GENERAL PATHOPHYSIOLOGY

MANUAL FOR THE STUDENTS OF THE 3\textsuperscript{RD} COURSE

field of study 22 «Health Care» specialty 222 «General Medicine»

educational qualification «Master of Medicine»

professional qualification «Physician»

Student of _______ group

____________________________________________________

UTSYS login ___________________

Teacher ______________________

Zaporizhzhia 2019
Approved on meeting of Central methodical council-board of ZSMU
and recommended for application in the process of study
(protocol №______ from «_____» _______________ 2019)

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General Pathophysiology: Manual for the students of the 3rd
course of international faculty speciality “General medicine” English

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### LECTURE PLAN (PART 1)

**5th semester - 105 hours: lectures – 20, pr.classes – 36, independent work - 49**

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pathophysiology as a science. Its aims, methods of research activity. Definitions of the basic pathophysiology principles. General etiology and pathogenesis.</td>
<td>2</td>
</tr>
<tr>
<td>2. Pathophysiology of the cell. General mechanisms of cell injury and death. Necrosis and apoptosis mechanisms.</td>
<td>2</td>
</tr>
<tr>
<td>3. Allergy: classification, etiology, stages and mechanisms of development, clinical manifestations. Autoimmune processes. Hypo-sensitization.</td>
<td>2</td>
</tr>
<tr>
<td>4. Inflammation: etiology and pathogenesis. Local and general signs, sequence of events in inflammation. Classification and biological importance of inflammation.</td>
<td>2</td>
</tr>
<tr>
<td>5. Thermoregulation pathology. Hyperthermia and hypothermia. Fever: etiology, pathogenesis, stages of development. Biological importance of fever.</td>
<td>2</td>
</tr>
<tr>
<td>6. Pathology of tissue growth. Tumor etiology, pathogenesis, stages of development. Benign and malignant tumors.</td>
<td>2</td>
</tr>
<tr>
<td>7. Hypoxia: etiology, pathogenesis, classification. Protective-adaptive and compensatory reactions in hypoxia development.</td>
<td>2</td>
</tr>
<tr>
<td>8. Disturbances of carbohydrates metabolism. Diabetes mellitus: definition, etiology, pathogenesis, classification, clinical manifestation and complications.</td>
<td>2</td>
</tr>
<tr>
<td>9. Disturbance of proteins and lipids metabolism. Starvation, obesity.</td>
<td>2</td>
</tr>
<tr>
<td>10. RBC pathology. Anemia: etiology, pathogenesis, principles of classifications, clinical manifestation, laboratory findings. Erythrocytosis.</td>
<td>2</td>
</tr>
</tbody>
</table>

### PRACTICAL CLASSES PLAN (PART 1)

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General etiology and pathogenesis of diseases.</td>
<td>2</td>
</tr>
<tr>
<td>2. Radiant energy influence on the organism. Radiation sickness</td>
<td>2</td>
</tr>
<tr>
<td>3. Chemical factors influence on the organism.</td>
<td>2</td>
</tr>
<tr>
<td>4. Pathophysiology of the cell. General mechanisms of cell injury and death.</td>
<td>2</td>
</tr>
<tr>
<td>5. Pathology of reactivity. Disturbances of immunological reactivity.</td>
<td>2</td>
</tr>
<tr>
<td>6. Disturbances of immunological reactivity. Allergy.</td>
<td>2</td>
</tr>
<tr>
<td>7. <strong>Section 1 “General nosology”</strong></td>
<td>2</td>
</tr>
<tr>
<td>8. Disturbances of peripheral bloodflow and microcirculation.</td>
<td>2</td>
</tr>
<tr>
<td>9. Alteration and microcirculation changes during inflammation.</td>
<td>2</td>
</tr>
<tr>
<td>10. Phagocytosis and proliferation in inflammation</td>
<td>2</td>
</tr>
<tr>
<td>11. Thermoregulation pathology. Fever.</td>
<td>2</td>
</tr>
<tr>
<td>12. Tissue growth pathology. Tumors.</td>
<td>2</td>
</tr>
<tr>
<td>13. Hypoxia.</td>
<td>2</td>
</tr>
<tr>
<td>14. <strong>Section 2 “Typical pathological processes”</strong></td>
<td>2</td>
</tr>
<tr>
<td>15. Disturbances of carbohydrates metabolism. Diabetes mellitus.</td>
<td>2</td>
</tr>
<tr>
<td>16. Disturbance of ABB and water-salt metabolism. Edemas pathogenesis.</td>
<td>2</td>
</tr>
<tr>
<td>17. Disturbance of proteins and lipids metabolism. Starvation, obesity.</td>
<td>2</td>
</tr>
<tr>
<td>18. <strong>PART 1 FINAL CONTROL</strong></td>
<td>2</td>
</tr>
</tbody>
</table>
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.
4. Pathogenesis: definition, sequence of events in disease pathogenesis.
5. Disease: definition, classification, disease stages.

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»

<table>
<thead>
<tr>
<th>Type of etiologic factor</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical</td>
<td></td>
</tr>
<tr>
<td>chemical</td>
<td></td>
</tr>
<tr>
<td>biological</td>
<td></td>
</tr>
<tr>
<td>hereditary</td>
<td></td>
</tr>
<tr>
<td>social</td>
<td></td>
</tr>
<tr>
<td>psychogenic/informational</td>
<td></td>
</tr>
<tr>
<td>iatrogenic</td>
<td></td>
</tr>
</tbody>
</table>
3. Fill the table “The role of conditions in disease development”

<table>
<thead>
<tr>
<th>Internal conditions</th>
<th>External conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Fill the table “Disease stages”

<table>
<thead>
<tr>
<th>Stage</th>
<th>Clinical manifestation</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Type of therapy</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
UNIT 2
RADIANT ENERGY INFLUENCE ON ORGANISM. RADIATION SICKNESS

1. Mechanisms of general and local effects of infra-red rays, ultra-violet rays and visible spectrum section on organism.
3. 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;
5. Stages of acute radiation sickness bone marrow form. Its mechanisms of development, mechanisms of main clinical manifestations, blood count.

1. Fill the table “Forms of acute radiation sickness”

<table>
<thead>
<tr>
<th></th>
<th>Bone marrow</th>
<th>Intestinal</th>
<th>Toxemia</th>
<th>Cerebral</th>
</tr>
</thead>
<tbody>
<tr>
<td>radiation dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>clinical symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Stage</th>
<th>Clinical symptoms</th>
<th>Laboratory indices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Fill the table “Influence of UV and IR rays on the human body”.

<table>
<thead>
<tr>
<th></th>
<th>Positive influence</th>
<th>Negative influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV rays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IR rays</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Task 1**

The research of organism tissues radio sensitivity has such results. Muscular, nervous, bone tissues are the least 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 $3.5 \times 10^{12}/L$, leukocytes $2.1 \times 10^9/L$; thrombocytes $80 \times 10^9/L$.

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.
UNIT 3
CHEMICAL FACTORS INFLUENCE ON ORGANISM

1. General and local effect of chemical factors on organism.
2. Intoxication: definition, types, specific and nonspecific mechanisms. Toxins: definition, classification, direct and indirect mechanisms of influence on organism.
4. Drugs and chemical addiction pathogenesis.
5. Pathogenesis of alcoholism.

1. Give the definitions and examples of:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definitions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poison</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toxin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xenobiotic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Fill the table with the types of toxins and their specific features:

<table>
<thead>
<tr>
<th>Toxin type</th>
<th>Example</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial toxins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fungal toxins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toxins of plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral poisons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-organic poisons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic poisons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio nuclides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticides</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Fill the table “Chemical carcinogens”

<table>
<thead>
<tr>
<th>Group</th>
<th>Compound</th>
<th>Source</th>
<th>Affected organs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aminoazotoluene</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>melphalan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>naphtylamine</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>benzopyrene</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>arsenic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cadmium</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>nickel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>aflatoxin B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(mycotoxin)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N-nitrosodimethylamine</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dichloroethane</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Fill the table “Chemical compounds of cigarette smoke”

<table>
<thead>
<tr>
<th>compound</th>
<th>effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>nicotine</td>
<td></td>
</tr>
<tr>
<td>N-notrozamines</td>
<td></td>
</tr>
<tr>
<td>benzene</td>
<td></td>
</tr>
<tr>
<td>aromatic amines</td>
<td></td>
</tr>
<tr>
<td>acetaldehyde</td>
<td></td>
</tr>
<tr>
<td>butadiene</td>
<td></td>
</tr>
<tr>
<td>polycyclic</td>
<td></td>
</tr>
<tr>
<td>aromatic</td>
<td></td>
</tr>
<tr>
<td>hydrocarbons</td>
<td></td>
</tr>
</tbody>
</table>

Teacher’s signature

__________________
UNIT 4
PATHOPHYSIOLOGY OF THE CELL.
GENERAL MECHANISMS OF CELL INJURY AND DEATH.

3. The main processes of the cell injury.
7. Types of cell death: necrosis and apoptosis. The difference between them.
8. Intracellular mechanisms of cell adaptation to injury.

