. Pathological condition
- b. Pathological reaction
- c. Pathological process
- d. Typical pathological process
- e. Compensatory reaction

**165.** A 60-year-old man, because of long stay in wet clothes at low temperature, became ill with croupous pneumonia. What is the cause of this form of lung inflammation?

- a. Pneumococcus
- b. Age
- c. Reduced reactivity of the body
- d. Effect of low temperature on the body
- e. Effect of high humidity on the body

**166.** A man aged 50 years who was treated for stomach ulcer had normalized digestion, disappearing of pain, improved mood. But in a few weeks, pain in the epigastrium, heartburn and acid belching appeared again. How can one characterize such manifestation of the disease?

- a. Relapse of the disease
- b. Remission period
- c. Terminal condition
- d. Prodromal period
- e. Latent period

**167.** During the work on the elimination of the consequences of an accident at the nuclear power plant, the worker received a radiation dose of 500 roentgens. He complains of headache, nausea, dizziness. What changes in the number of leukocytes of patient can be expected 10 hours after irradiation?

- a. Neutrophil leukocytosis
- b. Lymphocytosis
- c. Leukopenia
- d. Agranulocytosis
- e. Leukemia

**168.** One of the leading pathogenetic links in the development of pathology caused by ionizing radiation is the intensification of processes of free radicals oxidation of substances. Which substances are the main source of free radicals?

- a. Water
- b. Lipids
- c. Carbohydrates
- d. Proteins

- e. Ions of metals

**169.** The irradiation of the patient with a single dose of ionizing radiation caused the development of the bone-marrow form of the radiation disease. Which variant of blood count will be typical for the period of apparent well-being?

- a. Increasing lymphopenia, leukopenia
- b. Redistributive leukocytosis, lymphocytosis
- c. Anemia, leukopenia
- d. Thrombocytopenia, anemia
- e. Thrombocytopenia, leukocytosis

**170.** The patient came to the hospital after ionizing radiation with complaints about vomiting, anorexia, pain in different parts of abdomen, presence of blood in stool, increase of body temperature, lethargy. For what form of acute radiation sickness this clinical picture is typical?

- a. Intestinal
- b. Bone marrow
- c. Cerebral
- d. Mixed
- e. Toxemic

**171.** Coronary artery thrombosis caused the development of myocardial infarction. What mechanisms of cardiomyocyte damage are dominant in this pathology?

- a. Calcium
- b. Lipid
- c. Acidic
- d. Electrolyte-osmotic
- e. Protein

**172.** For stomach ulcer modelling, atophan was injected into the gastric arteries of the animal, that causes sclerosis of gastric arteries. What mechanism of damage of the gastric mucosa is leading in this experiment?

- a. Hypoxic
- b. Neurodystrophic
- c. Mechanic
- d. Disregulation
- e. Neurohumoral

**173.** A 15-years boy has been diagnosed with acute viral hepatitis. The research of which blood index should be carried out to confirm acute liver damage?

- a. Activity of aminotransferases [AIT and AST]
- b. Free and conjugated bilirubin content
- c. Erythrocytes sedimentation rate [ESR].
- d. Cholesterol level
- e. Content of protein fractions

**174.** In reperfusion syndrome, processes of free radical oxidation are activated, resulting in damage to cell membranes and a violation of cell functions. These changes are associated with excessive accumulation in the cytoplasm of which ions?

- a. Calcium
- b. Magnesium
- c. Chlorine
- d. Sodium
- e. Potassium

**175.** In hepatitis, myocardial infarction, the activity of alanine and aspartate aminotransferases greatly increases in blood plasma of the patient. Which process causes the increase of activity of these enzymes in the blood?

- a. Damage of cell membranes and release of enzymes in the blood
- b. Enhancement of enzymes by hormones
- c. Lack of pyridoxine
- d. Increased speed of amino acid synthesis in tissues
- e. Increase of amino acids catabolism in the tissues

**176.** In a body of a patient with hypertension a significant increase in the mass of the left ventricule myocardium was found. This is due to:

- a. Increased volume of cardiomyocytes
- b. Increased number of cardiomyocytes
- c. Growth of connective tissue

- d. Water retention in the myocardium
  - e. Fat infiltration of the myocardium
- 177.** In experimental animal, an experimental diabetes mellitus was caused by intraperitoneal injection of alloxone. What is the mechanism of action of this substance?
- a. Damage of beta-cells of pancreatic islets
  - b. Zinc bonding
  - c. Formation of antibodies to insulin
  - d. Activation of insulinase
  - e. Activation of the production of counter-insulin hormones
- 178.** In case of damage of cell by the ionizing radiation, mechanisms of protection and adaptation are activated. What is the mechanism of recovery of impaired intracellular homeostasis?
- a. Activation of the antioxidant system
  - b. Activation of Ca-mediated cellular functions
  - c. Accumulation of Na<sup>+</sup> in the cells
  - d. Decrease of adenylate cyclase activity
  - e. Hypertrophy of mitochondria
- 179.** A 52-year-old woman suffering from breast cancer has undergone a course of radiation therapy. The size of the tumor has decreased. Which of the following mechanisms of damage of the cell cause the efficiency of radiotherapy the most?
- a. Formation of free radicals
  - b. Hyperthermia
  - c. Lysis by NK-cells
  - d. Mutagenesis
  - e. Vessel thrombosis
- 180.** Blood serum analysis of the patient with acute hepatitis shows increased levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST). What changes on the cellular level can result in such findings?
- a. Cell destruction
  - b. Disturbed energy supply to the cells
  - c. Disturbed cellular enzyme systems
  - d. Damage to the genetic apparatus of the cells
  - e. Disturbed intercellular interactions
- 181.** To prevent transplant rejection after organ transplantation, it is necessary to conduct a course of hormone therapy for immunosuppression. What hormones are used for this purpose?
- a. Glucocorticoids
  - b. Mineralocorticoids
  - c. Sex hormones
  - d. Catecholamines
  - e. Thyroid hormones
- 182.** In the research of the condition of the immune system of the patient with chronic fungal skin lesions, violations of cellular immunity were revealed. Reducing of which indicators are the most typical for this?
- a. T-lymphocytes
  - b. Immunoglobulins G
  - c. Immunoglobulins E

### Disturbances of peripheral bloodflow and microcirculation

- 189.** Patient G. has inflammatory infiltration on the right forearm. Skin around inflammatory center is red, hot and painful. What kind of blood circulation disorder does this patient have?
- a. venous hyperemia
  - b. sludge syndrome
  - c. ischemia
  - d. arterial hyperemia
  - e. embolism
- 190.** What are the main conditions of a thrombus formation?
- a. vessel wall injury, BAS influence, anti-coagulation system activation
  - b. coagulation deficiency, platelets activation, hemodilution
  - c. anti-coagulation system activation, BAS influence, vessel wall injury

- d. B-lymphocytes
  - e. Plasmocytes
- 183.** A 2-years old child has been diagnosed with thymus hypoplasia. What immune system cell number change is the most typical for this immunodeficiency?
- a. Decreased number of T-lymphocytes
  - b. Decreased number of B-lymphocytes
  - c. Deficiency of T and B-lymphocytes
  - d. Absence of plasmatic cells
  - e. Reduction of immunoglobulins M
- 184.** The mice with no hair (i.e., nude) have no cellular reactions of the delayed type. For this pathology most likely is:
- a. Lack of thymus gland
  - b. Absence of gammaglobulins in the blood
  - c. Violation of hemopoiesis
  - d. Defective phagocytosis
  - e. Deficiency of components of the complement system
- 185.** The body uses the same mechanisms of the immune system response to the antigen both in the development of the immune and allergic reactions. Define the main difference between allergic reactions and the immune response:
- a. development of the damage to the tissues
  - b. of the amount of antigen present
  - c. feature of the structure of antigens
  - d. ways of receiving antigens to the body
  - e. hereditary predisposition
- 186.** In experiment the nephrocytotoxic serum of guinea pig was injected to rabbit. What kidney disease was modeled in this experiment?
- a. Acute diffuse glomerulonephritis
  - b. Nephrotic syndrome
  - c. Acute pyelonephritis
  - d. Chronic renal failure
  - e. Chronic pyelonephritis
- 187.** The patient P., after the trauma, was a need the injection of anti-tetanus serum, but a sensitivity test for serum was positive. How to conduct hyposensitization in a patient? Injection:
- a. of small doses of a specific allergen
  - b. of physiological doses of glucocorticoids
  - c. of the dissolving dose of a specific allergen
  - d. of therapeutic doses of antihistamines
  - e. of decreasing-sensitizing drugs
- 188.** Antileukocytic antibodies are detected in the blood of a patient with leukopenia. What type of Coombs-Gell hypersensitivity reaction developed in this case?
- a. Cytotoxic
  - b. Stimulating
  - c. Immune complex-mediated
  - d. Anaphylactic
  - e. Delayed-type hypersensitivity

- d. hemoconcentration, turbulent blood flow, vessel wall injury
  - e. vessel wall injury, coagulation system activation, slow bloodflow
- 252.** Patient with diabetes mellitus has venous hyperemia in lower extremities. What signs of this pathology would this patient have?
- a. redness, local temperature increase, tissues edema
  - b. paleness, local temperature decrease, tissue elasticity decrease
  - c. cyanosis, local temperature decrease, tissues edema
  - d. redness, local temperature increase, tissue volume increase
  - e. cyanosis, local temperature increase, tissue volume decrease

- 253.** Patient M. has angina pectoris attack as a result of myocardium ischemia after a physical load. Choose the correct ischemia definition:
- imbalance between tissues blood supply and demand
  - erythrocytes quantity decrease in circulation blood
  - local vasodilatation under BAS influence
  - oxygen partial pressure decrease in blood under physical load
  - imbalance between blood oxygen capacity and oxygen tissue need
- 254.** Patient 65 years old with diabetes mellitus and diabetic angiopathy has acute respiratory insufficiency as a result of pulmonary embolism. What blood system region could be a place for primary thrombus formation?
- lower extremities veins
  - portal vein system
  - mesenteric arteries
  - pulmonary veins
  - lower extremities arteries
- 255.** Skin-diver 10 minutes after the lifting from a depth of 15 m developed such clinical features: pain in joints and muscles, transient consciousness loss. Choose the appropriate pathology from listed below:
- gas mixture poisoning
  - lung vessels thrombosis
  - gas embolism
  - cerebral vessels spasm
  - respiratory acidosis
- 256.** Patient A. 60 years old with varicose veins of the lower extremities has cyanosis, decreased skin temperature, solitary petechiae, edema. What kind of hemodynamic disorder does the patient have?
- compression ischemia
  - obstructive ischemia
  - thrombus embolism
  - arterial hyperemia
  - venous hyperemia
- 257.** Patient P. 40 years old with opened fracture of the hip suddenly developed pulmonary embolism. Choose the possible type of embolism:
- thromboembolism
  - air embolism
  - tissue embolism
  - fat embolism
  - foreign body embolism
- 258.** Patient G. has inflammatory infiltration on the right forearm. Skin around inflammatory center is red, hot and painful. What sign additionally describes the arterial hyperemia development?
- arterioles constriction
  - venules dilation
  - erythrocytes aggregation in capillaries
  - functioning capillaries quantity increase
  - new capillaries growth
- 259.** Sportsman had arterial hyperemia features in humeral region after the intensive training. Which mechanism could lead to working arterial hyperemia development?
- neurogenic
  - substrative
  - neurotonic
  - neuroparalytic
  - metabolic
- 260.** Sportsman had arterial hyperemia features in humeral region after the intensive training. What is the possible negative consequence of arterial hyperemia in organs and tissues?
- excessive lymph formation with edema development
  - ruptures of microcirculation vessels walls
  - cells and tissues hypertrophy and hyperplasia
  - immunity depression
  - cells function activity increase
- 261.** Pain in the leg at walking, cyanosis and edema of shins appeared in a patient with varicosity. His foot is cold. What kind of disturbances of regional blood flow appeared in the patient?
- Angiospastic ischemia
  - Ischemic stasis
  - Compressive ischemia
  - Venous hyperemia
  - Obstructive ischemia
- 262.** Edema and cyanosis of low extremities appear in a food shop assistant at the end of a workday. What is the main factor of the edema development in this patient?
- Dilatation of resistant vessels
  - Orthostatic increase of venous pressure
  - Increase of number of functional capillaries
  - Increase of collateral blood flow
  - Increase of tissue drainage
- 263.** Redness and increase in volume of affected place of tissue and increase in local temperature were observed in a patient with burn of thigh. Which pathological process do indicated symptoms correspond to?
- Arterial hyperemia
  - Venous hyperemia
  - Thrombosis
  - Ischemia
  - Stasis
- 264.** Patient's arm was put in plaster cast on account of humeral bone fracture. Swelling, cyanosis and decrease of the temperature of the traumatized arm appeared next day. What kind of disturbances of regional blood flow appeared in the patient?
- Thrombosis
  - Venous hyperemia
  - Ischemia
  - Embolism
  - Arterial hyperemia
- 265.** One of the most dangerous points in myocardial infarction pathogenesis is enlargement of the zone of necrosis, dystrophy and ischemia. Increase in myocardial oxygen consumption plays important role in the development of indicated processes. Which substances contribute to this process?
- Chloride ions
  - Lipoproteins
  - Catecholamines
  - Acetylcholine
  - Adenosine
- 266.** After surgical removing of coronary artery occlusion in a patient with ischemic heart disease, the development of secondary myocardium injury (reperfusion syndrome) characterized by necrobiotic changes in the focus of previous ischemia. This complication results from:
- Accumulation of hydrogen ions
  - Deficiency of potassium ions
  - Deficiency of adenosine triphosphate
  - Excessive accumulation of calcium ions
  - Deficiency of creatinephosphate
- 267.** A 57-year-old man complains of heart pain that has developed after prolonged negative emotions. An emergency doctor diagnosed ischemic heart disease. What kind of ischemia is the most probable in this patient?
- Compressive
  - Obliterative
  - Angiospastic
  - Obturbative
  - Metabolic