1. Fill the table “Cell damage features”

<table>
<thead>
<tr>
<th>morphological</th>
<th>functional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Fill the table “Differences between necrosis and apoptosis”

<table>
<thead>
<tr>
<th></th>
<th>Necrosis</th>
<th>Apoptosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The reason of development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphological features</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reversibility of the process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependence on cell’s energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological importance and consequences</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Fill the table “Pathogenesis of hypoxic injury”

<table>
<thead>
<tr>
<th>Pathogenetic events</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>reversible injury</td>
<td></td>
</tr>
<tr>
<td>irreversible injury</td>
<td></td>
</tr>
<tr>
<td>reperfusion</td>
<td></td>
</tr>
</tbody>
</table>

4. Fill the table “Pathogenesis of free radical injury”

<table>
<thead>
<tr>
<th>Physiological sources of free radicals</th>
<th>Pathological sources of free radicals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>proteins</td>
</tr>
<tr>
<td></td>
<td>lipids</td>
</tr>
<tr>
<td>The effects of free radicals on the cell</td>
<td>nucleic acids</td>
</tr>
<tr>
<td></td>
<td>Enzymatic antioxidants</td>
</tr>
<tr>
<td></td>
<td>Non-enzymatic antioxidants</td>
</tr>
</tbody>
</table>
Task 1
Patient was made blood biochemical test in order to confirm hepatitis. Increased level of alanine transaminase (ALT) and aspartate transaminase (AST) was found in blood serum.

1. Which cellular changes could lead to this situation? Prove your answer.
2. Explain possible mechanism of enzymes appearance in the blood.
3. Which clinical importance does this test have?

Task 2
Patient with gastritis and increased acidity had fibrogastroscopy, during which the tissue was taken from the place of mucous coat erosion. Tissue histology: increased cells size with their form and coloring changing without features of cell organoids and membranes damage.

1. What features of cell injury (morphological or functional) are described here?
2. Point out cell adaptation feature to damage.

Task 3
Patient M., 50 years old complains of pain and burning sensation just below the xiphoid process. Sensations suddenly appear and also suddenly disappear. After a big meal pain usually intensifies, sometimes occurs even at night. Patient takes milk or soda solution to relieve this pain. The patient is overweight, smokes 15-20 cigarettes a day, drinks alcohol several times a week, prefers spicy and fatty foods. Upper GIT endoscopy: hyperemia of the lower third of the esophageal mucosa, the gastric mucosa is not changed. Biopsy data: a fragment of the mucosa of the esophagus is partially covered with stratified squamous epithelium, partially with prismatic epithelium of the gastric type.

1. Describe the possible mechanism of cell injury in this patient.
2. Name the features of cells adaptation to injuring factor

Task 4
A 30-year-old man sustained a fracture of his leg 2 months ago. The leg had been encased in a cast, which was just removed. The patient is amazed at the degree to which the muscles in his leg have shrunk.

1. Would you consider the changes in the patient’s muscles to be a normal adaptive response? Explain.
2. What type of measures can be taken to restore full function to the leg?
UNIT 5
THE IMPORTANCE OF REACTIVITY IN PATHOLOGY.
IMMUNE SYSTEM DEFICIENCY

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.


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

<table>
<thead>
<tr>
<th>Organ</th>
<th>Central</th>
<th>Peripheral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Fill the table “Primary immunodeficiencies”

<table>
<thead>
<tr>
<th>Disease</th>
<th>Defect</th>
<th>Laboratory findings</th>
<th>Clinical manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruton’s disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di George syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louis-Bar syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wiskott-Aldrich syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chediak Higashi syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe Combined Immune Deficiency</td>
<td></td>
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</tr>
</tbody>
</table>

3. Give the definition to immunological tolerance, explain the mechanisms of its formation
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
A 20-year-old woman has been diagnosed with IgA deficiency. She complains about frequent cases of bronchitis and sinus infections.
1. Why are these types of infections particularly prominent in persons with an IgA deficiency?

Task 3
Patient S, 15 years old, from the early childhood is frequently ill with infectious diseases, caused by staphylococci; chronic purulent inflammation on the skin. During immunological examination the primary deficiency in phagocytes system was revealed.
1. What type of immunity do the phagocytes take part in?
2. What body cells are phagocytes? Describe all their functions.

Task 4
Persons with impaired cellular immunity may not respond to the tuberculin test, even when infected with Mycobacterium tuberculosis.
1. Explain this phenomena

Teacher’s signature
UNIT 6
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.
5. Type 4 allergic reactions (delayed hypersensitivity): mechanisms, main clinical forms. The role of lymphokines.

1. Fill the table “Types of allergic reactions”

<table>
<thead>
<tr>
<th>Type of reaction</th>
<th>Antigen type and location</th>
<th>Ig or effector cells taking part</th>
<th>Mediators, factors causing cell injury</th>
<th>Examples of diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td></td>
<td></td>
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<tr>
<td>2</td>
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<td>4</td>
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<tr>
<td>5</td>
<td></td>
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</tr>
</tbody>
</table>
2. Fill the table «Mechanisms of autoimmune diseases development»

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Reason</th>
<th>Example of disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequestered antigens contact with immune cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alteration of the self antigens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molecular mimicry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alteration of MHC molecules expression on the cells’ membrane</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sign</th>
<th>Allergic reaction (1\textsuperscript{st} type)</th>
<th>Pseudoallergic reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of antigen which causes the reaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atopic diseases in patient and his family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependence of clinical symptoms from the dose of antigen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IgE blood level</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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, heart 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 °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. Is it an allergic reaction, or no? Prove your answer. If yes, 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?
UNIT 7
SECTION 1 CONTROL. Checking of practical skills and theoretical knowledge
«GENERAL NOSOLOGY. PATHOGENIC INFLUENCE OF THE ENVIRONMENTAL FACTORS. THE ROLE OF THE INTRINSIC FACTORS IN PATHOLOGICAL STATES DEVELOPMENT».

To be allowed to pass Section 1 control the student should:
1. attend all the lectures and practical classes until the current date;
2. get positive mark on each practical classes;
3. complete all the practical classes’ protocols and sign them by the teacher and show the lectures notebook.

In order to receive high grades in rating students should pass Section 1 control not later that in 2 weeks after its first date

SECTION 1 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).

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 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 analysis of etiology, pathogenesis and clinical manifestation of the disease.
UNIT 8
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.

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.

<table>
<thead>
<tr>
<th></th>
<th>color of the skin</th>
<th>temperature of the skin</th>
</tr>
</thead>
<tbody>
<tr>
<td>ischemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>venous hyperemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>arterial hyperemia</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In conclusions: explain the mechanisms of disturbances development.

CONCLUSION


Task 1
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 2
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?
2. Are these signs normal?
3. Explain the mechanism of this condition development.

Task 3
The experiment was held on the rabbit: sympathetic nerves that innervate the left ear were cut.

1. Which violation of peripheral blood circulation will occur in the experiment?
2. Explain the mechanism of its development.
3. Which other types of this violation of peripheral blood circulation can you name?

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 its development.
3. Explain the mechanism of edema, low skin temperature and subcutaneous hemorrhages.

Task 5
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 6
Patient B., 30 years old, has got a fracture of the right femur bone. During reposition of bone’s parts patient felt pain in the left side of chest, which was enhanced with breathing; palpitation, short breath and feeling of fair.
1. What kind of peripheral blood circulation disturbance had developed in patient?
2. Explain the mechanism of its development.
3. What possible complication can develop in this clinical case?

Task 7
The development of thrombosis was provided in the experiment on laboratory animal.
1. What conditions are favorable for thrombus formation? What is the role of endothelial damage in thrombosis pathogenesis?
2. What type of vessels do thrombi usually form in?
3. What complications of thrombosis do you know?

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.
UNIT 9
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 cite. The role of alteration in pathogenesis of inflammation.
3. Inflammation mediators, their origin, mechanisms of action. Alteration importance.
4. Local blood circulation violation under inflammation. Vascular reactions order under inflammation, their mechanisms and importance.

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

<table>
<thead>
<tr>
<th>Sign (in English)</th>
<th>Mechanism of development</th>
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</thead>
<tbody>
<tr>
<td>Tumor</td>
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<tr>
<td>Rubor</td>
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<tr>
<td>Calor</td>
<td></td>
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<tr>
<td>Dolor</td>
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<tr>
<td>Functio laesa</td>
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</table>

2. Fill the table “Systemic signs of inflammation”

<table>
<thead>
<tr>
<th>Sign</th>
<th>Mechanism of development</th>
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</table>

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

<table>
<thead>
<tr>
<th>Vascular reaction</th>
<th>Mechanism of development</th>
</tr>
</thead>
<tbody>
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</table>

4. Explain the mechanisms of:

Primary alteration __________________________________________________________

Secondary alteration _______________________________________________________

Exudation: 1) _____________________________________________________________

2) _____________________________________________________________________

3) _____________________________________________________________________

22
Task 1
Patient A., 35 years old, has got a burn of arm, it 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 this experiment?

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*10^{12}/L, WBC – 25*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 10
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
5. The difference between acute and chronic inflammation; their peculiarities

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

<table>
<thead>
<tr>
<th>The cell</th>
<th>Which substances secrete and release</th>
<th>Role in inflammation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macrophages: fixed and mobile</td>
<td></td>
<td></td>
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<tr>
<td>Mast cells</td>
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<tr>
<td>Neutrophils</td>
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<tr>
<td>Eosinophils</td>
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<tr>
<td>Thrombocytes</td>
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<tr>
<td>T- and B- lymphocytes</td>
<td></td>
<td></td>
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<tr>
<td>Fibroblasts</td>
<td></td>
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</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sign</th>
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<th>Chronic inflammation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason/causes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time of duration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vascular reactions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exudation and edema</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local signs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General signs</td>
<td></td>
<td></td>
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<tr>
<td>The sequence of stages</td>
<td></td>
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<tr>
<td>Prevailing stage</td>
<td></td>
<td></td>
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<tr>
<td>Prevailing cells</td>
<td></td>
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</tr>
</tbody>
</table>
**Task 1**

Patient C., 51 years old, with diagnosis “acute peritonitis”. After paracentesis (puncture of abdominal cavity) liquid was obtained which had the following signs: yellow color with green tint, density 1,029; proteins content – 3,9 %. In 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 hospitalized 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 signs: 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 reveled 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?

Task 7
Describe the role of nervous, immune and endocrine systems on the inflammation development. Give the examples of inflammation under different functional state of these systems.

Teacher’s signature
UNIT 11
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.
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 “Fever stages”

<table>
<thead>
<tr>
<th>1 Stage</th>
<th>2 Stage</th>
<th>3 Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

2. Describe the differences between fever and hyperthermia

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fever</th>
<th>Hyperthermia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main link of pathogenesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermoregulation state</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ways of treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological meaning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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°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 fevef

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.
1. Define the pathology and stage of its development. Define the vicious circles in pathogenesis.
2. Should this case of fever be treated with medicines? Why?

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

[Signature]
UNIT 12
TISSUE GROWTH PATHOLOGY. TUMORS.

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.

1. Define the main types of carcinogens:
___________________________________________________________________________________________________
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2. Fill the table «Pathogenesis of cancer growth»

<table>
<thead>
<tr>
<th>Transformation</th>
<th>Promotion</th>
<th>Progression</th>
</tr>
</thead>
<tbody>
<tr>
<td>mutational carcinogenesis</td>
<td></td>
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<tr>
<td>epegentic carcinogenesis</td>
<td></td>
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</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Anaplasia type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>morphological</td>
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<tr>
<td>biochemical</td>
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<tr>
<td>functional</td>
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</table>
4. Fill the table “Differences between benign and malignant tumors”

<table>
<thead>
<tr>
<th>Sign</th>
<th>Benign tumor</th>
<th>Malignant tumor</th>
</tr>
</thead>
<tbody>
<tr>
<td>level of differentiation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>autonomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>structure</td>
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<td>*</td>
</tr>
<tr>
<td>type of growth</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>metastases</td>
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</tr>
<tr>
<td>influence on the host</td>
<td>*</td>
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<td>organism</td>
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<tr>
<td>cancer cachexia</td>
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<td>*</td>
</tr>
<tr>
<td>capsule</td>
<td>*</td>
<td>*</td>
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<tr>
<td>possibility of relapse</td>
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</tbody>
</table>

* - explain the mechanism

Task 1
Patient R., 52 years old, complains of weakness, abdomen pains, digestion disorder, and 40% weight waste. 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 nitrogenic balance.
1. What are possible mechanisms of weight loss in this patient?
2. What mechanisms cause carbohydrate, protein and lipid metabolisms disorder?

Task 2
Patient G., 35 years old. Leukemia was found in 3 months after he was rayed by ionizing radiation. He had 15 kg weight loss, there were 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. Why this type of tumor is surrounded with capsule?

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. 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. Explain the described phenomena.
2. Why cells of tumor metastases are more resistant to anti-tumor therapy?

Teacher’s signature
UNIT 13

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»

<table>
<thead>
<tr>
<th>Type of hypoxia</th>
<th>The mechanism of development</th>
</tr>
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<tbody>
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3. Fill the table «Protective and compensatory reactions against hypoxia»

<table>
<thead>
<tr>
<th></th>
<th>Lungs</th>
<th>CVS</th>
<th>Blood</th>
<th>Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective reactions</td>
<td></td>
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</tr>
<tr>
<td>(acute hypoxia)</td>
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<tr>
<td>Compensatory reactions</td>
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<tr>
<td>(chronic hypoxia)</td>
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</table>
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 2nd day of being there. Mountain disease symptoms: breathlessness, skin cyanosis, tachycardia, headache, appetite loss, general weakness, insomnia occur.
1. What is the cause of mountain disease?
2. What pathogenic mechanism underlies symptoms which developed in the patient?

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 – 100/70 mm Hg. Heart rate – 95 beats per minute.
1. What hypoxia features does this patient have?
2. Which type of hypoxia does patient have? Prove your answer.

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. Why patient’s skin is red?

Teacher’s signature
UNIT 14
SECTION 2 CONTROL  Checking of practical skills and theoretical knowledge «TYPICAL PATHOLOGICAL PROCESSES».

The final practical class in Section 2 consists of estimating student’s rating grade. To be allowed to pass Section 2 control the student should:
1. attend all the lectures and practical classes until the current date;
2. get positive mark on each practical classes;
3. complete all the practical classes’ protocols and sign them by the teacher and show the lectures notebook.
4. successfully pass Section 1

In order to receive high grades in rating students should pass Section 2 control not later that in 2 weeks after its first date

SECTION 2 PRACTICAL SKILLS

1. Students should be able to analyze:
   • 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 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 15
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.

1. Explain the mechanism of diabetes symptoms

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Mechanism of development</th>
</tr>
</thead>
<tbody>
<tr>
<td>fasting hyperglycemia</td>
<td></td>
</tr>
<tr>
<td>glucosuria</td>
<td></td>
</tr>
<tr>
<td>polyuria</td>
<td></td>
</tr>
<tr>
<td>polydypsia</td>
<td></td>
</tr>
<tr>
<td>hyperphagia</td>
<td></td>
</tr>
<tr>
<td>weight loss</td>
<td></td>
</tr>
<tr>
<td>ketonemia</td>
<td></td>
</tr>
<tr>
<td>hyperlipidemia</td>
<td></td>
</tr>
<tr>
<td>hyperazotemia</td>
<td></td>
</tr>
<tr>
<td>hyperlactatacidemia</td>
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</tr>
</tbody>
</table>

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

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

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 boy 7 years old 2 months ago was ill with severe form of infectious parotitis. Now his mother complains of 3 kg weight loss in spite of 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

_________________________
UNIT 16
ACID-BASE BALANCE PATHOLOGY (ABB) AND WATER-SALT METABOLISM DISTURBANCES

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    |
pO₂    | 85-95 mm Hg    | 40-45 mm Hg  |
pCO₂   | 35-45 mm Hg    | 40-50 mm Hg  |

1. Describe the mechanisms of ABB maintenance

<table>
<thead>
<tr>
<th>Buffer blood system</th>
<th>Physiological mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Pathology</th>
<th>ABB shift</th>
<th>Mechanism</th>
<th>Compensatory reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>vomiting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diarrhea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hyperventilation of lungs</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>hypoventilation of lungs</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>diabetic coma</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(ketonemia)</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Describe the alterations of water and electrolyte balance

<table>
<thead>
<tr>
<th>Dehydration</th>
<th>Dehydration</th>
<th>Dehydration</th>
</tr>
</thead>
<tbody>
<tr>
<td>isoosmolar</td>
<td>hypoosmolar</td>
<td>hypersomolar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hyperhydration</th>
<th>Hyperhydration</th>
<th>Hyperhydration</th>
</tr>
</thead>
<tbody>
<tr>
<td>isoosmolar</td>
<td>hypoosmolar</td>
<td>hypersomolar</td>
</tr>
</tbody>
</table>

4. Explain the mechanism of edema formation

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Reason</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrodynamic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colloid-osmotic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Membranogenous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphogenous</td>
<td></td>
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</tr>
</tbody>
</table>

Task 1

Patient C, is suffering from lungs emphysema and respiratory insufficiency. ABB indices: pH=7.36; pCO₂=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=7.39; pCO₂=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.
UNIT 17
DISTURBANCES OF PROTEIN AND LIPIDS METABOLISM. STARVATION, OBESITY.

2. Gout: etiology, pathogenesis, 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^2]).

<p>| Classification of Overweight and Obesity by BMI, Waist Circumference, and Associated Disease Risk |
|----------------------------------|---------------------------------|---------------------------------|</p>
<table>
<thead>
<tr>
<th><strong>BMI(kg/m2)</strong></th>
<th><strong>Obesity Class</strong></th>
<th><strong>Disease Risk Relative to Normal Weight and Waist Circumference</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>18.5–24.9</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0–29.9</td>
<td>Increased High</td>
</tr>
<tr>
<td>Obesity</td>
<td>30.0–34.9</td>
<td>I High</td>
</tr>
<tr>
<td></td>
<td>35.0–39.9</td>
<td>II Very high</td>
</tr>
<tr>
<td>Extreme obesity</td>
<td>≥40</td>
<td>III Extremely high</td>
</tr>
</tbody>
</table>

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

Experimental results

<table>
<thead>
<tr>
<th>Student name</th>
<th>Height, kg</th>
<th>Weight, m</th>
<th>BMI</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

CONCLUSION


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

<table>
<thead>
<tr>
<th>Protein metabolism disturbances</th>
<th>Lipid metabolism disturbances</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

2. Describe the stages of starvation pathogenesis

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

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

__________________
UNIT 18 PART 1 FINAL CONTROL

General nosology.
Typical pathological processes. Typical metabolism disturbances.