- 268.** The theory exists that atherosclerosis plays an important role in periodontitis development, affecting vessels of gums. Which regional blood flow disturbance develops under atherosclerosis of vessels?
- Active hyperemia
  - Passive hyperemia
  - Embolism
  - Ischemia
  - Disorders of lymph outflow
- 269.** Instantaneous death of pilots occurs under depressurization of an airplane at the altitude of 19 km. What is the reason of the death in this case?
- Multiple gas embolism
  - Hemorrhage to the brain
  - Gas embolism of cerebral veins
  - Bleeding
  - Paralysis of respiratory center
- 270.** Gas embolism developed in a diver who was lifted up to the surface very fast. In this case it is a result of a fast changing:
- from increased atmospheric pressure to normal
  - from normal atmospheric pressure to increased
  - from normal atmospheric pressure to decreased
  - from decreased atmospheric pressure to normal
- 271.** Examination of the lower extremities of a 40-year-old patient with vascular disease of lower limbs (obliterating endarteritis) revealed skin pallor and dystrophy, local temperature decrease, and pain. The patient is likely to have the following disorder of the peripheral blood flow:
- Obstruction ischemia
  - Compression ischemia
  - Angiospastic ischemia
  - Venous hyperemia
  - Arterial hyperemia
- 272.** A female patient consulted by doctor about leg pain, edema of feet and shins that arises usually in the end of the workday. On the clinical examination: leg skin is cyanotic and cold to the touch. What type of peripheral blood flow disorder does this patient have?
- Venous hyperemia
  - Arterial hyperemia
  - Ischaemia
  - Stasis
  - Thrombosis
- 273.** Upper neck node of sympathetic trunk was removed from the rabbit on experiment. Redness and increased temperature of the skin of head is observed. What form of peripheral blood flow disorder developed in the rabbit?
- Neuroparalytic arterial hyperemia
  - Neurotonic arterial hyperemia
  - Metabolic arterial hyperemia
  - Venous hyperemia
  - Stasis
- 274.** A 42-year-old woman with neuralgia of trigeminal nerve complains of recurrent reddening and sensation of heat in the right part of her face and neck, and hypersensitivity of the skin. Which type of arterial hyperemia causes these symptoms?
- Metabolic
  - Neurotonic
  - Neuroparalytic
  - Functional
  - Reactive
- 275.** After physical activity, a patient with the thrombophlebitis of the lower extremities suddenly developed dyspnea, acute pain in the chest, cyanosis, swelling of cervical veins. What type of circulation pathology can develop in this situation?
- thromboembolism of mesenterial vessels
  - thromboembolism of coronary vessels
  - thromboembolism of the brain vessels
  - thromboembolism of the pulmonary artery
  - thromboembolism of the portal vein
- 276.** A 54-year-old female was brought to the casualty department after a car accident. A traumatologist diagnosed her with multiple fractures of the lower extremities. What kind of embolism is most likely to develop in this case?
- air
  - gaseous
  - fat
  - tissue
  - thromboembolism

### Inflammation

- 277.** Acute inflammation is always accompanied by the increase of erythrocyte sedimentation rate. This occurs due to elevation of serum content of:
- lipoproteins
  - albumens
  - immunoglobulins
  - C-reactive protein
  - glucocorticoids
- 278.** Which sign from the given belongs to systemic signs of inflammation?
- swelling
  - pain
  - leukocytosis
  - heat
  - redness
- 279.** Which of the given local sign of inflammation is developed due to vascular leakage?
- Calor (heat)
  - Rubor (redness)
  - Dolor (pain)
  - Tumor (swelling)
  - Functio laesa (loss of function)
- 280.** Which event is primary in inflammatory pathogenesis?
- disorders of blood circulation
  - phagocytosis
  - tissues acidosis development
  - increased vessels permeability
  - cell damage
- 281.** Which factor can directly cause secondary alteration?
- kinines
  - lysosomal enzymes
  - lymphokines
  - fibrinogen
  - cytokines
- 282.** Patient B., 32 years old, complains about dry cough, pain in muscles and joints, appetite loss, headache. Body temperature is 39 C, blood count: leukocytosis, increased ESR. Which is the mechanism of primary alteration in the case of viral infection?
- cell genetic program realization violation
  - cell membranes damage
  - cell energy supply violation
  - cell receptors damage
  - cell lysosome destruction
- 283.** Which of the statements from listed below correctly describes the metabolic changes in the site of inflammation?
- Decreased metabolism level during all inflammatory stages
  - Increased catabolism level during final inflammatory stage
  - Increased catabolism in early inflammatory stage

- d. Increased anabolism in early inflammatory stage  
e. Decreased anabolism in final stage of inflammation
- 284.** Patient B., 32 years old, complains about dry cough, pain in muscles and joints, appetite loss, headache. Body temperature is 39 C, blood count: leukocytosis, increased erythrocytes sedimentation rate. Which of inflammatory mediators can cause systemic effect?
- catecholamines
  - neutrophil's proteins
  - prostaglandins
  - kinins
  - interleukins
- 285.** Arachidonic acid metabolites (prostaglandins, leukotrienes) are known as potent mediators of inflammation. Which enzyme will release arachidonic acid from cell membrane lipids?
- Cyclooxygenase
  - Lipoxygenase
  - Adenylate cyclase
  - Phospholipase
  - Myeloperoxidase
- 286.** Which inflammatory mediator is known to be normally sequestered in intracellular granules?
- Histamine
  - Prostaglandin E2
  - Complement
  - Interleukin
  - Bradykinine
- 287.** Which substances released from activated neutrophils and macrophages may contribute to tissue damage during inflammation?
- Free oxygen radicals
  - Platelet activating factors
  - Endothelial growth factors
  - Interleukines
  - Gamma interferons
- 288.** Which influence results in arterial hyperemia development during inflammation?
- histamine secretion
  - compression of vessels by the exudate
  - vessel wall elasticity decrease
  - endothelium swelling
  - blood viscosity increase
- 289.** The main reason of the rapid onset of vasodilation after tissue injury is:
- release of histamine from mast cells
  - neural reflexes
  - release of leukotrienes
  - release of prostaglandins from mast cells
  - activation of complement system
- 290.** The main reason of the rapid onset of arterioles spasm after tissue injury is:
- release of histamine from mast cells
  - neural reflex
  - release of leukotrienes
  - release of prostaglandins from mast cells
  - activation of complement system
- 291.** Which mechanism is the most important for inflammatory exudate formation?
- prostaglandin's synthesis
  - tissue basophils degranulation
  - lysosomal enzymes release
  - leukocytes migration
  - increased vessels permeability
- 292.** The patient V. has painful vesicles filled with transparent liquid, surrounded with hyperemia zone, as a result of skin burn. Which mechanism is the leading one in inflammatory exudation process?
- increased tissue colloid and osmotic pressure
  - prostaglandin's synthesis
  - decreased tissue proteins level
  - increased lysosomal enzymes amount
  - leukocytes migration from vessels
- 293.** The vascular events in inflammation lead to formation of exudate. What is the leading factor of fluid leakage from the blood vessels in the site of inflammation?
- Increased permeability of the vessel wall
  - Erythrocyte aggregation
  - Increased blood pressure
  - Decreased resorption of pleural fluid
  - Hypoproteinemia
- 294.** Leakage of fluid out of blood vessels during acute inflammation is due to:
- increased vascular permeability, hydrostatic and tissue osmotic pressure
  - decreased tissue osmotic pressure
  - increased vascular permeability with decreased osmotic pressure
  - increased hydrostatic pressure and permeability
  - increased vascular permeability and hydrostatic pressure with decreased tissue osmotic pressure
- 295.** Choose the negative consequence of exudate formation in the inflammatory process from the given:
- transport of plasma-derived inflammatory mediators
  - transport of antibodies
  - elimination of toxins and metabolites from the vessels of inflammatory site
  - localization of the agent which caused inflammation
  - squeezing of tissues and organs with the exudate
- 296.** Patient G., 32 years old. Diagnosis: acute peritonitis. Muddy yellow liquor with pH 3.0 was got after abdominal cavity puncture. Which cells should be predominately found in inflammatory exudate of the patient with acute inflammation?
- macrophages
  - monocytes
  - lymphocytes
  - neutrophils
  - eosinophiles
- 297.** Patient P., 45 years old, during last year had pyelonephritis exacerbation three times. Which leukocytes are predominately found in the inflammatory center in chronic inflammation?
- neutrophils and adipose cells
  - neutrophils and fibroblasts
  - adipose cells and lymphocytes
  - eosinophiles and macrophages
  - monocytes and lymphocytes
- 298.** Choose the sequence of leukocytes migration towards inflammation site:
- monocytes – neutrophils – lymphocytes
  - neutrophils – monocytes - lymphocytes
  - lymphocytes – neutrophils - monocytes
  - neutrophils – lymphocytes - monocytes
  - lymphocytes – eosinophils - neutrophils
- 299.** During inflammation leukocytes emigrate from blood vessels by means of:
- natural holes in vessel walls
  - directional active migration
  - ruptures in the vessel wall
  - random active migration
  - passive pressure mediated mechanisms
- 300.** The three steps involved in movement of leukocytes from blood vessels into the extravascular space during acute inflammation are:
- adhesion, margination, and chemotaxis
  - stasis, margination, and emigration
  - margination, emigration, and chemotaxis
  - adhesion, margination, and emigration
  - emigration, chemotaxis, and phagocytosis

- 301.** Patient K., 28 years old. Diagnosis: pleuritis. In pleural punctate the quantity of neutrophils is high, some neutrophils include intact microbe cells inside. Define the state of phagocytosis in this case:
- phagocytosis activation
  - phagocytosis inhibition
  - incomplete phagocytosis
  - immune phagocytosis
- 302.** Which substances can act as opsonins (activate phagocytosis)?
- specific antibodies and oxygen
  - leukotrienes and prostaglandins
  - fibrinopeptides and C3
  - prostaglandins and C3b
  - specific antibodies and C3
- 303.** Monocytes and activated macrophages are:
- rarely found in chronic inflammation
  - closely related, in that macrophages can be derived from monocytes
  - derived from different precursor cells
  - found only in acute inflammation
  - equivalent cells
- 304.** The function of the enzymes of the activated macrophage (particularly in the lysosomes) is to:
- digest foreign material
  - remain in storage until the next chronic inflammatory event
  - synthesize new lysosomes
  - process antigen for lymphocytes
  - assist in the synthesis of collagen
- 305.** Patient P., complained about fever, chest pain, which increases under deep breathing. In order to definite diagnosis pleural cavity puncture was made and 20 ml of light liquid with 3-5% protein amount was got. Which kind of inflammation does the patient have?
- fibrinous
  - purulent
  - serous
  - putrescent
  - hemorrhagic
- 306.** Patient F., with acute inflammation of appendix was operated in a surgical department. The abdominal cavity contained exudate with dark yellow color. Microscopic analysis revealed big amount of microorganisms, neutrophils, monocytes and purulent bodies. Which kind of inflammation does the patient have?
- fibrinous
  - purulent
  - serous
  - putrescent
  - hemorrhagic
- 307.** Patient K., 28 years old, has quickly healed wound without scar formation after furuncle cutting. Point out cells, which play important role in proliferation process:
- neutrophils
  - eosinophils
  - fibroblasts
  - lymphocytes
  - monocytes
- 308.** Which cells secrete intercellular matrix components in a healing wound?
- Macrophages
  - Polymorphonuclear leukocytes
  - Multinucleated giant cells
  - Endothelial cells
  - Fibroblasts
- 309.** The process of new capillary growth in granulation tissue during wound healing is called:
- recanalization
  - endothelialization
  - diapedesis
  - angiogenesis
  - hemogenesis
- 310.** Patient K., 28 years old, has quickly healed wound without scar formation after furuncle cutting. How can you name this process?
- necrosis of margins
  - neoplastic transformation
  - secondary intention
  - primary intention
  - ulcer formation
- 311.** The strength of a healed wound depends fundamentally upon:
- how many multinucleated giant cells develop in the disrupted tissue
  - the size of the wound
  - whether the wound healed by first or second intention
  - whether granulation tissue formed in the wound
  - the amount and nature of the collagen produced
- 312.** The main human defense mechanisms against injury are:
- inflammation and wandering phagocytes
  - cell proliferation, wandering phagocytes, and inflammation
  - cell proliferation and immunity
  - wandering phagocytes and immunity
  - inflammation and immunity
- 313.** Tissue injury in human organism results in inflammation development. The inflammatory response:
- prevents blood loss from the injured tissue
  - rises body temperature to prevent spreading of infection
  - prevents formation of abscesses
  - localizes injury and promote healing
  - has only negative consequences
- 314.** Which disease is an example of an autoimmune disease that leads to chronic inflammation?
- Viral pneumonia
  - Chronic pyelonephritis
  - Silicosis
  - Rheumatoid arthritis
  - Asbestosis
- 315.** Inflammation development was studied after skin septic damage in experiment on rabbits. Which hormones have anti-inflammatory effect?
- thyroid hormones
  - catecholamines
  - mineralocorticoids
  - glucocorticoids
  - posterior pituitary hormones
- 316.** Patient S., with rheumatoid arthritis was prescribed glucocorticoids. What is the main mechanism of glucocorticoids anti-inflammatory effect?
- inhibition of histamine secretion
  - microcirculation improvement
  - secondary proliferation decrease
  - immune system activity depression
  - tissue acidosis prevention
- 317.** Inflammatory process development was studied in experiment on rats. Inflammation was caused with 0,1% formalin solution subcutaneous injection. Which hormones can be used to strengthen inflammation in the process of modeling?
- mineralocorticoids
  - female sexual hormones
  - glucocorticoids
  - male sexual hormones
  - posterior pituitary hormones
- 318.** In postoperative scar region one could find granulation tissue intensive growth. In order to inhibit stage of proliferation in inflammation usually glucocorticoid