The final semester control consists of estimating student’s rating grade. To be allowed to pass final semester control the student should:
1. get positive marks during all practical classes;
2. have no missed lectures and practical classes to the current date;
3. successfully pass Section 1, 2

RECOMMENDED LITERATURE

Basical:

Additional:
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

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

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

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

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

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

Which of the processes listed below is a TYPICAL PATHOLOGICAL PROCESS?

a. inflammation
b. burn
c. poisoning
d. birth defect
e. acquired trauma

Which of the processes listed below is a TYPICAL PATHOLOGICAL PROCESS?

a. burn
b. poisoning
c. birth defect
d. trauma
e. hypoxia

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

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

From the list of “civilization diseases” choose the one which DOESN’T belong to this group:

a. atherosclerosis
b. diabetes
c. pneumonia
d. allergy
e. stenocardia

From the list of “civilization diseases” choose the one which DOESN’T belong to this group:

a. atherosclerosis
b. burns disease
c. diabetes
d. allergy
e. stenocardia

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

Choose the example of pathogenetic 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 spasmolitics
e. arthritis treatment with analgetics

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 spasmolitics
e. arthritis treatment with analgetics

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

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

18. Experiment is the one of basic methods of research in pathophysiology. Choose the correct sequence of the stages of making an experiment.
   a. discussion of possible results => making => analysis of results => conclusions
   b. planning => carrying out => conclusions => analysis of results
   c. planning => making => conclusions => analysis of results
   d. making => conclusions => analysis of results
   e. discussion of possible results => making

19. 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
   c. latent (incubative) period => prodromal period => manifestation of disease
   d. latent (incubative) period => period of hidden signs => prodromal period => manifestation of disease
   e. latent period (incubative) => prodromal period => outcome of disease

20. Choose the disease that can be named “civilization disease”?
   a. rheumatism
   b. pneumonia
   c. diabetes mellitus
   d. hepatitis
   e. pancreatitis

21. 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

22. 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 condition
   b. Pathological process
   c. Disease
   d. Pathological reaction
   e. Compensatory reaction

23. 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 epigastrum, 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

24. 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

25. 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

26. 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

27. 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

28. 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

29. When a 5-year-old child was brought home from the kindergarten he presented with weakness, headache, body temperature rise up to 37,5°C. What period of disease development is observed in this case?
   a. prodromal
   b. latent
   c. incubative
   d. recovery
   e. disease outcome

30. 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)

31. 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 lipido peroxidation

32. The UV radiation causes both negative and positive influences on the human organism. Choose the sign of UV-rays overdose from the following:
   a. early ageing
   b. reduction of skin elasticity
   c. sunburns
   d. vitamin D deficiency
   e. skin tumors development

33. The UV radiation causes both negative and positive influences on the human organism. Choose the sign of UV-rays deficiency from the following:
   a. vitamin D deficiency
   b. skin tumors development
   c. immune deficiency
   d. disturbance of psychic activity
   e. increase of skin elasticity

34. 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

35. Which diseases treatment can include irradiation with ultra-violet rays?
   a. heart diseases
   b. GIT diseases
   c. blood diseases
   d. skin diseases
   e. eyes diseases

36. Which rays can be used in treatment of inflammatory processes?
   a. UV rays
   b. IR rays
   c. UV rays and IR rays
   d. UV rays and X-rays
   e. IR rays and gamma rays

37. Which is the most dangerous long-term consequence after ionizing radiation influence?
   a. malignant neoplasm
   b. asthenia syndrome
   c. early ageing
   d. liver dysfunction

38. Which medicines from the listed below can be photoactive?
   a. sulfonamides
   b. non-steroid anti-inflammatory drugs
   c. barbiturates
   d. vitamin B group
   e. all of them

39. 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

40. 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

41. 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

42. 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

43. What is the mechanism of the selective effect of gamma-radiation on the tumor cells that can be used in medical practice?
   a. Affectation of tissues with high blood supply
   b. Affectation of tissues with high maintenance of water
   c. Activation of the immune system
   d. Affectation of tissues with high mitotic rate
   e. Initiation of the mutations in tumor cells

44. 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

45. 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

46. 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

47. 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

48. 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
49. 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 activation of lipid peroxidation in the cells
   d. increased amount of carcinogenic substances
   e. partial pressure of oxygen in the blood

50. 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)

51. 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

52. 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

53. 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 haemopoiesis
   c. depression of cellular immunity
   d. anemia
   e. disturbance of regeneration capability of epithelial tissues

54. 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

55. Choose the list in which the tissues of the organism are situated due to their radiosensitivity in the decreasing order:
   a. epithelial, haematopoietic, cartilages, bone, muscular, nervous
d. nervous, haematopoietic, epithelial, cartilages, bone, muscular
c. bone, muscular, nervous, haematopoietic, epithelial
d. muscular, haematopoietic, bone, nervous, epithelial, cartilages
e. haematopoietic, epithelial, cartilages, bone, muscular, nervous

56. 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?
   a. prevention of tissue’s hypoxia
   b. activation of oxidation reactions
c. inhibition of free radicals formation
   d. increasing of tissue blood supply

57. 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?
   a. prevention of tissue hypoxia
   b. increase of intensity of oxidation reactions
c. activation of the cell’s anti-oxidative system
d. increase of tissue blood supply
e. stimulation of the organism’s energy supply systems

58. Which blood count correctly reflects the period of disease manifestation of acute radiation sickness bone marrow form:
   a. leukocytosis, lymphocytosis, monocytopenia
   b. lymphocytosis, anemia, thrombocytopenia
   c. erythrocytosis, leukopenia, thrombocytosis
   d. leukopenia, anemia, thrombocytopenia
   e. leukocytosis, lymphopenia, anemia

59. 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?
   a. bone marrow
   b. intestinal
   c. toxic
   d. haemorrhagic
   e. cerebral

60. Which dose of ionizing radiation causes typical bone marrow form of acute radiation sickness?
   a. less than 0,5 Gray
   b. 1-10 Gray
   c. 10-20 Gray
d. 20-80 Gray
e. more than 80 Gray

61. Which dose of ionizing radiation causes intestinal form of acute radiation sickness?
   a. less than 0,5 Gray
   b. 1-10 Gray
c. 10-20 Gray
d. 20-80 Gray
e. more than 80 Gray

62. Which dose of ionizing radiation causes toxemia form of acute radiation sickness?
   a. less than 0,5 Gray
   b. 1-10 Gray
c. 10-20 Gray
d. 20-80 Gray
e. more than 80 Gray

63. Which dose of ionizing radiation causes cerebral form of acute radiation sickness?
   a. less than 0,5 Gray
   b. 1-10 Gray
c. 10-20 Gray
d. 20-80 Gray
e. more than 80 Gray

64. 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?
   a. latent period
   b. period of primary reactions
c. manifestation
d. prodromal period
e. period of convalescence

65. 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?
   a. Bone marrow
   b. Intestinal
c. Toxic
d. Cerebral
e. Haemorrhagic

66. The mechanisms of protection and adaptation are activated at reversible cellular injury by ionizing radiation. Name the
71. Choose the most correct definition of an abstinence syndrome:
   a. complex of psychoneurological disorders after stop of alcohol or toxic substance consumption
   b. complex of somatic, vegetative and psychoneurological disorders after stop of alcohol or toxic substance consumption
   c. complex of somatic and vegetative disorders after stop of alcohol consumption
   d. somatic, vegetative and psychoneurological reactions during consumption of alcohol or toxic substance
   e. psychoneurological reaction on the consumption of alcohol or toxic substance

72. Which stage of alcoholic and narcotic dependence is characterized by invincible attraction to the substance (alcohol, drug) consumption without the abstinence syndrome?
   a. physical dependence stage
   b. tolerance development
   c. sensitization development
   d. cumulative effect phenomena
   e. psychological dependence stage

73. Which stage of alcoholic and narcotic dependence is characterized by manifestation of vegetative, somatic, psychic and neurological disorders after stopping the consumption of substance (alcohol, drug)?
   a. physical dependence stage
   b. psychological dependence stage
   c. tolerance development
   d. sensitization development
   e. phenomenon of cumulative effect

74. Do endogenous narcotic substances have physiological effects upon the organism?
   a. yes, they are natural anti-oxidants
   b. yes, they take part in adaptation processes and motivation behavior
   c. yes, the consumption of large doses of drugs promote better adaptation of the organism to the environment
   d. no, there are no endogenous narcotic substances in the organism
   e. no, endogenous narcotic substances are synthesized only during pathological processes

75. Does endogenous alcohol have physiological effects upon the organism?
   a. yes, it is natural anti-oxidant
   b. yes, the consumption of large dose of alcohol promotes better adaptation of the organism to the environment
   c. yes, it takes part in adaptation processes and motivation behavior
   d. no, there is no endogenous alcohol in the organism
   e. no, endogenous alcohol is synthesized only during pathological processes

76. Which main pathological mechanism of cellular damage is the result of lipid peroxidation activation?
   a. decrease of ATP-formation
   b. disturbance of RNA-synthesis
   c. release of proinflammatory mediators
   d. destruction of membranes
   e. damage of MHC proteins

77. Which pathogenic mechanism causes the development of abstinence syndrome in alcohol abuse?
   a. sensitization of nervous cells to the alcohol
   b. formation of the cells pathological tolerance in the organism
   c. appearance of polyorganic functional insufficiency
   d. decrease of activity of alcohol dehydrogenase in the liver
   e. decrease of endogenous alcohol synthesis

78. The patient developed abstinence syndrome as a result of narcotic usual dose absence. Which pathogenic mechanism causes the development of abstinence syndrome in drugs addiction?
   a. decrease of endogenous opioids synthesis
   b. development of sensitization of nervous cells to alcohol
   c. formation of pathological tolerance of the cells in the organism
   d. appearance of multiple organ functional insufficiency
   e. decrease of activity of enzymes that metabolize narcotic