- treatment is prescribed. Which mechanism of proliferation processes is inhibited by glucocorticoids?
- macrophages proliferation
  - fibroblasts proliferation
  - collagen resorption stimulation by eosinophils
  - collagen fibers synthesis increase
  - collagenases activation
- 319.** It is known that inflammation is characterized with a series of microcirculation alterations. What is the first response of arterioles to injury?
- vasoconstriction
  - vasodilation
  - redness
  - edema
  - hyperemia
- 320.** Leukocytes are taking active part in inflammatory process. What is the name of the phenomenon where WBC's marginate and become attached to the edge of the endothelium?
- cementing
  - pavementing
  - margination
  - adhesion
  - rolling
- 321.** Leukocytes are taking active part in inflammatory process. They can move from the bloodstream to the site of inflammation. Active movement of neutrophils along a concentration gradient is known as...
- passive diffusion
  - chemotaxis
  - facilitated diffusion
  - chemotactic diffusion
  - adhesion
- 322.** Leukocytes are taking active part in inflammatory process by neutralizing bacteria and clearing the cell's debris from the site of inflammation. The process by which polymorphonuclear leukocyte's cytoplasm surrounds the bacteria and encloses it into an invagination of the cell membrane is known as...
- phagolysosome
  - phagolysis
  - phagolium
  - phagocytosis
  - phagophobia
- 323.** Inflammation is characterized by increased vessels permeability and increase of hydrostatic blood pressure. Increase of the osmotic and oncotic pressure is present in the intercellular fluid. What kind of edema will appear in this case?
- hydrodynamic
  - colloid-osmotic
  - lymphogenic
  - membranogenic
  - mixed
- 324.** Necrosis focus appeared in the area of hyperemia and skin edema as a result of a thermal burn. What is the main mechanism that causes destructive process in the inflammation area in a few hours after the burn has appeared?
- primary alteration
  - secondary alteration
  - emigration of lymphocytes
  - diapedesis of erythrocytes
  - proliferation of fibroblasts
- 325.** In a patient who had undergone trauma of the knee with subsequent hemorrhagic bursitis complains of the limited ability of movements in the joint due to scar formation. Which inflammatory event was responsible for this complication development?
- primary alteration
  - secondary alteration
  - violation of microcirculation
  - exudation
  - proliferation
- 326.** A 6-year-old child had hyperergic inflammation of the upper respiratory tract. There was a threat of serious respiratory disorder so the doctor had to use anti-inflammatory hormone for the immediate therapy. Which from the given hormones has anti-inflammatory action?
- epinephrine
  - cortisone
  - insulin
  - thyroid hormone
  - vasopressin
- 327.** Modeling of inflammation on the intestine mesentery of a frog revealed peripheral orientation of leukocytes and their migration through the vascular wall. Which factor from the given determines this process?
- decrease of oncotic pressure in the vessels
  - increase of oncotic pressure in the site of inflammation
  - increase of chemotactic substances in the site of inflammation
  - increase of hydrostatic pressure in the vessels
  - decrease of hydrostatic pressure in the vessels
- 328.** An experimental model of inflammation with abscess formation was provided on laboratory animal. Then a lethal dose of tetanin was injected into the abscess cavity, but the animal didn't die. How can you explain the absence of animal lethal outcome in this case?
- activation of antibodies synthesis
  - formation of a barrier around the site of inflammation
  - stimulation of leukopoiesis
  - intensification of vascularization in the site of inflammation
  - activation of phagocytosis in the site of inflammation
- 329.** Edema is an obligatory local sign of inflammation. One of its mechanisms is the increase of vascular permeability. Increased vascular permeability caused by endothelial cell's retraction and contraction affect the following level of circulation:
- pre-arterioles
  - arterioles
  - capillaries
  - venules
  - lymphatics
- 330.** Killing of pyogenic bacteria by neutrophils in the site of inflammation is brought about by the following mechanism:
- by active oxygen radicals
  - by nitric oxide mechanism
  - by oxygen independent bactericidal mechanism
  - by hydrolytic enzymes
  - all from the listed
- 331.** The patient with ascites was made abdominal cavity puncture. 100 ml of fluid were obtained with the following properties. Which of them is used a typical sign for differentiation of transudate from exudate?
- single cells presence
  - low protein content
  - specific gravity
  - fluid color
  - fluid transparency

### Thermoregulation pathology

- 332.** It is known that inflammation is often accompanied by fever development. Which primary mechanism onset fever reaction under inflammation?
- C-reactive protein formation in inflammation center
  - increased leukocytes quantity
  - phagocytosis activation
  - humoral immune response activation
  - secondary alteration
- 333.** Primary bacterial pyrogens are starting fever onset. What bacteria component can be the primary pyrogen?
- Membrane proteins
  - Membrane lipids
  - Lysosomal content
  - Membrane lipopolysaccharides
  - Bacterial cell nucleus
- 334.** Pyrogens are known to be the cause of the fever onset. What from the following may be the source of the secondary pyrogens?
- Bacteria
  - Necrotic tissue
  - Platelets
  - Macrophages
  - Erythrocytes
- 335.** The patient developed fever as a result of acute viral infection. Which of the following substances is the most likely cause of temperature rise?
- Interleukine
  - Histamine
  - Bradykinine
  - Immunoglobuline
  - Interferone
- 336.** Which mechanism of temperature increase is the earliest one in the first stage of fever development?
- tachycardia
  - increase of basal metabolism rate
  - shivering
  - skin vessels constriction
  - sweat secretion decrease
- 337.** Patient I., 24 years old, soldier has got radiation dose 8 Gray. Diagnosis: double lobar pneumonia. Temperature was increased up to 37<sup>0</sup>C. Blood count: anemia, leukopenia with marked granulocytopenia, increased erythrocytes sedimentation rate. What is the cause of low fever reaction in this clinical situation?
- hemic hypoxia development
  - inflammatory barrier formation
  - thermoregulation center damage with radiation
  - leukopenia with granulocytopenia
  - heat-producing mechanisms violation
- 338.** Patient M., 52 years old with bronchial asthma, was treated with glucocorticoids and fever developed as a result of post injective abscess. Patient had subfebrile temperature, which didn't correspond to the severity of inflammatory process. Why did patient have low fever reaction?
- decreased endogen pyrogens production
  - violation of heat loss through lungs
  - inflammatory barrier formation in injection place
  - violation of heat-producing mechanisms
  - thermoregulation center inhibition
- 339.** Patient with infectious disease has fever. How can you estimate thermoregulation of the patient with fever 1<sup>st</sup> stage?
- Thermoregulation is in normal balance
  - Heat loss prevails
  - Heat production prevails
  - Heat production is decreased
  - Heat loss is normal
- 340.** Patient with infectious disease has fever. How can you estimate thermoregulation of the patient with fever 2<sup>nd</sup> stage?
- Thermoregulation is in normal balance
  - Heat loss prevails
  - Heat production prevails
  - Heat production is decreased
  - Heat loss is decreased
- 341.** Patient with infectious disease has fever. What mechanism is the main in the 3<sup>rd</sup> stage of fever?
- increased heat production
  - shivering
  - peripheral vessels dilatation
  - diuresis increase
  - breathing frequency increase
- 342.** Overload of which functional system may be fatal to the patient who has critical decrease of the temperature in the 3<sup>rd</sup> fever stage?
- nervous
  - respiratory
  - circulatory
  - endocrine
  - digestive
- 343.** The child with gastroenteritis, 10 years old, had high fever reaction (38<sup>0</sup>C) which lasted 1 week and was accompanied with 3 kg weight loss and acetone smell from the mouth. Which mechanism could lead to child's weight loss?
- disturbances in digestion
  - increased contractive thermogenesis
  - pancreatic cells damage
  - loss of appetite under fever
  - lipolysis activation
- 344.** Patient S., 27 years old ill with flu. Body temperature is about 39<sup>0</sup>C. The patient has a variety of complaints due to disturbances of many organs and systems functions. Which physiological system doesn't directly take part in fever development, but its function is also altered?
- nervous
  - respiratory
  - circulatory
  - endocrine
  - digestive
- 345.** At what fever pathogenesis stage do antipyretic drugs (aspirin, paracetamol, indometacin) influence on?
- decrease receptors sensitivity
  - inactivate cyclooxygenase
  - break temperature increase mechanisms
  - inhibit phospholipase A2 activity
  - destroy prostaglandin E
- 346.** Patient D., 27 years old, had body temperature increase up to 38<sup>0</sup>C during a week. He was treated with glucocorticoids for the purpose of temperature decrease. Which mechanism of glucocorticoids influence can cause anti-fever effect?
- heat producing decrease
  - phagocytes activity decrease
  - heat loss increase
  - thermoregulation center inhibition
  - primary pyrogens destruction
- 347.** Patient V., 32 years old, had headache, weakness, extremities pain, stuffy nose, chill in the morning. Temperature increased up to 38.2 C. Diagnosis: influenza. Which accompanying state needs the prescription of anti-pyretic drugs to this patient?
- peptic ulcer
  - heart failure
  - obesity
  - hypoxia
  - allergy

348. Patient V., 32 years old, had headache, weakness, extremities pain, stuffy nose, chill in the morning. Body temperature – 38.2 C. Diagnosis: influenza. The patient has no accompanying disease. The patient was not prescribed antipyretic drugs. Is it correct? Why?
- No. The patient should be prescribed antipyretic drugs
  - Yes. Because fever activates immune system
  - Yes. Because body temperature is relatively low
  - Yes. Because flu is not treated at all
349. The patient with chronic infectious inflammation of urogenital system was prescribed pyrotherapy in order to increase immune defense against infectious agent. What means are used for this purpose?
- hot baths
  - hot drinks
  - cauterization of the body specific sites
  - injection of bacterial pyrogen
  - using of local warming with infrared rays
350. Patient with cardiac valve defect was given hypothermia during operation on open heart in order to decrease nervous tissue hypoxic damage. Which hypothermia effect was used?
- tissues oxygen need decrease
  - decrease of heart contraction frequency
  - arterial pressure decrease
  - nervous cells activity inhibition
  - cellular membranes stability increase
351. Experiment was performed to reveal the role of alcohol in hypothermia mechanisms. 2 rats were put in camera with ice for 3 hours. First rat was given alcohol in the middle dose of intoxication. First rat hypothermia developed earlier. Which mechanism of thermoregulation is disturbed by alcohol?
- non-shivering heat production
  - heat loss by conduction
  - thermoregulation center activity
  - shivering
  - thermoreceptors sensitivity
352. Fever can be divided into several types due to the level of body temperature increase. The patient's temperature is 38,7 C. Which type of fever does this temperature correspond to?
- Subfebrile temperature
  - Febrile temperature
  - Pyretic temperature
  - Hyperpyretic temperature
353. Fever can be divided into several types due to level of body temperature increase. Which type of fever usually accompanies chronic local infections?
- Subfebrile temperature
  - Febrile temperature
  - Pyretic temperature
  - Hyperpyretic temperature
354. A warmly dressed child has spent a long time indoors. This resulted in body temperature elevation and general weakness development. What form of thermoregulation disorder is observed in this case?
- Exogenous hyperthermia
  - Endogenous hyperthermia
  - Fever
  - Heat shock
  - Neurogenous hyperthermia
355. A 25 year old man spent a long time in the sun under condition of high air humidity. As a result of it his body temperature rose up to 39 C. Which pathological process has developed in the patient?
- Hyperthermia
  - Infectious fever
  - Hypothermia
  - Noninfectious fever
  - Burn disease
356. Development of fever is accompanied with the increase of "acute phase" proteins level (ceruloplasmin, fibrinogen, C-reactive protein). Name the possible mechanism of this phenomenon:
- stimulating effect of interleukin-1 on hepatocytes
  - the destructive effect of elevated temperature on the body's cells
  - proliferative effect of interleukin -2 on T-lymphocytes
  - degranulation of tissue basophils
  - activation of the complement system
357. The patient with acute pneumonia developed febrile fever. Which mediator of inflammation plays a role of endogenous pyrogen?
- interleukin-1
  - histamine
  - bradykinin
  - serotonin
  - leukotriene
358. The patient with acute respiratory viral infection has developed subfebrile fever. He was not prescribed antipyretic medicines. In two days his body temperature returned to normal range. What is the most probable mechanism of temperature decrease in this case?
- decrease of heat production due to decrease of metabolism
  - activation of immune system protective function
  - decrease of endogenous pyrogens formation
  - development of tolerance to pyrogens
  - destruction of pyrogens

### Tissue growth pathology. Tumors

359. It is known, that the state of the organism plays an important role in the cancer development. The group of fessophaesophaindividuals most susceptible to the cancer often...
- are anemic
  - are immunodeficient
  - have neurologic dysfunction
  - have chronic diseases
  - have high Ca blood level
360. Carcinogens influence results in the transformation of the proto-oncogens to oncogenes, which leads to tumor development. What substances synthesis is controlled by the proto-oncogens?
- innate immunity humoral factors
  - growth factors
  - growth hormones
  - neuropeptides
  - complement proteins
361. Patient K., 55 years old, complaints about weight loss, increased fatigability, dry cough, and bloody phlegm. Anamnesis: prolonged contact with organic toxic substances. Diagnosis: lung tumor. Which process underlies mutational cancerogenesis mechanism?
- protooncogenes transformation into oncogenes
  - cell division regulation violation
  - mRNA synthesis violation
  - ATP synthesis violation
  - Ca<sup>++</sup> insufficient entrance in cell
362. A liver tumor was diagnosed in the patient. What process underlies epigenetic cancerogenesis mechanism?
- protooncogenes transformation into oncogenes
  - activation of the cell mitosis rate
  - mRNA synthesis violation
  - ATP synthesis violation
  - Ca<sup>++</sup> insufficient entrance in cell