79. Free radicals constantly form in any organism due to the effect of external and internal causes. What is the positive role of free radicals in organism vital activity?
   a. are exclusively pathogenic factors
   b. take part in synthesis of immunoglobulins
   c. take part in processes of necrosis development
   d. take part in processes of cellular detoxication
   e. take part in killing of pathogenic microorganism

80. Free radicals constantly form in the healthy cell due to the effect of external and internal causes. What is the physiological role of free radicals in cell activity?
   a. are exclusively pathogenic factors
   b. take part in synthesis of biologically active substances
   c. take part in processes of necrosis development
   d. take part in processes of cellular detoxication
   e. take part in ATP generation

81. In patient suffering with alcohol abuse disorders in heart, lungs, kidney and liver activity are revealed. Which stage of alcohol abuse is characterized by multiple organ failure?
   a. stage of psychological dependence
   b. stage of physical dependence
Which substance is responsible for the formation of multiple organ failure in alcohol abuse?
- formaldehyde
- ethanol
- methanol
- acetaldehyde
- acetylsalicylic acid

Which of the substances listed below can be related to the class of enzymatic antioxidants?
- superoxide dismutase
- lycopene
- tocopherol
- ascorbic acid
- glutathione peroxidase

Which method of pathogenic therapy is the most appropriate to use after acute poisoning?
- desintoxication therapy
- prescription of analgetics
- blood transfusion
- prescription of anticonvulsants
- prescription of purgatives

Which factor promotes formation of free radicals?
- hypervitaminosis E
- lack of oxygen
- lack of nitrogen
- ionizing radiation
- excess of carbon dioxide

Free radicals activate lipid peroxidation in the organism and cause cellular damage. Which factor provides formation of free radicals?
- hypervitaminosis D
- infra-red radiation
- lack of oxygen
- ultraviolet radiation
- excess of carbon dioxide

Free radicals activate lipid peroxidation in the organism and cause cellular damage. Which factor promotes formation of free radicals?
- hypervitaminosis E
- lack of oxygen
- lack of nitrogen
- ionizing radiation
- excess of carbon dioxide

It is known that oxygen plays key role in mechanisms of cellular damage. Which factor from the listed below potentiates formation of free radicals?
- hypervitaminosis D
- infra-red radiation
- lack of oxygen
- ultraviolet radiation
- excess of carbon dioxide

The negative effects of free radicals depend on their quantity in tissues. What is the role of intracellular antioxidant systems?
- increase the formation of free radicals
- increase the oxygen consumption in the cell
- decrease the formation of free radicals
- decrease the oxygen consumption in the cell
- increase ATP-formation

Each cell in the organism has antioxidant systems for protection from free radicals pathogenic effects. Which of the substances from listed below can be related to the class of non-enzymatic anti-oxidants?
- peroxidase
- superoxide dismutase
- ceruloplasmin
- beta-endorphin
- ferritin

Each cell in the organism has antioxidant systems for protection from free radicals pathogenic effects. Which of the substances from listed below can be related to the class of non-enzymatic anti-oxidants?
- catalase
- superoxide dismutase
- leu-enkephalin
- beta-endorphin
- ferritin

Each cell in the organism has antioxidant systems for protection from effect of free radicals. Which of the substances listed below can be related to the class of enzymatic antioxidants?
- superoxide dismutase
- lycopene
- tocopherol
- ascorbic acid
- glutathione peroxidase

Which type of necrosis develops after alkali application?
- coagulative
- colliguitive
- hemorrhagic
- caseous
- fat necrosis

Coagulation of which substances is the leading mechanism of coagulative necrosis development?
- membranes
- lipids
- proteins
- DNA
- RNA

The effect of toxins upon the organism is determined with:
- toxin chemical structure
- dose of toxin
- previous state of organism
- duration of toxic effect
- all the items are true

Which of the terms refers to the ability of toxins to cause defects in a developing fetus?
- teratogenicity
- mutagenicity
- general toxicity
- specific toxicity
- cancerogenicity

Which of the terms refers to the ability of toxins to cause defects of DNA replication?
- teratogenicity
- mutagenicity
- general toxicity
- specific toxicity
- cancerogenicity

Which of the terms refers to the ability of toxins to cause defects of a histohaematic barrier?
- dysfunction of a histohaematic barrier
- phagocytosis impairment
- metabolic disorder
- liver pathology
- alteration in the skin pH

Each cell in the organism has antioxidant systems for protection from effect of free radicals. Which of the substances listed below can be related to the class of enzymatic antioxidants?
- superoxide dismutase
- lycopene
- tocopherol
- ascorbic acid
- glutathione peroxidase

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- superoxide dismutase
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- glutathione peroxidase

Each cell in the organism has antioxidant systems for protection from effect of free radicals. Which of the substances listed below can be related to the class of enzymatic antioxidants?
- superoxide dismutase
- lycopene
- tocopherol
- ascorbic acid
- glutathione peroxidase
100. In an experiment a tissue preparation is subjected to oxidative stress. Presence of which of the following substances within these cells is necessary for reduction of free radicals amount?
- glutathione reductase
- catalase
- hydrogen peroxide
- NADPH oxidase
- myeloperoxidase

**The influence of heredity on human pathology development**

101. Hereditary disease – phenylketonuria – was found in child in the maternity hospital. Which reason causes the occurrence of hereditary diseases?
- changes of chromosomal quantity
- qualitative and quantitative changes of genes
- effect of surrounding environment negative factors
- hereditary pathology of the closest relatives

102. Congenital disease – non-closure of fetal oval foramen – was revealed in child in the maternity hospital. Which reason from listed below can cause the occurrence of congenital diseases?
- rhesus conflict of mother and fetus
- effect of teratogenic factors
- congenital pathology of the closest relatives
- qualitative and quantitative changes of genetic information

103. In which period of life the clinical signs of hereditary diseases can appear?
- right after birth
- in the period of puberty
- in the middle age
- at any age
- in senile age

104. Hereditary diseases may be connected with disorders of chromosomes and genes structure or quality. Which of the diseases from listed below can be related to chromosomal diseases?
- Klinefelter’s syndrome
- stomach ulcer
- essential hypertension
- syndactylysm
- phenylketonuria

105. Hereditary diseases may be connected with disorders of chromosomes and genes structure or quality. Which of the diseases from listed below can be related to gene diseases?
- diabetes mellitus
- haemophilia
- X-trisomy syndrome
- Klinefelter’s syndrome
- stomach ulcer

106. Which chromosomal disease can be observed both in men and women equally?
- Down’s syndrome
- XO syndrome
- Kleinfelter’s syndrome
- X-chromosome trisomy syndrome
- Phenylketonuria

107. The dominant pathological gene linked with X-chromosome was found in woman during chromosomal set mapping. In which conditions this pathological gene can cause diseases in children depending on sex?
- in all children not depending on sex
- only in sons
- in all daughters
- will lead to fetal death in prenatal period
- in 50% of daughters

108. Is hemophilia theoretically possible in girls?
- no, because women are only bearers of pathological gene
- yes, if father is sick on haemophilia
- no, because pathological gene is inherited only with Y-chromosome
- yes, if 2 X-chromosomes with pathological gene are inherited

109. One of the most common hereditary disorders is color blindness (daltonism). Define the type of this disorder.
- single autosomal dominant gene disorder
- single autosomal recessive gene disorder
- autosomal disorder
- sex chromosome disorder
- single X-linked gene disorder

110. It is known that phenylketonuria is characterized by a lack of phenylalanine hydroxylase. Which method of its treatment is most commonly used?
- elimination of phenylalanine from the diet
- injections of phenylalanine hydroxylase
- oral administration of phenylalanine hydroxylase
- correction of the patient’s life style
- surgical treatment

111. Diagnosis of hereditary diseases includes detection of Barr bodies in the cells. Which number of Barr bodies will be detected in the person with Turner syndrome?
- zero
- one
- two
- three
- four

112. Diagnosis of hereditary diseases includes detection of Barr bodies in the cells. Which number of Barr bodies will be detected in the woman with Down’s syndrome?
- zero
- one
- two
- three
- four

113. Diagnosis of hereditary diseases includes detection of Barr bodies in the cells. Which number of Barr bodies will be detected in the man with Kleinfelter’s syndrome?
- zero
- one
- two
- three
- four

114. It is known the genetic program implements under environmental factors influence. Which group of diseases from the listed below is dependent on both inherited predisposition and environmental factors?
- congenital diseases
- chromosomal diseases
- monogenic diseases
- multifactorial diseases
- genomic

115. A doctor consulted a woman with defects of physical and sexual development. Microscopy of mucosal cells from the oral cavity didn’t reveal sex chromatin in the nucleus. What kind of chromosomal pathology is it typical for?
- Turner syndrome
- Down’s syndrome
- Kleinfelter syndrome
- Trisomy of X chromosome
- Patau syndrome

116. What method of examination will be helpful for diagnosing Turner and Kleinfelter syndromes?
- genealogical
- statistical
- identification of sex chromatin

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117. The frequency of heterozygotes on phenylketonuria in Ukrainian population is 3%. What method of examination is used for early diagnosis of phenylketonuria in newborns?
   a. genealogical
   b. statistical
   c. identification of sex chromatin
   d. dermatoglyphic
   e. biochemical

118. A woman who was sick with rubella during the pregnancy delivered a deaf child with hare lip and cleft palate. This congenital defect is an example of:
   a. Phenocopy
   b. Edward’s syndrome
   c. Genocopy
   d. Patau’s syndrome
   e. Down’s syndrome

119. A woman who was infected with toxoplasmosis during the pregnancy has a child with multiple congenital defects. This is a result of:
   a. Teratogenesis
   b. Cancerogenesis
   c. Biological mutation
   d. Chemical mutation
   e. Genes recombination

120. A couple had a child with Down's disease. Mother is 42 years old. This disease is most probably caused by the following pathology of prenatal development:
   a. Gametopathy
   b. Blastopathy
   c. Embryopathy
   d. Non-specific fetopathy
   e. Specific fetopathy

121. Examination of a 12 year old boy with developmental retardation revealed achondroplasia: disproportional constitution with evident shortening of upper and lower limbs as a result of growth disorder of epiphyseal cartilages of long tubal bones. This disease is:
   a. Inherited, autosomal dominant
   b. Inherited, autosomal recessive
   c. Inherited, sex-linked
   d. Inherited, polygenic
   e. Congenital

122. The couple was consulted in genetic consultation. The man suffers from insulin-dependent diabetes mellitus, and the woman is healthy. What is the probability of insulin-dependent diabetes in children of this couple?
   a. more than in the population
   b. the same as in the population
   c. 100%
   d. 50%
   e. 25%

Cell injury mechanisms

123. Microscopy of biopsy material shows the signs of cellular damage. Which of the signs from listed below can be related to morphologic signs of cellular damage?
   a. disturbance of cellular division
   b. change of cell’s color
   c. increase of cellular membrane permeability for proteins
   d. release of intracellular enzymes into blood
   e. increase of suboxidized substances in blood

124. The increase of organ volume due to increased number of the cells in response to different stimuli can be estimated as …
   a. hypertrophy
   b. hyperplasia
   c. hyperactivity
   d. hypertactivity
   e. overnutrition

125. The increase of organ volume due to increased volume of the cells in response to different stimuli can be estimated as …
   a. hypertrophy
   b. hyperplasia
   c. hyperactivity
   d. hypertactivity
   e. overnutrition

126. Microscopy of biopsy material shows the signs of cellular damage. Which of the signs from listed below can be related to functional signs of cellular damage?
   a. change of cellular organoids quantity and structure
   b. swelling of cell
   c. changed cell’s color
   d. release of intracellular enzymes into blood
   e. accumulation of calcium in the cell

127. Which signs of cellular damage can be related to functional?
   a. damage of nuclear membrane
   b. destruction of structure of mitochondria
   c. swelling of cell
   d. change of color
   e. disturbance of cellular division

128. Which is the most typical morphological sign of cell death by apoptosis?
   a. condensation of nucleus and cytoplasm
   b. presence of inflammatory reaction
   c. compensatory increase of DNA-synthesis
   d. swelling of mitochondria
   e. increase of cell’s size

129. Which is the most typical morphological sign of cell death by necrosis?
   a. condensation of nucleus and cytoplasm
   b. presence of inflammatory reaction
   c. compensatory increase of DNA-synthesis
   d. shrinking of the cell
   e. increase of cell’s size

130. Which is the most typical morphological sign of cell death by necrosis?
   a. condensation of nucleus and cytoplasm
   b. swelling of the cell
   c. compensatory increase of DNA-synthesis
   d. shrinking of the cell
   e. increase of cell’s size

131. Each cell of the organism has limited abilities to adapt to pathogenic factors influence. What will happen to the cell if the pathogenic factor will be of extreme strength?
   a. apoptosis
   b. adaptation
   c. necrosis
   d. reversible injury
   e. necrobiosis

132. Osmotic fragility test is carried out by adding hypotonic solution to the sample of patient’s blood. We observe hemolysis of erythrocytes as a result of test. Which process underlies hemolysis in this case?
   a. swelling and rupture of RBC
   b. shrinking and apoptosis of RBC
   c. activation of lipid peroxidation and membranes destruction
   d. decrease of ATP synthesis
   e. destruction of lysosomal membranes

133. Chose the example of specific cell injury from listed below:
   a. myocardial ischemia
   b. intestinal epithelial injury due to bacterial toxins
   c. immune hemolysis of RBC
   d. liver cell injury due to chemicals
134. Ischemic heart disease develops in the patients due to hypoxic injury of myocardial cells. But even when the bloodflow is restored to the site of ischemia, the degree of myocardial fiber injury may increase. Which factor is playing the leading role in reperfusion injury?
   a. cytoskeletal filament loss
   b. activation of anaerobic glycolysis
   c. increase in toxic oxygen radicals
   d. mitochondrial swelling
   e. nuclear chromatin clumping and decreased protein synthesis

135. Disturbance of which process is primary observed in hypoxic injury:
   a. detachment of ribosomes from EPR
   b. reduction of intracellular pH
   c. oxidative phosphorylation by mitochondria
   d. sodium pump activity
   e. activation of glycolysis

136. Which factor directly causes the decrease of intracellular pH in the case of hypoxic injury?
   a. detachment of ribosomes from EPR
   b. decreased oxidative phosphorylation by mitochondria
   c. failure of sodium pump
   d. activation of anaerobic glycolysis
   e. increased membranes permeability

137. Which process is initiated by calcium ions in hypoxic cell injury?
   a. detachment of ribosomes from EPR
   b. disturbance of cells aerobic respiration
   c. disturbance of sodium pump
   d. activation of glycolysis
   e. activation of intracellular enzymes

138. Reperfusion injury is developed mostly due to massive inflow to the cell of:
   a. calcium
   b. sodium
   c. potassium
   d. aminoaids
   e. enzymes

139. Free radicals cause the cell’s injury by the mechanisms listed below EXEPT OF:
   a. lipid peroxidation of membranes
   b. nonperoxidative mitochondrial injury
   c. disturbance of cells aerobic respiration
   d. DNA lesions
   e. cross-linking of proteins

140. Which mechanism of cellular adaptation is provided with anti-oxidants action?
   a. compensation of energy metabolism disturbance
   b. protection of cell’s membranes
   c. compensation of water-ion misbalance
   d. repair of cell genome
   e. decrease of cell’s functional activity

141. Which factors determine the type of cell’s response to injuring stimuli?
   a. kind of injuring factor
   b. injuring factor severity and time of duration
   c. prior state of the cell
   d. type of the affected cell
   e. all is correct

142. Which process distinguishes irreversible hypoxic injury from reversible one?
   a. inability to reverse mitochondrial dysfunction
   b. damage to plasma membrane sodium pump
   c. inability to re-start protein synthesis
   d. extremely low pH
   e. depletion of ATP store in the cell

143. Which tissue cells are most sensitive to hypoxic injury?
   a. skeletal muscles
   b. smooth muscles
   c. myocardial cells
   d. brain cells
   e. liver cells

144. Give the correct definition of apoptosis. Apoptosis is…
   a. a process of virus infected cell killing
   b. a programmed cell death
   c. a death of the cell after injuring factor influence
   d. a cell’s death as a result of enzymes action
   e. an irreversible cell injury

145. People who have had a heart attack may experience additional damage once blood flow has been restored, a phenomenon referred to reperfusion injury. Which blood cells from listed below take active part in reperfusion injury development?
   a. lymphocytes
   b. eosinophils
   c. neutrophils
   d. erythrocytes
   e. thrombocytes

146. Patient was made blood biochemical test in order to confirm hepatitis. Increased levels of alanine transaminase (ALT) and aspartate transaminase (AST) were found. It has been defined as a functional sign of hepatic cells injury. Which from the listed may be the reason of it?
   a. cell’s membrane damage
   b. damage to plasma membrane sodium pump
   c. depletion of ATP store in the cell
   d. nonperoxidative mitochondrial injury
   e. disturbance of cells aerobic respiration

147. Cells may adapt to external and internal stimuli by undergoing changes in their size, number and type. What happens to other kidney when one is damaged? It undergoes…:
   a. hypertrophy
   b. atrophy
   c. hyperplasia
   d. metaplasia
   e. dysplasia

148. Cells may adapt to external and internal stimuli by undergoing changes in their size, number and type. What happens to muscles of extremities that have been encased in plaster casts? The muscles undergo…:
   a. hypertrophy
   b. atrophy
   c. hyperplasia
   d. metaplasia
e. dysplasia

149. A 30-year-old man sustained a fracture of his leg 2 months ago. The leg had been encased in a cast, which was just removed. The patient is amazed at the degree to which the muscles in his leg have shrunk. Which is the reason of it?
   a. inadequate nutrition
   b. loss of innervation
   c. loss of endocrine stimulation
   d. decreased workload
   e. diminished blood supply

150. Sperm analysis in a 40-year-old childless man shows low sperm motility. Which sign of cell damage is observed?
   a. morphological
   b. functional
   c. chemical
   d. biochemical
   e. pathological

151. Activation of lipid peroxidation in the patient with acute hepatitis is observed. Which mechanism is leading in cell injury in this case?
   a. decrease in ATP synthesis
   b. disturbance of RNA synthesis
   c. damage of membranes
   d. release of inflammatory mediators
152. Every day, blood cells in our body become senescent and die without producing signs of inflammation, and yet, massive injury or destruction of tissue, such as occurs with a heart attack, produces significant signs of inflammation. Why it happens?