- 363.** Stomach malignant neoplasm was experimentally modeled in animal, and tumor cells were cultivated for the purpose of biochemical anaplasia research. Which glycolysis alteration will be observed after oxygen adding to cell culture?
- anaerobic glycolysis activity increase
  - anaerobic glycolysis activity decrease
  - aerobic glycolysis activity increase
  - no changes after oxygen adding
  - aerobic glycolysis activity decrease
- 364.** Patient K., complaints about weight loss. Diagnosis: mediastinum tumor with intestinal metastases. Which alterations of carbohydrate metabolism are observed in malignant tumor cells?
- positive Paster's effect
  - activation of ATP formation
  - aerobic glycolysis activation
  - negative Paster's effect
  - glycogen synthesis activation
- 365.** Patient Ch., 60 years old. Diagnosis: liver cancer (hepatoma). Blood analysis: ALT decreased level, embryonic fetoprotein presence. What is the mechanism of fetoprotein appearance in hepatoma patient serum?
- protein metabolism violation in tumor surrounding cells
  - iRNA synthesis violation
  - cell division regulation violation
  - ATP synthesis violation in consequence of tumor intoxication
  - tumor cells protein metabolism violation
- 366.** Patient N., 50 years old, complaints about weight loss, and fatigability. Blood analysis: hypoglycemia, hyperinsulinemia. Pancreatic islet tumor was found after further examination. Why is insulin synthesis increased in the patient?
- morphological anaplasia
  - biochemical anaplasia
  - functional anaplasia
  - physical and chemical anaplasia
  - immunological anaplasia
- 367.** It was established that in the development of hepatoma the synthesis of bile acids is often stopped in it. What kind of anaplasia does this indicate?
- energy
  - morphological
  - functional
  - biochemical
  - physico-chemical
- 368.** Patient K., complaints about weight loss. Diagnosis: mediastinum tumor with intestinal metastases. Blood analysis: uncompensated acidosis. Which possible mechanism can lead to acidosis development?
- positive Paster's effect in tumor cells
  - carbon dioxide accumulation in the blood
  - alkaline accumulation in the intestines
  - anaerobic glycolysis in tumor cells
  - buffer systems blocking by tumor toxins
- 369.** Patient T., 59 years old. X-raying: oval dark patch in right lung lower lobe with distinct margins, 3x5 cm in size, which is typical for tumor. Which feature is typical for benign tumor growth?
- metastasis
  - cancer cachexia
  - germination in surrounding tissue
  - infiltrative growth
  - expansive growth
- 370.** Patient R., 52 years old, complaints about weakness, stomach aches, digestion violation, and weight loss during last 3 months. Pancreatic tumor with metastases into mesenteric lymphatic nodes was found during laparotomy. Carbohydrate, protein, and lipid metabolisms violation was found. What mechanism could lead to patient's weight loss?
- nutrients consumption alteration due to digestion violation
  - substrates and energy deficiency due to metabolism violation
  - consumption of substrates and energy by tumor organism intoxication due to metabolism violation
  - increase of substrates and energy use by antitumor protective system
- 371.** Patient R., 52 years old, complaints about weakness, stomach aches, digestion violation, and weight loss during last 3 months. Pancreatic tumor with metastases into mesenteric lymphatic nodes was found during laparotomy. Choose the correct definition of metastasis. Metastasis is...
- an alteration in normal cell growth
  - growth of benign or malignant neoplasm
  - the ability of secondary tumor nodes growth
  - a mutation in normal cells
- 372.** Which of the following is the correct sequence of events during the process of metastasis?
- vascularization, adherence of neoplastic cells, invasion into lymph and vascular system
  - transport, vascularization, adherence of neoplastic cells
  - vascularization, extravasation, transport
  - cell detachment, invasion into lymph and vascular system, migration
- 373.** Worker M., works at factory, where chemical cancerogenes are used, but he doesn't have tumor. What type of represented below phenomenon is referred to anticellular mechanisms of anti-tumor defense?
- tumor cell elimination
  - oncogenes elimination in cell
  - oncogene expression inhibition
  - cancerogenes elimination in cell
  - blastomogenic factors inactivation
- 374.** The body's defense against a tumor can be provided against a carcinogen, a mutation process, or a mutated cell. What mechanism supports anti-cellular defense?
- Increase in natural killer cells amount
  - High-dose immunological tolerance
  - Increase in the activity of lysosomal enzymes
  - Simplification of the antigenic structure of tissues
  - Low-dose immunological tolerance
- 375.** Which one from the following processes underlies antimutational mechanism of anti-tumor defense?
- inactivation of carcinogens by phagocytosis
  - activation of cells anti-oxidative system
  - inactivation of carcinogens by the natural metabolic processes
  - activation of cytotoxic T-lymphocytes
  - elimination or inhibition of oncogenes
- 376.** Patient R., 53 years old. Stomach tumor with metastases in perigastric lymphatic nodes was found. Distant metastases are absent. What stage of tumor pathogenesis is present in this case?
- tumor promotion
  - tumor progression
  - protooncogene transformation into oncogene
  - oncoproteins formation
  - tumor initiation
- 377.** It is known, that proto-oncogenes mutations may result in cancer development. Which substances synthesis is encoded by proto-oncogenes?
- growth factors
  - growth suppressors
  - natural antioxidants

- d. apoptosis inhibitors  
e. immunoglobulins
- 378.** Cancer development may result from mutational and epigenetic carcinogenesis. Which from the listed factors may initiate epigenetic carcinogenesis?
- a. ionizing radiation  
b. ultraviolet rays  
c. formaldehyde  
d. chronic tissue injury  
e. tobacco smoke
- 379.** Choose the most correct definition for the described process: "A pathologic process in which a permanent alteration in a cell's growth controlling mechanisms permits its continuous proliferation"
- a. tumor  
b. neoplasia  
c. neoplasm  
d. cancer  
e. proliferation
- 380.** Both benign and malignant neoplasms have common and unique characteristics. Which from the following characteristics is unique for malignant neoplasm?
- a. absence of cell division limit  
b. irreversible new growth  
c. autonomy  
d. less degree of differentiation  
e. epigenetic carcinogenesis
- 381.** Both benign and malignant neoplasms have common and unique characteristics. Which from the following characteristics is typical only for benign neoplasms?
- a. anaplasia  
b. metastases  
c. loss of differentiation  
d. autonomy  
e. encapsulation
- 382.** Malignant tumor cells clone was grown in laboratory to investigate the following cellular phenomena: Hayflick limit, contact inhibition and biochemical anaplasia. Which process is regulated by Hayflick limit?
- a. speed of ATP synthesis  
b. speed of DNA synthesis  
c. proto-oncogens activation  
d. maximal number of cell divisions  
e. speed of cell division
- 383.** Clinical examination of the patient revealed the initial stage of the liver cancer. Presence of which type of protein in blood serum will confirm this diagnosis?
- a. gamma-globulin  
b. properdin  
c. paraprotein  
d. C-reactive protein  
e. alpha-fetoprotein
- 384.** A man has been working at the petroleum refining industry for a long time. Which class of occupational carcinogens is present at this type of industry?
- a. nitrosamines  
b. aromatic amines  
c. polycyclic aromatic hydrocarbons  
d. pesticides  
e. arsenic compounds
- 385.** A man has been working at the petroleum refining industry for a long time and has no tumors. Which phenomenon from the listed below belongs to anticarcinogenic mechanisms of antitumor defense?
- a. activation of anti-oncogenes  
b. oncogenes elimination  
c. tumor cell elimination  
d. carcinogenic factors inactivation  
e. oncogenes expression inhibition
- 386.** A person with complaints about weakness, cough with bloody phlegm and chest pain was diagnosed lung cancer. Choose the name of the first stage of carcinogenesis from the following list:
- a. transformation  
b. promotion  
c. activation  
d. progression  
e. implantation

### Hypoxia

- 387.** Patient L., 47 years old, has developed the pain shock as a result of trauma. The patient is in a hard state, humid, pale skin with acrocyanosis, confused, has tachypnoe and tachycardia, AP 90/60 mm Hg. Which type of hypoxia does this patient have?
- a. hemic  
b. tissue  
c. respiratory  
d. substrate  
e. circulatory
- 388.** A group of tourists went to the mountains. On the third day two of them showed symptoms of mountain sickness: increased fatigability, noise in the ears, palpitations, short breath. Which pathological process has developed in these tourists?
- a. physical overload  
b. normobaric hypoxic hypoxia  
c. hypobaric hypoxic hypoxia  
d. respiratory hypoxia  
e. unknown poisoning
- 389.** Patient E., was put on a strict diet (decreased consumption of carbohydrates) in order to lose weight. In six days she began to complain of weakness, short breath, and impossibility to work normally. What type of hypoxia has developed in this patient?
- a. tissue  
b. respiratory  
c. circulatory  
d. hemic  
e. substrate
- 390.** Patient S. has alcohol intoxication. Pale skin, tachypnoe, and tachycardia are observed in him. One of alcohol toxic influence mechanisms in organism is Krebs cycle enzymes activity decrease. What type of hypoxia does this patient have?
- a. tissue  
b. respiratory  
c. circulatory  
d. hemic  
e. substrate
- 391.** The cause of man's death was hypoxia which was developed as a result of cyanides intoxication. What is a mechanism of cyanides' histotoxic action?
- a. decrease of tissues blood supply  
b. inactivation of cytochrome oxidase  
c. activation of membranes lipids oxidation  
d. damage of mitochondria  
e. increase of cells oxygen consumption
- 392.** The cause of 20 years old girl death was acute hypoxia which was developed as a result of cyanides intoxication. What stage of oxygen transport was violated?
- a. oxygen transport by hemoglobin  
b. hemoglobin synthesis  
c. oxygen diffusion in lungs  
d. tissue oxygen consumption



- e. alveolar ventilation
- 393.** Patient O., 65 years old, used big doses of sulfonamide medicines for a long time. Now he has breathlessness, weakness, appetite loss, and sleep violation. Methemoglobinemia was found in the blood. What is the mechanism of hemoglobin inactivation in erythrocytes during methemoglobin formation?
- hemoglobin joining with sulfonamides
  - reconstructive enzyme systems inactivation
  - iron oxidation in hemoglobin
  - protein damage in hemoglobin
  - oxidative enzyme systems inactivation
- 394.** Woman has aniline intoxication. She complains of: nausea, headache, tinnitus, mites in the eyes, weakness, and drowsiness. She has cyanosis of skin and mucous membranes, breathlessness, and tachycardia. Which type of hypoxia is present in this case?
- hemic
  - circulatory
  - histotoxic
  - substrate
  - hypoxic
- 395.** Patient E., 26 years old has hypoxia, which has developed as a result of larynx edema. The patient is in a hard state, humid, pale skin with acrocyanosis, tachypnoe (increased frequency of breathes), tachycardia, and decreased arterial pressure. What symptom of acute hypoxia is related to the manifestation of organism urgent protective adaptation reactions?
- skin pallor
  - decreased AP
  - increase of frequency and intensity of breath
  - acrocyanosis development
  - increased sweat secretion
- 396.** Patient R., 46 years old, has hypoxia as a result of emetic masses aspiration. The patient is in a hard state, humid, pale skin with acrocyanosis, tachypnoe, tachycardia, and decreased arterial pressure. What symptom of acute hypoxia is the manifestation of organism urgent protective adaptation reactions?
- skin pallor
  - decreased AP
  - acrocyanosis development
  - tachycardia
  - increased sweat secretion
- 397.** Patient M., was given hypoxic trainings in normobaric conditions. What urgent protective adaptation reactions could develop in reply to acute hypoxia in first session?
- erythropoiesis stimulation
  - parasympathetic nervous system activation
  - venous inflow decrease to heart
  - breath frequency increase
  - reserve alveoli are included into breath
- 398.** Patient S., 54 years old, has hypoxia, which has developed as a result of emetic masses aspiration. Can erythrocytes quantity be changed in periphery blood in first hours of hypoxia?
- won't be changed in hypoxia first stages
  - is decreased as a result of erythrocytes hemolysis
  - is increased, by means of hemopoiesis increase
  - is decreased as a result of blood accumulation in depot
  - is increased, by means of their leaving blood depot
- 399.** Patient M., 35 years old, lives in mountains from his childhood. Which index of external respiration will be changed in this patient?
- increased lungs vital capacity
  - increased inspiration duration
  - increased expiration duration
  - lung breathlessness development
  - breath frequency increase
- 400.** Patient T., 27 years old, lives in mountains from childhood. He was made cardiovascular system instrumental examination. Which heart activity change does this patient have?
- respiratory arrhythmia
  - heart stroke volume increase
  - bradycardia
  - heart minute volume decrease
  - tachycardia
- 401.** Patient T., 46 years old. Diagnosis: chronic respiratory insufficiency. He was found acrocyanosis, breathlessness, heart borders widening, arterial pressure increased, erythrocytes quantity increased, leukocytosis. Which symptom of chronic hypoxia is referred to organism's prolonged compensatory mechanisms?
- blood clotting
  - increased arterial pressure
  - increase quantity of erythrocytes
  - increased respiration frequency
  - leukocytosis
- 402.** Patient Yu., 40 years old, has acrocyanosis, breathlessness, heart borders widening, increased arterial pressure, erythrocytes quantity increase, leukocytosis. Diagnosis: pulmonary tuberculosis. Which symptom of chronic hypoxia is the manifestation of organism's prolonged compensatory mechanisms?
- leukocytosis
  - AP increase
  - respiration frequency increase
  - myocardium hypertrophy
  - blood clotting
- 403.** Increased number of RBC was revealed in people residing in village which is located in mountains at the altitude of 3000 m. What is the reason for their increased RBC quantity?
- increased vitamin B12 synthesis
  - increased blood clotting
  - changes in spleen function
  - increased erythropoietin production
  - increased blood circulating volume
- 404.** A child has been brought to a hospital. He had nitrates' poisoning symptoms: cyanosis, dyspnoea and cramps. What is the reason of these symptoms development?
- methemoglobin formation
  - oxyhemoglobin formation
  - reduced hemoglobin formation
  - carbhemoglobin formation
  - carboxyhemoglobin formation
- 405.** There are several classifications of hypoxia. One of them divides hypoxia on subtypes due to time of appearance and duration of hypoxia manifestation. Define the type of hypoxia which results from cyanide poisoning from the following:
- Fulminant
  - Acute
  - Subacute
  - Chronic
  - Endogenous
- 406.** There are several classifications of hypoxia. One of them divides hypoxia on subtypes due to time of appearance and duration of hypoxia manifestation. Define the type of hypoxia which results from cardiac arrest from the following:
- Fulminant
  - Acute