153. What is the main task of immune system during human life-time?
   a. protection of the organism from pathogenic effects of environment
   b. providing the genetic homogeneity of the organism
   c. increasing of organism resistance to negative factors influence
   d. creation of favorable conditions for the living cells
   e. antimicrobial activity

154. Which cells are responsible for the high level of immunoglobulins during the secondary immune response?
   a. plasmatic cells
   b. B-cells
   c. immune memory cells
   d. T suppressors
   e. T killers

155. Which possible quantity of antigens is B-cell receptor affine to?
   a. all known antigens
   b. only one antigen
   c. group of similar antigens
   d. all protein antigens
   e. all cellular antigens

156. Which immune reactions do natural killer cells take part in?
   a. innate immunity
   b. cellular immunity
   c. humoral immunity
   d. immune tolerance
   e. adaptive immunity

157. Which cells perform their function by “respiratory burst” with active oxygen radicals formation?
   a. monocytes
   b. basophils
   c. eosinophils
   d. natural killers
   e. neutrophils

158. Which cytokine from listed below can provide systemic (endocrine) effect?
   a. lymphotoxin
   b. alpha interferon
   c. gamma interferon
   d. interleukin 8
   e. interleukin 1

159. Which cells' quantity is markedly decreased in Bruton’s disease?
   a. monocytes
   b. plasmatic cells
   c. natural killers
   d. T helpers
   e. T suppressors

160. 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?
   a. T-lymphocytes
   b. macrophages
   c. NK-cells
   d. B-lymphocytes
   e. plasmocytes

161. Which of the substances from listed below are antibodies in the organism?
   a. due to necrosis of heart muscle
   b. due to apoptosis of heart muscle
   c. due to atrophy of heart muscle
   d. due to swelling of heart muscle
   e. due to disturbances in calcium metabolism

**Disturbance of immune system function. Immunodeficiency.**

a. globulins of the plasma
b. albumins of the plasma
c. buffer systems
d. lipoprotein systems
e. plasma fibrinogen

162. 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?
   a. complement
   b. immunoglobulin M
   c. interleukin-1
   d. interferon
   e. factor of tumor necrosis

163. During the patient examination the signs of immunodeficiency were found. Name the organ where maturation of immune cells related to cellular immunity takes place?
   a. thymus
   b. bone marrow
   c. bursa of Fabricius
   d. spleen
   e. lymphatic nodes

164. During the patient examination the high amount of IgG was found. Where are immunoglobulins synthesized in the human body?
   a. in the bone marrow
   b. in thymus
   c. in lymph nodes
   d. in bursa of Fabricius
   e. in spleen

165. Blood analysis of patient showed signs of HIV infection (human immunodeficiency virus). Affection of which immune cells is typical for AIDS?
   a. T-killers
   b. T-helpers
   c. B-lymphocytes
   d. macrophages
   e. neutrophils

166. 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?
   a. 1 – 5 years
   b. 10 – 20 weeks
   c. all life
   d. several days
   e. till 1 year

167. 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?
   a. if to irradiate the animal before injection of antigen
   b. if to inject antigen and cytostatic agent at the same time
   c. if to inject antimacrophage antibodies before injecting antigen
   d. if to inject excessive dose of antigen
   e. if to hold desensitization before injection of antigen

168. Cooperative interaction of which immune cells is necessary for effective formation of primary humoral immune response?
   a. macrophages, plasmatic cells, B-lymphocytes
   b. macrophages, T-lymphocytes, B-lymphocytes
c. mast cells, plasmatic cells, B-lymphocytes
d. B-lymphocytes, macrophages, plasmatic cells
e. T-lymphocytes, plasmatic cells, B-lymphocytes

169. Cooperative interaction of which immune cells is necessary for effective formation of primary cellular immune response?
a. T-lymphocytes, plasmatic cells
b. macrophages, plasmatic cells
c. mast cells, plasmatic cells
d. T-lymphocytes, B-lymphocytes
e. macrophages, T-lymphocytes

170. Which is the main distinction of secondary immune response from primary immune response?
a. elongated latent period after antigen administration
b. slower rise of antibody concentration
c. higher level of antibodies amount
d. activation of IgE synthesis
e. shortened latent period after antigen presentation

171. The main task of immune system is to support the genetic homogeneity of the organism. How do T-lymphocytes destroy own virus-infected cells in the organism?
a. by necrobiosis
b. by dystrophy
c. by necrosis
d. by apoptosis
e. by inflammation

172. Which type of immune reaction is absent in the patients with DiGeorge syndrome?
a. humoral
b. reaginic
c. cell-mediated
d. immune complex
e. cytotoxic

173. Decreased blood level of which substance usually accompanies DiGeorge syndrome development?
a. sodium
b. potassium
c. aminoacids
d. enzymes
e. calcium

174. It is known that DiGeorge syndrome is characterized by alterations of electrolytes metabolism disorder. Hypoplasia of which gland can result in this disorder?
a. thymus
b. thyroid gland
c. parathyroid gland
d. pituitary gland
e. salivary gland

175. 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?
a. Di George syndrome
b. Loui-Barr syndrome
c. secondary immunodeficiency syndrome
d. Bruton’s disease
e. Chediack-Higasy syndrome

176. Which drugs from listed below can cause acquired immunodeficiency development?
a. sulfonamides
b. antibiotics
c. antipyretics
d. local anesthetics
e. enzymes

177. What is the role of MHC molecules class 1 on the surface of body cells?
a. to identify self and non-self cells
b. to identify cells with high mitotic activity
c. it is a hormone specific receptor
d. to activate protein synthesis in the cells
e. it is a marker of apoptosis

178. 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:
a. active resistance
b. passive resistance
c. cross resistance
d. sensitization
e. reactivity

179. Which substances from listed below can organize immune response and provide the destruction of alien cells?
a. Ig A
b. cytokines
c. opsonins
d. plasma albumens
e. plasma globulins

180. 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?
a. mineralocorticoids – to increase inflammatory reaction in transplant
b. glucocorticoids – to inhibit immune system activity
c. glucocorticoids – to decrease vessels permeability
d. mineralocorticoids – to inhibit immune system activity
e. growth hormone – to enhance anabolic processes in the cells

181. 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?
a. Swiss-type agammaglobulinemia
b. Dysimmunoglobulinemia
c. Bruton’s disease
d. Louis-Bar syndrome
e. Di George syndrome

182. 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?
a. combined immunodeficiency
b. hypoplasia of the thymus
c. Bruton’s disease
d. Turner’s syndrome
e. hereditary deficiency of the complement system

183. 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?
a. basophils
b. eosinophils
c. erythrocytes
d. macrophages
e. platelets

184. 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?
a. increase in IgA, IgM
b. decrease of IgA, IgM
c. without changes
d. decrease in IgD, IgE
e. increase of IgD, IgE

185. 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?
a. hereditary disorders of the immune system  
b. teratogenic influences on the fetus  
c. disturbances in mother's metabolism during pregnancy  
d. violations of reactivity and resistance of the organism  
e. toxic damage of B-lymphocytes  

186. 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: 
a. immune memory  
b. immune tolerance  
c. active phagocytosis  
d. antibodies synthesis  
e. allergic reactions  

187. 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  

Disturbance of immune system function. Allergy  

190. Which 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  

191. 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  

192. Which stage of allergic reactions are allergy mediators synthesized at?  
a. hidden  
b. immunologic  
c. sensitization  
d. biochemical  
e. stage of clinical manifestation  

193. Which class of immunoglobulins is called “reaginic antibodies”?  
a. IgA  
b. IgD  
c. IgG  
d. IgE  
e. IgM  

194. 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  

195. 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  

196. 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. eosinophils  
d. monocytes  
e. complement  

188. 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  

189. 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
202. The formation of blood circulating immune complexes (antigen – antibody) is typical for allergic reactions of type:
   a. 1st type
   b. 2nd type
   c. 4th type
   d. 5th type
   e. 3rd type

203. 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?
   a. circulation in the blood
   b. ability to activate the complement
   c. fixation on the receptor of a mast cell
   d. fixation on T-killer
   e. ability for binding antigen

204. 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 hypotenion developed. Define the complication described:
   a. immune tolerance
   b. fever
   c. drug dependence
   d. allergy
   e. inflammation

205. The immune complex reaction in organism proceeds with participation of IgM and IgG. Which is the common feature both of IgM and IgG?
   a. fixation on the receptor of mast cell
   b. fixation on tissue macrophage
   c. fixation on T-killer
   d. ability to interact with pollen
   e. ability to activate the complement

206. Which disease develops with the 2nd type of allergic reaction?
   a. atopic bronchial asthma
   b. contact allergic dermatitis
   c. food allergy
   d. autoimmune hemolytic anemia
   e. jaundice of the newborns

207. 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?
   a. histamine
   b. lymphokines
   c. factor of lymphocytes blast transformation
   d. serotonin
   e. activated components of the complement

208. Allergic reactions of the 3rd type are typical for pathogenesis of:
   a. atopic bronchial asthma
   b. autoimmune glomerulonephritis
   c. contact allergic dermatitis
   d. anaphylactic shock
   e. tuberculin reaction

209. Type 5 allergic reactions are known as “stimulating reactions”. Choose the example of disease provided with stimulating allergic reactions:
   a. hay fever
   b. Arthus reaction
   c. Quincke’s disease
   d. autoimmune thyroiditis
   e. autoimmune hemolytic anemia

210. Which immune cells contribute to tissue injury in immune complex allergic reactions?
   a. B—cells
   b. plasmatic cells
   c. T-cells
   d. mast cells
   e. phagocytes

211. 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?
   a. absence of immunological stage
   b. absence of biochemical stage
   c. presence in patients with immune deficiency
   d. dependence from the type of allergen
   e. independence from the dose of allergen

212. It is known that many cases of “food allergy” are not real allergy, but pseudoallergy. Which is the distinctive feature of pseudoallergy?
   a. absence of biochemical stage
   b. absence of clinical manifestation
   c. presence in patients with immune deficiency
   d. dependence from the type of allergen
   e. dependence from the dose of allergen

213. Which mechanisms are considered to be general mechanisms of autoimmune pathology?
   a. direct antibody mediated effects
   b. T cell mediated effects
   c. immune complex mediated effects
   d. all of listed
   e. none of listed

214. 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?
   a. over expression of MHC 2 class molecules
   b. altering of self-antigens
   c. similarity of antigens
   d. contact with sequestered antigens
   e. primary changes of immune system.