- c. Subacute  
d. Chronic  
e. Endogenous
- 407.** Which from the listed hypoxia types is observed more frequently than others?  
a. respiratory  
b. hemic  
c. circulatory  
d. histotoxic  
e. combined
- 408.** Which from the listed hypoxia types is observed in the case of prolonged organism malnutrition or starvation?  
a. hemic  
b. circulatory  
c. histotoxic  
d. substrate  
e. combined
- 409.** It is known that interval hypoxic trainings can increase the working capacity of the body's organs and systems. Which type of hypoxia should be used with this aim?  
a. respiratory  
b. hemic  
c. hypoxic  
d. circulatory  
e. histotoxic
- 410.** Choose the example of circulatory hypoxia from the listed clinical cases:  
a. bronchial asthma attack  
b. anaphylactic shock  
c. starvation  
d. iron deficiency anemia  
e. nitrates poisoning
- 411.** Choose the example of hypoxia caused by hemoglobin inactivation from the listed clinical cases:  
a. bronchial asthma attack  
b. anaphylactic shock  
c. starvation  
d. iron deficiency anemia  
e. nitrates poisoning
- 412.** Which type of hypoxia develops during shock and collapse?  
a. circulatory
- b. respiratory  
c. hypoxic  
d. hemic  
e. tissue
- 413.** Patient suffers from thyrotoxicosis for a long time. Which type of hypoxia can develop in this patient?  
a. tissue  
b. hemic  
c. circulatory  
d. respiratory  
e. combined
- 414.** A healthy person manifested with the symptoms of hypoxia: weakness, paleness of skin, dizziness, increased heart and breath rate after intensive physical work in the opened air. Which type of hypoxia may develop in the patient?  
a. hemic  
b. respiratory  
c. histotoxic  
d. overload  
e. substrate
- 415.** Choose the possible reason of histotoxic (tissue) hypoxia from the given:  
a. formation of methemoglobin  
b. decreased activity of tissue respiratory enzymes  
c. acute blood loss  
d. increased synthesis of prostoglandin E  
e. poisoning with carbon monoxide
- 416.** Which alterations in cell's metabolism in a person with chronic hypoxia can verify the adaptation to hypoxia?  
a. decreased activity of glycolysis  
b. activation of phospholipase A2  
c. activation of lipids peroxidation  
d. increased activity of glycolysis  
e. increased intracellular sodium
- 417.** Choose the possible reason of combined type of hypoxia from the given:  
a. acute blood loss  
b. chronic blood loss  
c. carbon monoxide poisoning  
d. lung emphysema  
e. mountain sickness

### KROK TESTS ON TYPICAL PATHOLOGICAL PROCESSES

- 418.** Student X. during the exam couldn't answer the questions correctly. He turned red, felt hot and embarrassed. Which type of arterial hyperemia this student had developed?  
a. neurotonic  
b. neuroparalytic  
c. metabolic  
d. pathological  
e. post-ischemic
- 419.** A patient with obliterating endarteritis underwent ganglionic sympathectomy of femoral artery. The positive therapeutic effect of this operation is related to development of arterial hyperemia of the lower extremities. Which type of arterial hyperemia would develop in the patient after operation?  
a. Neuroparalytic  
b. Metabolic  
c. Neurotonic  
d. Functional  
e. Reactive
- 420.** A 25-year-old patient complains of increasing pain in his leg muscles occurring during walking and forcing him to make frequent stops. Objectively: skin of legs is pale, no hair-covering, toenails are with atrophic changes, no pulsation of pedal artery. The most probable cause of these changes is:  
a. ischemia  
b. venous hyperemia  
c. arterial hyperemia  
d. embolism
- 421.** A man has suffered multiple bone fractures of his lower extremities during a traffic accident. During transportation to a hospital his condition was further aggravated: blood pressure decreased, there were signs of pulmonary artery embolism. What kind of embolism is the most likely in the given case?  
a. fat embolism  
b. gas embolism  
c. air embolism  
d. tissue embolism  
e. thromboembolism
- 422.** A patient with chronic heart failure presents with increased blood viscosity. Capillaroscopy detected damage to the vessel walls of the microcirculation system. What disorder is possible in the given case?  
f. Embolism  
g. Blood `sludge` phenomenon  
h. Thrombosis

- i. Venous hyperemia  
j. Arterial hyperemia
- 423.** A 30-year-old man complains of suffocation, heaviness in the chest on the right, general weakness. Body temperature is 38,9 °C. Objectively the right side of the chest lags behind the left side during respiration. Pleurocentesis yielded exudate. What is the leading factor of exudation in the patient?
- Increased permeability of the vessel wall
  - Erythrocyte aggregation
  - Increased blood pressure
  - Decreased resorption of pleural fluid
  - Hypoproteinemia
- 424.** A patient, having suffered a thermal burn, developed painful boils filled with turbid liquid in the skin. What morphological type of inflammation has developed in the patient?
- Serous
  - Proliferative
  - Croupous
  - Granulomatous
  - Diphtheritic
- 425.** After transfusion of 200 ml of blood a patient presented with body temperature rise up to 37,9 °C. Which of the following substances is the most likely cause of temperature rise?
- Interleukin-1
  - Interleukin-2
  - Tumour necrosis factor
  - Interleukin-3
  - Interleukin-4
- 426.** As a result of careless handling of an iron, a 34-year-old female patient has got acute pain, redness, swelling of her right index finger. A few minutes later, there appeared a blister filled with a transparent liquid of straw yellow color. The described changes verify the following pathological process:
- exudative inflammation
  - traumatic edema
  - vacuolar degeneration
  - alterative inflammation
  - proliferative inflammation
- 427.** A 7-year-old child has acute onset of disease: temperature rise up to 38 °C, rhinitis, cough, lacrimation, and large-spot rash on the skin. Pharyngeal mucosa is edematous, hyperemic, with whitish spots in the buccal area. What kind of inflammation causes the changes in the buccal mucosa?
- catarrhal inflammation
  - serous inflammation
  - suppurative inflammation
  - hemorrhagic inflammation
  - fibrinous inflammation
- 428.** Cellular composition of exudate largely depends on the ethiological factor of inflammation. Which leukocytes are the first to be involved in the focus of inflammation caused by pyogenic bacteria?
- neutrophil granulocytes
  - eosinophilic granulocytes
  - basophils
  - myelocytes
  - monocytes
- 429.** Blood plasma of a healthy man contains several dozens of proteins. During an illness new proteins can originate, namely the protein of 'acute phase'. Select such protein from the listed below:
- C-reactive protein
  - Prothrombin
  - Fibrinogen
  - G immunoglobulin
- e. A immunoglobulin
- 430.** 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, 8°C. What complication developed in this patient?
- Collapse
  - Hyperthermia
  - Hypovolemia
  - Acidosis
  - Alkalosis
- 431.** A 25-year-old man has spent a long time in the sun under high air humidity. As a result of it his body temperature rose up to 39°C. What pathological process is it?
- Hyperthermia
  - Infectious fever
  - Hypothermia
  - Noninfectious fever
  - Burn disease
- 432.** At the end of the working day a worker of a hot work shop has been delivered to a hospital. The patient complains of a headache, dizziness, nausea, general weakness. Objectively: the patient is conscious, his skin is hyperemic, dry, hot to the touch. Heart rate is of 130/min. Respiration is rapid, superficial. What disorder of thermoregulation is most likely to have occurred in this patient?
- Reduced heat transfer
  - Increased heat transfer and reduced heat production
  - Increased heat transfer and heat production
  - Increased heat production with no changes to the heat transfer
  - Reduced heat product
- 433.** This year influenza epidemic is characterised by patients' body temperature varying from 36, 9°C to 37, 9°C. Such fever is called:
- Subfebrile
  - High
  - Hyperpyretic
  - Apyretic
  - Moderate
- 434.** A patient with lobar pneumonia has had body temperature of 39°C with daily temperature fluctuation of no more than 1°C for 9 days. This fever can be characterized by the following temperature curve:
- Persistent
  - Hectic
  - Remittent
  - Hyperpyretic
  - Recurrent
- 435.** A patient has acute bronchitis. The fever up to 38, 5°C had lasted for a week, presently there is a decrease in temperature down to 37, 0°C. Specify the leading mechanism in the 3rd stage of fever:
- Peripheral vasodilation
  - Increased heat production
  - Development of chill
  - Increased diuresis
  - Increased respiratory rate
- 436.** A patient with pneumonia has body temperature of 39,2 °C. What cells are the main producers of endogenous pyrogen that had caused such temperature rise?
- Monocytes
  - Eosinophils
  - Neutrophils
  - Endotheliocytes
  - Fibroblasts

437. In patient with relapsing fever during several days had high fever which alternates with the periods of normal temperature. Such type temperature curve is called:
- Febris intermittens
  - Febris recurrens
  - Febris hectica
  - Febris continua
438. Febris atypica During a day the patient's body temperature rises and keeps at the same level for 1 to 3 hours; then it drops to the normal level. Such type of fever is observed regularly every fourth day. Which type of temperature curve is described?
- Febris intermittens
  - Febris recurrens
  - Febris hectica
  - Febris continua
  - Febris atypica
439. After overcooling patient's body temperature rose up to 39,7 C and varied from 39 C to 39,5 C during 3 days. Which type of temperature curve is described?
- Febris continua
  - Febris recurrens
  - Febris hectica
  - Febris intermittens
  - Febris atypical
440. This year influenza epidemic is characterized by patients' body temperature varying from 36,9 to 37,9 C. Such fever is called:
- subfebrile
  - moderate
  - hyperpyretic
  - high
  - apyretic
441. A female patient has been diagnosed with cervical erosion, which is a precancerous pathology. What defense mechanism can prevent the development of a tumor?
- Increase in natural killer level (NK cells)
  - High-dose immunological tolerance
  - Increase in the activity of lysosomal enzymes
  - Simplification of the antigenic structure of tissues
  - Low-dose immunological tolerance
442. A 56-year-old female patient complains of a fast growing hard neoplasm in the mammary gland that appeared a month ago. Objectively: the tumor is fused with the surrounding tissues, with uneven shape, slightly painful. Choose the characteristic of malignant tumor cell, which determines the infiltrative type of its growth:
- lack of contact inhibition
  - negative Paster's effect
  - increased contact inhibition
  - tight intercellular junctions
  - presence of embryonal antigens
443. Epidemiological study of the spread of tumors showed a high correlation between the lung tumors development with tobacco smoking. Choose the substance from the list of carcinogens, which is present in tobacco smoke:
- benzpyrene
  - aminoazotoluol
  - aflatoxin
  - methylcholanthrene
  - diethylnitrosamine
444. Clinical examination of the patient with cancer of esophagus revealed cancer metastases to mediastinal lymphatic nodes, general cachexia. Which stage of cancer development is described in this clinical situation?
- progression
  - transformation
  - promotion
  - activation
  - implantation
445. Malignant neoplasm is characterized with the alteration of carbohydrate's metabolism compared with the normal tissue. The same amount of glucose in normal tissue cells results in 20-25-fold higher energy production than in malignant tumor cells. Which alteration in carbohydrate's metabolism is present in malignant tumor cells?
- increase of anaerobic glycolysis
  - activation of oxidative reactions
  - activation of reduction reactions
  - increase of aerobic glycolysis
  - decrease of anaerobic glycolysis
446. From the group of children who were eating sweet sappy watermelon two kids developed the signs of poisoning: rapid weakness, dizziness, headache, vomiting, edema, tachycardia, cyanosis of mouth, ears, tips of the fingers cyanosis. High concentration of nitrates was detected. What is the leading mechanism of the pathogenesis of the poisoning in the two children?
- Insufficiency of met-Hb-reductase
  - Insufficiency of superoxidismutase
  - Block cytochrome oxidase
  - Insufficiency glutathione pyroxidase
  - Insufficiency of catalase
447. Measurements of the arterial pCO<sub>2</sub> and pO<sub>2</sub> during an attack of bronchial asthma revealed hypercapnia and hypoxemia respectively. What kind of hypoxia occurred in this case?
- Respiratory
  - Hemic
  - Circulatory
  - Tissue
  - Histotoxic
448. Cyanide is a poison that causes instant death of the organism due to fulminant tissue hypoxia. What enzymes found in mitochondria are affected by cyanide?
- Cytochrome oxidase (aa3)
  - Flavin enzymes
  - Cytochrome 5
  - NAD<sup>+</sup>-dependent dehydrogenase
  - Cytochrome P-450
449. Diseases of respiratory system and circulatory disorders impair the transport of oxygen, thus causing hypoxia. Under these conditions the energy metabolism is carried out by anaerobic glycolysis. As a result, the following substance is generated and accumulated in blood:
- Lactic acid
  - Pyruvic acid
  - Glutamic acid
  - Citric acid
  - Fumaric acid
450. The resuscitation unit has admitted a patient in a health-threatening condition. It is known that he had mistakenly swallowed sodium fluoride which blocks cytochrome oxidase. Which type of hypoxia developed in the patient?
- tissue
  - cardiovascular
  - hemic
  - respiratory
  - hypoxic
451. A public utility specialist went down into a sewer well without protection and after a while lost consciousness.

- Ambulance doctors diagnosed him with hydrogen sulfide intoxication. What type of hypoxia developed?
- hemic
  - respiratory
  - circulatory
  - overload
  - tissue

**452.** When ascending to the top of Elbrus, a mountain climber experiences oxygen starvation, dyspnea, palpitations and numbness of the extremities. What kind of hypoxia has developed in the mountain climber?

- hypoxic
- hemic
- cardiac
- circulatory
- tissue

**453.** An inflammation can be characterized by hemocapillary dilation in the affected area, decreased blood circulation and increased vessel wall permeability. What cells play the key role in this process?

- Tissue basophils

### **Disturbance of carbohydrate metabolism. Diabetes mellitus.**

**456.** The effects of insulin action listed below can be divided according to the time of their realization. Which insulin effect is the fastest?

- anabolism stimulation
- hypoglycemic
- catabolism inhibition
- cellular division stimulation

**457.** The effects of insulin action listed below can be divided according to the time of their realization. Which insulin effect is the slowest?

- anabolism stimulation
- hypoglycemic
- catabolism inhibition
- cellular division stimulation

**458.** Muscular and adipose tissue form the majority of body weight. They are insulin-dependent tissue. Choose the correct definition: insulin dependent tissues...

- consume glucose with the help of insulin
- functions are determined by insulin
- consume glucose directly from the blood
- are affected in type 1 diabetic patients
- are affected in type 2 diabetic patients

**459.** Patient Ts., 35 years old, has glucose-tolerance test violation. Diagnosis: diabetes mellitus. What does this violation mean?

- increased glucagon secretion by alpha-cells
- inhibition of insulin secretion by beta-cells
- decreased glucose consumption in insulin-dependent tissues
- increased tissues insulin-resistance
- increased contra-insulin hormones secretion

**460.** Choose the characteristic feature of type 1 diabetes mellitus:

- Middle age at onset
- Associated obesity
- Low plasma level of endogenous insulin
- Insulin resistance
- Presence of antibodies to beta-cells

**461.** Patient E., 25 years old. Polydipsia, poliuria, glucosuria, stable hyperglycemia developed in 2 weeks after viral infection. Diagnosis: diabetes mellitus type I. What is the main pathogenic mechanism in this case?

- alpha-cells destruction
- beta-cells destruction
- tissues insulin resistance increase
- glucose toxic action

- Fibroblasts
- Macrophages
- Plasma cells
- Eosinophils

**454.** A 30-year old person has been stung by a bee. The stung area exhibits edema, hyperemia, and elevated temperature. What is the initial pathogenetic factor of inflammatory edema in this case?

- Increase of microvascular permeability
- Increase of capillary blood pressure
- Decrease of oncotic blood pressure
- Increase of osmotic pressure in the inflammation focus
- Disturbed lymphatic efflux

**455.** A man has been working for a long time in oil processing. What type of carcinogens does he encounter at his workplace?

- Polycyclic aromatic hydrocarbons
- Amines
- Nitrosamines
- Amino-azo compounds
- Biological carcinogens

### **Disturbance of carbohydrate metabolism. Diabetes mellitus.**

e. metabolism violation

**462.** Patient has diabetes mellitus type I. Blood glucose concentration is 18 mmol/l. What is a characteristic feature of this disease?

- absolute insulin deficiency
- glucose tolerance test violation
- tissues' insulin-resistance
- plasma ketone bodies high level
- stable hyperglycemia

**463.** Patient T., 55 years old, with obesity developed diabetes mellitus type II. What is the main pathogenic factor in this pathology development?

- hereditary predisposition
- obesity
- ageing
- tissues' insulin resistance
- viral infection

**464.** The patient with obesity has diabetes. What is obesity for diabetes?

- complication
- risk factor
- outcome
- stage of development
- obesity is not connected with diabetes

**465.** Patient P., 52 years old, has diabetes mellitus type II and obesity. What is the main feature of lipid's usage for energy metabolism?

- hyperketonemia
- hyperlipidemia
- hyperglycemia
- hypernitrogenemia
- hyperphagia

**466.** Patient D., 28 years old, has protein metabolism violation, which clinically manifests as violation of wounds healing, decreased antibodies synthesis. Diagnosis: diabetes mellitus type I. Which clinical symptom can verify this violation?

- blood proteins concentration decrease
- hyperproteinemia
- gluconeogenesis inhibition
- aminoacidemia
- alpha-fetoprotein presence in blood

**467.** Patient with diabetes mellitus has hyperglycemia 19 mmol/l, which clinically manifests as glucosuria, polyuria, polydipsia. Which mechanism is responsible for polyuria development?

- a. hyperphagia
  - b. hyperlipidemia
  - c. polydipsia
  - d. tissues dehydration
  - e. glucosuria
- 468.** Patient with diabetes mellitus has glucosuria, polyuria, polydipsia. Choose the minimal blood glucose level, which is accompanied with glucosuria:
- a. 8 mmol/L
  - b. 10 mmol/L
  - c. 12 mmol/L
  - d. 14 mmol/L
  - e. 16 mmol/L
- 469.** One of the diabetes mellitus clinical symptoms is hyperphagia. It is developed due to...
- a. lack of energy in the organism
  - b. lack of fatty acids in the blood
  - c. lack of insulin
  - d. excess of glucose in the blood
  - e. affection of appetite controlling centers
- 470.** Patient with diabetes mellitus has hyperglycemia 19 mmol/ l, which clinically manifests as glucosuria, polyuria, polydipsia. Which mechanism is responsible for polydipsia development?
- a. low osmotic pressure of blood plasma
  - b. lack of insulin
  - c. dehydration
  - d. glucosuria
  - e. hyperglycemia
- 471.** Which coma often occurs in the patients with diabetes mellitus type 1 if diet doesn't match the dose of insulin?
- a. hyperglycemic
  - b. hyperlactacidemic
  - c. hyperosmolar
  - d. ketonemic
  - e. hypoglycemic
- 472.** Patient R., 46 years old, has diabetic neuropathy. What is the main mechanism of nervous fibers damage in diabetes?
- a. glucose toxicity
  - b. ketones toxic action
  - c. nervous fibers dehydration
  - d. metabolic acidosis development
  - e. glycation of proteins in nervous tissue
- 473.** Patient O., 49 years old, has hypoglycemia symptoms. Violation of brain functions and sympathetic system activation are the mechanisms of hypoglycemia symptoms development. Which body tissue needs constant blood glucose supply?
- a. respiratory system
  - b. kidney tissue
  - c. nervous system
  - d. endocrine system
  - e. gastro-intestinal system
- 474.** Patient with diabetes mellitus type I was done insulin prolonged intravenous infusion in order to decrease glycemia high level. Hypoglycemic coma was developed. Choose the mechanism of hypoglycemia development?
- a. increased glucose excretion from organism by urine
  - b. glucagon secretion inhibition
  - c. glucose interaction with insulin
  - d. increased glucose consumption by tissues
  - e. inhibition of gluconeogenesis and ketogenesis in liver
- 475.** A patient suffers from diabetes. Glycemia fasting level is 7,5 mmol/L. The level of which blood plasma protein allows to estimate the glycemia rate retrospectively (4-8 weeks before examination)?
- a. fibrinogen
  - b. hemoglobin A1C
  - c. albumin
  - d. ceruloplasmin
  - e. C-reactive protein
- 476.** A patient was delivered to the hospital by an emergency. Patient is unconscious, the skin is dry, face is cyanotic. Heart rate is 132 bpm. There is acetone smell from the mouth. Blood glucose level – 20.1 mmol/L, urine glucose – 3,5 g/L. What is the probable diagnosis?
- a. hypoglycemic coma
  - b. acute infectious intoxication
  - c. anaphylactic shock
  - d. acute heart failure
  - e. hyperglycemic coma
- 477.** A patient with diabetes mellitus was delivered to the hospital in coma. Which type of coma is the most severe life threatening condition?
- a. hypoglycemic
  - b. hyperglycemic
  - c. hyperlactacidemic
  - d. hyperosmolar
  - e. ketonemic
- 478.** A patient with type 2 diabetes mellitus complains of progressive loss of vision. Which complication development may underlie this process?
- a. diabetic angiopathy
  - b. diabetic retinopathy
  - c. diabetic neural dystrophy
  - d. diabetic neuropathy
- 479.** A patient with constant thirst and increased urination was done oral glucose tolerance test that proved diabetes mellitus diagnosis. Which sign of diabetes is typical only to type 1 diabetes mellitus?
- a. hyperglycemia
  - b. hypoglycemia
  - c. relative insulin deficiency
  - d. obesity
  - e. absolute insulin deficiency
- 480.** A patient with type 1 diabetes mellitus demonstrates high level of aminoacidemia. Which mechanism is responsible to aminoacidemia development?
- a. hyperproteinemia
  - b. increased proteolysis
  - c. decreased aminoacids blood concentration
  - d. increased blood osmotic pressure
  - e. increased blood oncotic pressure
- 481.** A patient with type 1 diabetes mellitus has disturbances in protein metabolism which clinically manifest as slowing of wounds healing. Which mechanism is responsible for low activity of regeneration process in the patient?
- a. decreased blood pH
  - b. accumulation of ketone bodies in the blood
  - c. decreased synthesis of proteins
  - d. increased synthesis of contrainsular hormones
  - e. increased activity of lipid metabolism
- 482.** The patient who suffers from diabetes mellitus type 1 for a long time, lost consciousness after extreme physical loading. He was immediately hospitalized to the endocrinological ward. Clinical observation: superficial breathing, heart rate – 132 bpm, BP -80/40 mmHg, glycemia level – 1,88 mmol/L. Which diabetic complication has developed in the patient?
- a. hyperglycemic coma
  - b. hyperosmolar coma
  - c. diabetic neuropathy
  - d. hypoglycemic coma
  - e. diabetic nephropathy
- 483.** A patient was done blood level test after 12 hours of fasting. Glycemia level is 3,7 mmol/L. Which mechanism maintains blood glucose level in the state of zero calorie intake?

- a. activation of glycogenolysis
  - b. activation of glycogenesis
  - c. activation of glycolysis
  - d. inhibition of glycogenesis
  - e. inhibition of gluconeogenesis
- 484.** A boy 12 years old in 6 months after a severe viral disease lost 7 kg of weight in spite of increased appetite. Daily diuresis is 3 L. Casual blood glucose level is 12 mmol/L. What is the probable diagnosis for this patient?
- a. type 2 diabetes mellitus
  - b. type 1 diabetes mellitus
  - c. renal failure
  - d. renal diabetes
  - e. diabetes insipidus
- 485.** A patient with diabetes mellitus was delivered to the hospital in the unconscious state. ABP – 80/50 mmHg, acetone smell from the mouth, and Kussmaul's respiration are present in the patient on clinical examination. Accumulation of which substances may cause such abnormalities?
- a. ketone bodies
  - b. beta-lipoproteins
  - c. lactic acid
  - d. glucose
  - e. aminoacids
- 486.** The key mechanism of diabetes mellitus type 2 development is insulin resistance. Give the correct definition of insulin resistance:
- a. disturbance of cellular response to insulin influence
  - b. decrease of insulin synthesis in the pancreas
  - c. increase of insulin synthesis in the pancreas
  - d. increase of cellular response to insulin influence
  - e. synthesis of insulin with altered structure
- 487.** On the empty stomach in the patients blood glucose level was 5,65 mmol/L, in an hour after usage of sugar it was 8,55 mmol/L, in 2 hours - 4,95 mmol/L. Such indicators are typical for:
- a. diabetes mellitus type 1
  - b. diabetes mellitus type 2
  - c. subclinical diabetes mellitus
  - d. healthy person
  - e. thyrotoxicosis

### Acid-base balance and water – electrolyte balance disorders.

- 488.** Alteration of ABB of the resuscitation department patient was found. Which buffer system of blood will be changed first of all?
- a. Bicarbonate
  - b. Phosphate
  - c. Hemoglobin
  - d. Oxyhemoglobin
  - e. Protein
- 489.** Prolonged convulsions occur in the patient suffered from epilepsy. Blood analysis: pH – 7.14 (N-7.34-7.44), pCO<sub>2</sub> – 45 (N- 35-45) mmHg, HCO<sub>3</sub><sup>-</sup> – 14 mmol/L (N- 22-26). What kind of acid-base balance disturbances occurs in this case?
- a. Metabolic ketoacidosis
  - b. Metabolic lactoacidosis
  - c. Respiratory alkalosis
  - d. Metabolic alkalosis
  - e. No disorders of ABB
- 490.** Patient with bronchial asthma developed asthmatic attack. He complains of headache, giddiness, breathlessness. What kind of acid-base balance disorder occurs in this case?
- a. Non-gas acidosis
  - b. Excretory acidosis
  - c. Gas alkalosis
  - d. Non-gas alkalosis
  - e. Gas acidosis
- 491.** The patient who suffered from chronic glomerulonephritis has general weakness, tachycardia with recurrent arrhythmia, confusion and drowsiness. What kind of acid-base balance disturbances accompanies uremic coma?
- a. Gas acidosis
  - b. Non-gas alkalosis
  - c. Non-gas acidosis
  - d. Gas alkalosis
  - e. Respiratory alkalosis
- 492.** Pregnant woman has gestosis accompanied by vomiting of 24 hours duration. Tetany and dehydration were developed soon. What kind of acid-base balance shift leads to described changes?
- a. Gas alkalosis
  - b. Gas acidosis
  - c. Non-gas metabolic acidosis
  - d. Non-gas metabolic alkalosis
  - e. Non-gas excretory alkalosis
- 493.** The patient who suffered from diabetes mellitus was admitted to the hospital because of worsening of his condition. He has general weakness, polyuria, and drowsiness. Kussmaul's respiration, heart arrhythmia and acetone smell from mouth. What kind of acid-base balance shift is described in this case?
- a. Gas alkalosis
  - b. Gas acidosis
  - c. Non-gas metabolic alkalosis
  - d. Non-gas metabolic acidosis
  - e. Non-gas excretory alkalosis
- 494.** A group of alpinists had done blood analysis in mountains at height 3000 meters. Blood analysis: decrease of HCO<sub>3</sub><sup>-</sup> to 15 mmol/l (norm is 22-26 mmol/l). What is the mechanism of HCO<sub>3</sub><sup>-</sup> decrease in the blood?
- a. Decrease of HCO<sub>3</sub><sup>-</sup> reabsorption in kidneys
  - b. Hyperventilation
  - c. Activation of acidogenesis
  - d. Hypoventilation
  - e. Decrease of ammoniogenesis
- 495.** Buffer capacity of blood decreased in the worker as a result of exhausting muscle work. Which acid substance accumulation in the blood may explain this violation?
- a. alpha-ketoglutaric acid
  - b. 3-phosphoglycerate
  - c. lactic acid
  - d. pyruvic acid
  - e. 1,3-biphosphoglycerate
- 496.** Repeated vomiting occurs in patient with pylorostenosis which is accompanied by loss of chloride ions from the organism and development of non-gas alkalosis. Which alteration of electrolyte's content may result from this change of acid-base balance?
- a. Hyperchloremia
  - b. Hyponatremia
  - c. Hypokalemia
  - d. Hypernatremia
  - e. Hyperphosphatemia
- 497.** 48-year-old patient with diabetes mellitus was admitted to the hospital in severe pre-coma condition. Metabolic acidosis was found after examination of acid-base balance. Patient was treated with complex therapy including injections of insulin and infusion of sodium bicarbonate solution. Why the patient was given sodium bicarbonate solution?

- a. To restore the blood volume  
 b. For parenteral nutrition  
 c. To decrease the plasma glucose level  
 d. For ABB correction  
 e. To potentiate the action of insulin
- 498.** Patient has disturbances of airways passage at the small and medium bronchi level. What kind of acid-base balance disorder may develop in this patient?
- a. Respiratory alkalosis  
 b. Metabolic alkalosis  
 c. Respiratory acidosis  
 d. Metabolic acidosis  
 e. No changes of ABB
- 499.** The patient had been under artificial ventilation during operation for cardiac valve insufficiency. At the end of operation patient developed muscles tetany, decrease of kidney function and overexcitability of the nervous system. It was found out that the volume of artificial ventilation was calculated incorrectly. What kind of acid-base balance disorder develops in this case?
- a. Exogenous acidosis  
 b. Respiratory acidosis  
 c. Metabolic acidosis  
 d. Respiratory alkalosis  
 e. Non-gas alkalosis
- 500.** A woman has distinct hypersalivation syndrome. She has been removing saliva during several hours from her mouth with napkin because of pain while swallowing. What kind of ABB disorder may develop in this patient in some time?
- a. Non-gas excretory acidosis  
 b. Gas alkalosis  
 c. Metabolic acidosis  
 d. Non-gas excretory alkalosis  
 e. Gas acidosis
- 501.** Gas acidosis due to hypercapnia has developed during bronchial asthma attack. Which buffer system of blood plays the main role in compensation of this condition?
- a. Bicarbonate  
 b. Hemoglobin  
 c. Phosphate  
 d. Protein  
 e. All of them
- 502.** Hyperglycemia, ketonuria, polyuria, hyperstenuria and glucosuria were found on patient's examination. What kind of acid-base balance disorder takes place in this case?
- a. Metabolic acidosis  
 b. Gas acidosis  
 c. Metabolic alkalosis  
 d. Non-gas alkalosis  
 e. Gas alkalosis
- 503.** The 65-year-old patient with multiple fractures of ribs was admitted to the hospital. What type of acid-base balance disorder may develop in this case?
- a. Gas acidosis  
 b. Gas alkalosis  
 c. Non-gas acidosis  
 d. Non-gas alkalosis  
 e. No disorders of acid-base balance
- 504.** Disorders of ABB can manifest as acidosis or alkalosis. Name the possible reason of gas alkalosis:
- a. Pulmonary hyperventilation  
 b. Loss of gastric juice  
 c. Loss of intestine juice  
 d. Pulmonary hypoventilation  
 e. Hyperaldosteronism
- 505.** What kind of acid-base balance disturbance may develop in the patient with gastric ulcer who often uses sodium bicarbonate for relieving pain without control of physician?
- a. Metabolic acidosis  
 b. Respiratory acidosis  
 c. Respiratory alkalosis  
 d. Metabolic alkalosis  
 e. Excretory acidosis
- 506.** The patient was injected with 500 ml of 5% solution of glucose. What type of water electrolyte misbalance may take place in this case?
- a. Hypoosmolar dehydration  
 b. Hyperosmolar hyperhydration  
 c. Isoosmolar hyperhydration  
 d. Hypoosmolar hyperhydration  
 e. Hyperosmolar dehydration
- 507.** During mountain climbing a sportsman developed severe short breath, headache, giddiness, and palpitation. What type of ABB disorder did the mountain climber manifest?
- a. respiratory alkalosis  
 b. metabolic alkalosis  
 c. non-gas alkalosis  
 d. respiratory acidosis  
 e. excretory acidosis
- 508.** A patient ill with enteritis accompanied by massive diarrhea has low water rate in the extracellular space, high water rate inside the cells and low blood osmolarity. How this disturbance of water-electrolytic metabolism is called?
- a. Hypoosmolar hypohydration  
 b. Hyperosmolar hypohydration  
 c. Osmolar hypohydration  
 d. Hypoosmolar hyperhydration  
 e. Hyperosmolar hyperhydration
- 509.** An infant has apparent diarrhea resulting from improper feeding. One of the main diarrhea effects is loss of sodium bicarbonate from the intestines. What form of acid-base balance disorder may take place in this case?
- a. Metabolic acidosis  
 b. Metabolic alkalosis  
 c. Respiratory acidosis  
 d. Respiratory alkalosis  
 e. No disorders of acid-base balance will be observed
- 510.** A pregnant woman had been having toxicosis with severe repeated vomiting for 24 hours. In the end of the day there appeared tetanic convulsions and fluid loss. What shift of acid-base state caused these changes?
- a. Gaseous alkalosis  
 b. Gaseous acidosis  
 c. Excretory alkalosis  
 d. Metabolic acidosis  
 e. Excretory acidosis
- 511.** What is the purpose of sodium bicarbonate infusion during resuscitation actions?
- a. Increase of survival time of brain under hypoxia  
 b. Respiratory acidosis prevention  
 c. Metabolic acidosis correction  
 d. Metabolic alkalosis therapy  
 e. Hypoxia correction
- 512.** A patient with pneumosclerosis has blood pH at the rate of 7,34. Analysis of blood gas content showed hypercapnia. Urine analysis revealed the increase of its acidity. What form of acid-base misbalance is present in this case?
- a. Excretory alkalosis  
 b. Gas alkalosis  
 c. Non-gas alkalosis  
 d. Non-gas acidosis  
 e. Gas acidosis



- 513.** What mechanism activation in renal tubules underlies metabolic alkalosis development in the person with primary hyperaldosteronism?
- Excessive Na<sup>+</sup> secretion
  - Lack of H<sup>+</sup> reabsorption
  - Decrease of H<sup>+</sup> secretion
  - Excessive Na<sup>+</sup> reabsorption
  - Decrease of Na<sup>+</sup> secretion
- 514.** A patient was admitted to the infectious department. His symptoms: dry skin, decreased skin turgor, rice-water stool. The patient was diagnosed with cholera. What disorder of water-electrolyte balance is most often observed in this disease?
- Hyperosmolar hyperhydration
  - Hypoosmolar hypohydration
  - Isoosmolar hypohydration
  - Hyperosmolar hypohydration
  - Hypoosmolar hyperhydration
- 515.** A woman with intractable vomiting was admitted to the infectious disease ward. What changes of water-salt metabolism are likely to be observed?
- Isoosmolar dehydration
  - Hyperosmolar dehydration
  - Hypoosmolar hyperhydration
  - Hypoosmolar dehydration
  - Hyperosmolar hyperhydration
- 516.** Prolonged food consumption rich of carbohydrates excluding proteins and fats by experimental animals caused accumulation of water in the tissues. What is the main pathogenetic mechanism of edema development in this case?
- lymphogenous
  - membranogenous
  - disregulation
  - hyponcotic
  - hyperosmolar
- 517.** Inflammation is characterized by microcirculatory vessels permeability increase, increase of their fluid dynamic blood pressure. Increase of the osmotic pressure and dispersity of protein structures present in the intercellular fluid. Which kind of edema will appear in this case?
- Mixed
  - Hydrodynamic
  - Colloid-osmotic
  - Lymphogenous
  - Membranogenous
- 518.** A patient who suffers from heart failure has enlarged liver, edema of lower extremities, ascites. What is the leading mechanism in the development of this edema?
- Colloid osmotic
  - Hydrodynamic
  - Lymphogenous
  - Membranogenous
- 519.** 30 minutes after drinking mango juice a child suddenly developed a local swelling in the area of the soft palate, which impeded swallowing and, eventually, respiration. Mucosa of the swollen area was hyperemic and painless. Blood test revealed moderate eosinophilia. Body temperature was normal. Anamnesis states that the elder sister of the child has been suffering from bronchial asthma attacks. What kind of edema has developed in the child?
- alimentary
  - allergic
  - cardiac
  - inflammatory
  - hepatic

#### **Disturbance of lipid and protein metabolism.**

- 520.** It is known that gout is often causing recurrent acute or chronic arthritis. Which of the following substances level in the blood is the leading pathogenetic mechanism of this disease?
- hyperlipidemia
  - hyperproteinemia
  - hyperuricemia
  - hypoproteinemia
  - hypouricemia
- 521.** The precipitation of monosodium urate crystals in specific tissues underlies the clinical manifestation of the gout. Which tissues are primarily affected?
- kidneys
  - cartilages and tendons
  - vessels and connective tissue
  - lungs and bronchi
  - muscles
- 522.** The knowledge about lipoproteins metabolism is very important in lipid metabolism study. Which from the following substances transport triglycerides and cholesterol from enterocytes through lymphatics into the blood circulation?
- chylomicrons
  - high-density lipoprotein
  - very-low-density lipoprotein
  - intermediate-density lipoprotein
  - low-density lipoprotein
- 523.** The knowledge about lipoproteins metabolism is very important in lipid metabolism study. Which from the following substances are synthesized in the liver, and transport triglycerides and cholesterol to peripheral tissues?
- chylomicrons
  - high-density lipoprotein
  - very-low-density lipoprotein
  - intermediate-density lipoprotein
  - low-density lipoprotein
- 524.** The knowledge about lipoproteins metabolism is very important in lipid metabolism study. Which from the following substances are the most cholesterol-rich of all lipoproteins?
- chylomicrons
  - high-density lipoprotein
  - very-low-density lipoprotein
  - intermediate-density lipoprotein
  - low-density lipoprotein
- 525.** The knowledge about lipoproteins metabolism is very important in lipid metabolism study. Which from the following substances are initially cholesterol-free and that are synthesized in both enterocytes and the liver?
- chylomicrons
  - high-density lipoprotein
  - very-low-density lipoprotein
  - intermediate-density lipoprotein
  - low-density lipoprotein
- 526.** The pathways regulating food intake include interaction between the various substances and nervous centers. Which of the following substances high blood level corresponds to increased body fat amount?
- cholecystokinin
  - ghrelin
  - glucagon
  - leptin
  - insulin
- 527.** Hypersecretion of which hormones may result in specific abdominal obesity?
- glucocorticoids
  - thyroid hormones
  - epinephrine

- d. mineralocorticoids  
e. parathyroid hormones
- 528.** A patient who was starving for a long time has developed edema on the extremities. Which from the given pathogenic factors plays the leading role in edema development in the case of total starvation?
- a. low hydrostatic pressure of the blood  
b. low osmotic pressure of the blood  
c. high oncotic pressure in the tissues  
d. low oncotic pressure of the blood  
e. high osmotic pressure of the interstitial liquid
- 529.** A patient who was starving for a long time has developed edema on the extremities. Which from the given pathogenic factors plays the leading role in edema development in the case of total starvation?
- a. proteins deficiency  
b. energy deficiency  
c. fatty acids deficiency  
d. vitamins deficiency  
e. minerals deficiency
- 530.** Which tissues usually have a glucose store in a form of glycogen, which can be used for energy needs during the periods of fasting?
- a. brain and heart  
b. kidneys  
c. bone marrow and spleen  
d. liver and muscles  
e. fatty (adipose tissue)
- 531.** Which process characterizes the terminal stage of starvation which is often fatal to the patient?
- a. increased glycogenolysis  
b. depletion of protein stores  
c. depletion of lipid stores  
d. depletion of glycogen stores  
e. increased gluconeogenesis
- 532.** Which disturbance of acid base balance is typical for starvation process?
- a. gaseous acidosis  
b. metabolic acidosis  
c. metabolic alkalosis  
d. gaseous alkalosis  
e. there are no changes of ABB
- 533.** Why protein-energy undernutrition (cachexia) often accompanies cancer development?
- a. due to decreased protein intake  
b. due to decreased carbohydrates intake  
c. due to prevalence of anabolism  
d. due to prevalence of catabolism  
e. due to absence of appetite
- 534.** The main index of protein metabolism is nitrogen balance. Choose the condition from the listed below that will be accompanied by positive nitrogen balance:
- a. recovery from disease  
b. physical stress  
c. emotional stress  
d. starvation  
e. acute infectious disease
- 535.** The main index of protein metabolism is nitrogen balance. Choose the condition from the listed below that will be accompanied by negative nitrogen balance
- a. childhood  
b. pregnancy  
c. massive wound healing  
d. acute infectious disease  
e. lactation
- 536.** Give the definition to such condition when a person is totally deprived of food, but water is available:
- a. total starvation  
b. absolute starvation  
c. complete starvation
- d. incomplete starvation  
e. partial starvation
- 537.** Early starvation stage is characterized with complete depletion of muscles and liver glycogen stores. The time of glycogen stores depletion is usually about...
- a. 1- 10 hours  
b. 6-12 hours  
c. 12-24 hours  
d. 1- 2 days  
e. 2-3 days
- 538.** Which stage of starvation is accompanied with the maximal body weight loss?
- a. early starvation  
b. prolonged  
c. adapted  
d. terminal phase
- 539.** Body's metabolism is changed during starvation. Which substance from the following is the source of energy for the brain in the early starvation stage?
- a. glycogen  
b. glucose  
c. ketone bodies  
d. aminoacids  
e. free fatty acids
- 540.** Body's metabolism is changed during starvation. Which substance from the following is the source of energy for the brain in the prolonged starvation stage?
- a. glycogen  
b. glucose  
c. ketone bodies  
d. aminoacids  
e. free fatty acids
- 541.** The terminal stage of starvation may be fatal for the patient. Which body's index from the following determines the time of terminal phase onset and duration?
- a. blood glucose level  
b. glycogen stores  
c. protein reserves  
d. lipid reserves  
e. ketone bodies blood level
- 542.** Choose the clinical situation in which an abnormally high level of protein will be found in the patient's blood plasma:
- a. intestinal malabsorption  
b. Bruton's disease  
c. liver failure  
d. nephrotic syndrome  
e. cholera
- 543.** Gout is defined as precipitation of sodium urate crystals in the body. What is the most common cause of monosodium urate accumulation in the blood?
- a. increased rate of cell's proliferation  
b. increased rate of cell's death  
c. intake of purine-rich food  
d. overactivity of enzymes responsible for urates synthesis  
e. decreased renal excretion of urates
- 544.** Which typical pathological process primarily develops in the patient with monosodium urate crystals accumulation in the joint?
- a. fever  
b. inflammation  
c. tumor  
d. hypoxia  
e. allergy
- 545.** Choose obesity type which is more often complicated with hyperinsulinemia, diabetes mellitus and hypertension:
- a. hyperplastic obesity  
b. hypertrophic obesity

- c. general obesity
  - d. abdominal obesity
  - e. peripheral obesity
- 546.** Which type of obesity will you suppose in a child 9 years old, body weight 52 kg?
- a. hyperplastic obesity
  - b. hypertrophic obesity
  - c. general obesity
  - d. abdominal obesity
  - e. peripheral obesity
- 547.** Endocrine mechanisms of obesity determine fat accumulation due to abnormalities in hormones metabolism. Which of the following substance deficiency is responsible for primary obesity development?
- a. neuropeptide Y
  - b. leptin
  - c. thyroxine
  - d. cortisone
  - e. insulin
- 548.** Endocrine mechanisms of obesity determine fat accumulation due to abnormalities in hormones metabolism. Which substance from the listed stimulates appetite and feeding behavior?
- a. neuropeptide Y
  - b. leptin
  - c. thyroxine
  - d. cortisone
  - e. insulin
- 549.** Endocrine mechanisms of obesity determine fat accumulation due to abnormalities in hormones metabolism. Which hormone from the listed determines basal metabolic rate and its deficiency will result in weight gain?
- a. neuropeptide Y
  - b. leptin
- c. thyroxine
  - d. cortisone
  - e. insulin
- 550.** A chemical burn caused esophagus stenosis. Difficulty of ingestion led to the critical loss of weight. Blood protein content - 57 g/L. What type of starvation is it?
- a. Proteinic
  - b. Complete
  - c. Incomplete
  - d. Water
  - e. Absolute
- 551.** A 28-year-old patient with normosthenic body types has starved for 48 hours. Which substrates are used by muscles as energy source in this case?
- a. aminoacids
  - b. glucose
  - c. fatty acids
  - d. lactate
  - e. pyruvate
- 552.** One of the factors that cause obesity is inhibition of fatty acids oxidation due to:
- a. Impaired phospholipid synthesis
  - b. Excessive consumption of fatty foods
  - c. Choline deficiency
  - d. Low level of carnitine
  - e. Lack of carbohydrates in the diet
- 553.** 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. Chylomicrons
  - b. High-density lipoproteins
  - c. Low-density lipoproteins
  - d. Middle-density lipoproteins
  - f. Very low-density lipoproteins

### KROK TESTS ON TYPICAL DISORDERS OF METABOLISM

- 554.** A patient with type 1 diabetes mellitus was given an insulin injection. In 2 hours he developed general weakness, irritability, increase of sweating, blood glucose level -3,2 mmol/l. What is the basic mechanism of hypoglycemia manifestation development?
- a. carbohydrate starvation of the brain
  - b. increase of ketone bodies synthesis
  - c. increase of glycogenolysis
  - d. increase of lipogenesis
  - e. decrease of gluconeogenesis
- 555.** Prolonged fasting causes hypoglycemia which is amplified by alcohol consumption, as the following process is inhibited:
- a. gluconeogenesis
  - b. glycolysis
  - c. glycogenolysis
  - d. proteolysis
  - e. lipolysis
- 556.** A 12-year-old teenager has significantly put off weight within 3 months; glucose concentration rose up to 50 mmol/L. He fell into a coma. What is the main mechanism of its development?
- a. Hyperosmolar
  - b. Hypoglycemic
  - c. Ketonemic
  - d. Lactacidemic
  - e. Hypoxic
- 557.** 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?
- a. Steroid diabetes
  - b. Insulin-dependent diabetes mellitus
- c. Myxedema
  - d. Type I glycogenosis
  - e. Addison's disease
- 558.** According to the results of glucose tolerance test, the 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?
- a. Decreased activity of glucose reabsorption enzymes
  - b. Increased activity of glucose reabsorption enzymes
  - c. Exceeded glucose reabsorption threshold
  - d. Increased glucose secretion
  - e. Increased glucose filtration
- 559.** Examination of a 56-year-old female patient with a history of type 1 diabetes revealed a disorder of protein metabolism that is manifested by aminoacidemia in the laboratory blood test values, and clinically by the delayed wound healing and decreased synthesis of antibodies. Which of the following mechanisms causes the development of aminoacidemia?
- a. Increased proteolysis
  - b. Albuminosis
  - c. Decrease in the concentration of amino acids in blood
  - d. Increase in the oncotic pressure in the blood plasma
  - e. Increase in low-density lipoproteinLevel
- 560.** A patient with diabetes mellitus suffers from persistently nonhealing surgical wound, which is a sign of disrupted tissue trophism. What is the cause of such disorder?
- a. Disruption of protein metabolism regulation
  - b. Hypoglycemia
  - c. Ketonemia
  - d. Increased lipid catabolism

- e. Anemia
- 561.** 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?
- Gluconeogenesis
  - Glycogenolysis
  - Glucose reabsorption
  - Glucose transport to the cell
  - Glycolysis
- 562.** A woman complains of visual impairment. Examination revealed obesity in the patient and her fasting plasma glucose level is hyperglycemic. What diabetes complication can cause visual impairment/blindness?
- Microangiopathy
  - Macroangiopathy
  - Atherosclerosis
  - Neuropathy
  - Glomerulopathy
- 563.** A 30-year-old man with diabetes mellitus type I was hospitalised. The patient is comatose. Laboratory tests revealed hyperglycemia and ketonemia. What metabolic disorder can be detected in this patient?
- Metabolic acidosis
  - Metabolic alkalosis
  - Respiratory acidosis
  - Respiratory alkalosis
  - Normal acid-base balance
- 564.** A 15-year-old patient has fasting plasma glucose level 4,8 mmol/L, one hour after glucose challenge it becomes 9,0 mmol/L, in 2 hours it is 7,0 mmol/L, in 3 hours it is 4,8 mmol/L. Such parameters are characteristic of:
- Subclinical diabetes mellitus
  - Diabetes mellitus type 1
  - Diabetes mellitus type 2
  - Healthy person
  - Cushing's disease
- 565.** 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:
- Renal disorder
  - Diabetes insipidus
  - Pellagra
  - Myxedema
  - Essential hypertension
- 566.** A patient with low blood albumen content has massive edema predominantly of his face and limbs. What is the leading pathogenetic mechanism of edema development in this case?
- Drop of oncotic blood pressure
  - Increase of vascular permeability
  - Rise of hydrodynamic blood pressure
  - Lymphostasis
  - Increase of lymph outflow
- 567.** A patient was stung by a bee. Examination revealed that his left hand was hot, pink and swollen; there was a big red blister on the site of sting. What is the leading mechanism of edema development in this case?
- Increased vessel permeability
  - Reduced vessel filling
  - Injury of vessels caused by the sting
  - Drop of oncotic pressure in tissue
  - Drop of osmotic pressure in tissue
- 568.** A newborn child with pylorostenosis has often repeating vomiting accompanied by apathy, weakness, hypertonicity, sometimes convulsions. What disorder of acid-base balance is it?
- Nongaseous alkalosis
  - Gaseous alkalosis
  - Gaseous acidosis
  - Metabolic acidosis
  - Excretory acidosis
- 569.** An infant has pylorospasm, weakness, hypodynamia, convulsions as a result of frequent vomiting. What kind of acid-base disbalance is it?
- Excretory alkalosis
  - Excretory acidosis
  - Metabolic acidosis
  - Exogenous nongaseous acidosis
  - Gaseous alkalosis
- 570.** A patient with enteritis accompanied by massive diarrhea has low water rate in the extracellular space, high water rate inside the cells and low blood osmolarity. What is such disturbance of water-electrolytic metabolism called?
- Hypo-osmolar hypohydration
  - Hyperosmolar hypohydration
  - Osmolar hypohydration
  - Hypo-osmolar hyperhydration
  - Hyperosmolar hyperhydration
- 571.** A 56-year-old patient suffering from cardiac insufficiency has edema of feet and shins, edematous skin is pale and cold. What is the leading mechanism of edema pathogenesis?
- Rise of hydrostatic pressure in venules
  - Drop of oncotic pressure in capillaries
  - Increase of capillary permeability
  - Disorder of lymph outflow
  - Positive water balance
- 572.** A 49-year-old woman spent a lot of time standing. As a result of it she got leg edema. What is the most likely cause of the edema?
- Increase in hydrostatic pressure of blood in veins
  - Decrease in hydrostatic pressure of blood in veins
  - Decrease in hydrostatic pressure of blood in arteries
  - Increase in oncotic pressure of blood plasma
  - Increase in systemic arterial pressure
- 573.** After taking poor-quality food a patient developed repeated episodes of diarrhea. On the next day he presented with decreased arterial pressure, tachycardia, extrasystole. Blood pH is 7,18. These abnormalities were caused by the development of:
- Nongaseous acidosis
  - Gaseous acidosis
  - Nongaseous alkalosis
  - Gaseous alkalosis
  - Metabolic alkalosis
- 574.** A patient with diabetes developed a diabetic coma due to the acid-base imbalance. Specify the kind of this imbalance:
- Metabolic acidosis
  - Metabolic alkalosis
  - Respiratory acidosis
  - Gaseous alkalosis
  - Non-gaseous alkalosis
- 575.** A patient with respiratory failure has blood pH of 7,35. pCO<sub>2</sub> test revealed hypercapnia. Urine pH test revealed an increase in the urine acidity. What form of acid-base imbalance is the case?
- Compensated respiratory acidosis
  - Compensated metabolic acidosis
  - Decompensated metabolic acidosis
  - Compensated respiratory alkalosis
  - Decompensated respiratory alkalosis
- 576.** A hypertensive patient had been keeping to a salt-free diet and taking antihypertensive drugs together with hydrochlorothiazide for a long time. This resulted in electrolyte imbalance. What disorder of the internal environment occurred in the patient?
- Hypochloremic alkalosis
  - Metabolic acidosis

- c. Hyperkalemia
  - d. Hypermagnesemia
  - e. Increase in circulating blood volume
- 577.** A patient with a pathology of the cardiovascular system developed edemata 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
- 578.** A patient has severe blood loss caused by an injury. What kind of dehydration will be observed in this particular case?
- a. Iso-osmolar
  - b. Hyposmolar
  - c. Hyperosmolar
  - d. Normosmolar
- 579.** A patient suffers from disrupted patency of the airways at the level of small and medium-sized bronchial tubes. What changes of acid-base balance can occur in the patient?
- a. Respiratory acidosis
  - b. Respiratory alkalosis
  - c. Metabolic acidosis
  - d. Metabolic alkalosis
  - e. Acid-base balance remains unchanged
- 580.** A patient developed increased blood content of  $\text{HCO}_3^-$  against the background of repeated and uncontrollable vomiting. What will be the leading mechanism in compensation of developed acid-base imbalance?
- a. Decreased pulmonary ventilation
  - b. Increased renal reabsorption of bicarbonate
  - c. Increased pulmonary ventilation
  - d. Increased renal reabsorption of ammonia
- 581.** During starvation muscle proteins break up into free amino acids. These compounds will be the most probably involved into the following process:
- a. Gluconeogenesis in liver
  - b. Gluconeogenesis in muscles
  - c. Synthesis of higher fatty acids
  - d. Glycogenolysis
  - e. Decarboxylation
- 582.** A 2-year-old child with mental and physical retardation has been delivered to a hospital. He presents with frequent vomiting after having meals. There is phenylpyruvic acid in urine. Which metabolism abnormality is the reason for this pathology?
- a. Amino-acid metabolism
  - b. Lipid metabolism
  - c. Carbohydrate metabolism
  - d. Water-salt metabolism
  - e. Phosphoric calcium metabolism
- 583.** A 62-year-old exacerbad woman complains of frequent pain attacks in the area of her chest and backbone, rib fractures.

Her doctor suspected myeloma (plasmocytoma). What of the following laboratory characteristics will be of the greatest diagnostic importance?

- a. Paraproteinemia
  - b. Hyperalbuminemia
  - c. Proteinuria
  - d. Hypoglobulinemia
  - e. Hypoproteinemia
- 584.** Toxic affection of liver results in dysfunction of protein synthesis. It is usually accompanied by the following kind of dysproteinemia:
- a. Absolute hypoproteinemia
  - b. Relative hypoproteinemia
  - c. Absolute hyperproteinemia
  - d. Relative hyperproteinemia
  - e. Paraproteinemia
- 585.** A 12-year-old patient was found to have blood serum cholesterol at the rate of 25 mmol/L. The boy has a history of hereditary familial hypercholesterolemia, which is caused by the impaired synthesis of the following protein receptors:
- a. Low density lipoproteins
  - b. High density lipoproteins
  - c. Chylomicrons
  - d. Very low density lipoproteins
  - e. Intermediate density lipoproteins
- 586.** A 46-year-old female patient consulted a doctor about pain in the small joints of the upper and lower limbs. The joints are enlarged and shaped like thickened nodes. Serum test revealed an increase in urate concentration. This might be caused by a disorder in metabolism of:
- a. Purines
  - b. Carbohydrates
  - c. Lipids
  - d. Pyrimidines
- 587.** A 49-year-old man complains of pain in his metatarsophalangeal joints and joint deformation. In blood hyperuricemia can be observed. X-ray has revealed metatarsophalangeal joint space narrowing, erosion, periarticular calcification of the both joints, osteoporosis. Microscopy has revealed inflammatory granulomatous reaction surrounding necrotizing masses in the area of the first metatarsophalangeal joint. Choose the most likely diagnosis:
- a. Gout (podagra)
  - b. Pyrophosphate arthropathy
  - c. Rheumatoid arthritis
  - d. Hyperparathyroidism
  - e. Urolithiasis
- 588.** Upon toxic damage of hepatic cells resulting in disruption of liver function the patient developed edemas. What changes of blood plasma are the main cause of edema development?
- a. Decrease of albumin content
  - b. Increase of globulin content
  - c. Decrease of fibrinogen content
  - d. Increase of albumin content
  - e. Decrease of globulin content