215. Prevention of which type of allergic reactions can be provided with the hyposensitization (specific immunotherapy)?
   a. 1st type
   b. 2nd type
   c. 3rd type
   d. 4th type
   e. 5th type

216. 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:
   a. Acute heart failure
   b. Orthostatic collapse
   c. Anaphylactic shock
   d. Bronchial asthma attack
   e. Pulmonary embolism

217. Allergic reactions are characterized by increased sensitivity to various substances. Which substance amount can prove the presence of hyper-sensitivity state in the patient?
   a. histamine
   b. IgE
   c. IgA
   d. prostaglandins
   e. complement

218. 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 itching appear. Which substance from the listed can cause such clinical symptoms?
   a. histamine
   b. IgE
   c. IgM and IgG
   d. prostaglandins
   e. complement
219. 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? 
   a. 1st type
   b. 2nd type
   c. 3rd type
   d. 4th type
   e. 5th type

220. 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 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

KROK TESTS ON GENERAL NOSOLOGY

222. 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

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

224. 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

225. 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)

226. Several minutes after a dentist administered Novocain for local tooth anesthesia, sudde 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

227. A 12-year-old child has developed nephritic syndrome (proteinuria, hematuria, cylindriuria) 2 week after the case of tonsillitis. Nephritic syndrome is the sign of affected glomerular basement membrane in the kidneys. What mechanism is the most likely to cause the basement membrane damage?
   a. immune complex
   b. granulomatous
   c. cytotoxic
   d. reaginic
   e. antibody-mediated

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

229. 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

230. A disaster fighter at a nuclear power plant developed hemorrhagic syndrome on the background of 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

231. 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

232. 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

233. A child with a history of frequent angine 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

234. 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

235. 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

236. 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

237. 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

238. 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

239. 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 antigenspecificIgG  
e. Binding of IgE receptors to the mast Cells

240. 10 days after having quinse 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 cytolysis

241. 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 cytolysis

242. 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

243. 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

244. 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

245. 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 70x10^9/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

246. 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
247. 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

248. 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?
   a. Macrophages, monocytes
   b. Wiskott-Aldrich
   c. Chediak-Higashi
   d. Louis-Bar
   e. Swiss-type

249. 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

SECTION 2 “TYPICAL PATHOLOGICAL PROCESSES”

Disturbances of peripheral bloodflow and microcirculation

250. 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

251. 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. 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:
   a. imbalance between tissues blood supply and demand
   b. erythrocytes quantity decrease in circulation blood
   c. local vasodilatation under BAS influence
   d. oxygen partial pressure decrease in blood under physical load
   e. 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?
   a. lower extremities veins
   b. portal vein system
   c. mesenteric arteries
   d. pulmonary veins
   e. 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 T-lymphocytes, B-lymphocytes
   a. NK-cells
   b. Fibroblasts, T-lymphocytes, B-lymphocytes
   c. 0-lymphocytes

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?
   a. compression ischemia
   b. obstructive ischemia
   c. thrombus embolism
   d. arterial hyperemia
   e. venous hyperemia

257. Patient P. 40 years old with opened fracture of the hip suddenly developed pulmonary embolism. Choose the possible type of embolism:
   a. thromboembolism
   b. air embolism
   c. tissue embolism
   d. fat embolism
   e. 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?
   a. arterioles constriction
   b. venules dilatation
   c. erythrocytes aggregation in capillaries
   d. functioning capillaries quantity increase
   e. 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?
   a. neurogenic
   b. substrative
   c. neurotonic
   d. neuroparalytic
   e. 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?
   a. excessive lymph formation with edema development
   b. ruptures of microcirculation vessels walls
   c. cells and tissues hypertrophy and hyperplasia
   d. immunity depression
   e. cells function activity increase
261. Ischemia is characterized with the following signs EXCEPT:
   a. palesness
   b. redness
   c. local hypothermia
   d. pain
   e. slowing of the bloodflow

262. 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?
   a. Angiospastic ischemia
   b. Ischemic stasis
   c. Compressive ischemia
   d. Venous hyperemia
   e. Obstructive ischemia

263. 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?
   a. Dilatation of resistant vessels
   b. Orthostatic increase of venous pressure
   c. Increase of number of functional capillaries
   d. Increase of collateral blood flow
   e. Increase of tissue drainage

264. 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?
   a. Arterial hyperemia
   b. Venous hyperemia
   c. Thrombosis
   d. Ischemia
   e. Stasis

265. 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?
   a. Thrombosis
   b. Venous hyperemia
   c. Ischemia
   d. Embolism
   e. Arterial hyperemia

266. 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?
   a. Chloride ions
   b. Lipoproteins
   c. Catecholamines
   d. Acetylcholine
   e. Adenosine

267. After surgical removing of coronary artery occlusion in a patient with ischemic heart disease, the development of secondary myocardium injury (reperfusion syndrome) characterized by necrotic changes in the focus of previous ischemia. This complication results from:
   a. Accumulation of hydrogen ions
   b. Deficiency of potassium ions
   c. Deficiency of adenosine triphosphate
   d. Excessive accumulation of calcium ions
   e. Deficiency of creatinephosphate

268. 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?
   a. Compressive
   b. Obliterative

   c. Angiospastic
   d. Obturative
   e. Metabolic

269. 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?
   a. Active hyperemia
   b. Passive hyperemia
   c. Embolism
   d. Ischemia
   e. Disorders of lymph outflow

270. 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?
   a. Multiple gas embolism
   b. Hemorrhage to the brain
   c. Gas embolism of cerebral veins
   d. Bleeding
   e. Paralysis of respiratory center

271. 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:
   a. from increased atmospheric pressure to normal
   b. from normal atmospheric pressure to increased
   c. from normal atmospheric pressure to decreased
   d. from decreased atmospheric pressure to normal

272. 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:
   a. Obstruction ischemia
   b. Compression ischemia
   c. Angiospastic ischemia
   d. Venous hyperemia
   e. Arterial hyperemia

273. 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?
   a. Venous hyperemia
   b. Arterial hyperemia
   c. Ischaemia
   d. Stasis
   e. Thrombosis

274. 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?
   a. Neuroparalytic arterial hyperemia
   b. Neurotonic arterial hyperemia
   c. Metabolic arterial hyperemia
   d. Venous hyperemia
   e. Stasis

275. 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?
   a. Metabolic
   b. Neurotonic
   c. Neuroparalytic
   d. Functional
   e. Reactive

276. 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?
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277. 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?

- [a] air
- [b] gaseous
- [c] fat
- [d] tissue
- [e] thromboembolism

**Inflammation**

278. Acute inflammation is always accompanied by the increase of erythrocyte sedimentation rate. This occurs due to elevation of serum content of:

- [a] lipoproteins
- [b] albumens
- [c] immunoglobulins
- [d] C-reactive protein
- [e] glucocorticoids

279. Which sign from the given belongs to systemic signs of inflammation?

- [a] swelling
- [b] pain
- [c] leukocytosis
- [d] heat
- [e] redness

280. Which of the given local sign of inflammation is developed due to vascular leakage?

- [a] Calor (heat)
- [b] Rubor (redness)
- [c] Dolor (pain)
- [d] Tumor (swelling)
- [e] Functio laesa (loss of function)

281. Which event is primary in inflammatory pathogenesis?

- [a] disorders of blood circulation
- [b] phagocytosis
- [c] tissues acidosis development
- [d] increased vessels permeability
- [e] cell damage

282. Which factor can directly cause secondary alteration?

- [a] kinines
- [b] lysosomal enzymes
- [c] lypshokines
- [d] fibrinogen
- [e] cytokines

283. 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?

- [a] cell genetic program realization violation
- [b] cell membranes damage
- [c] cell energy supply violation
- [d] cell receptors damage
- [e] cell lysosome destruction

284. Which of the statements from listed below correctly describes the metabolic changes in the site of inflammation?

- [a] Decreased metabolism level during all inflammatory stages
- [b] Increased catabolism level during final inflammatory stage
- [c] Increased catabolism in early inflammatory stage
- [d] Increased anabolism in early inflammatory stage
- [e] Decreased anabolism in final stage of inflammation

285. Patient B., 32 years old, complaints 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?

- [a] catecholamines
- [b] neutrophil’s proteins
- [c] prostaglandins
- [d] kinins
- [e] interleukins

286. Arachidonic acid metabolites (prostaglandins, leukotriens) are known as potent mediators of inflammation. Which enzyme will release arachidonic acid from cell membrane lipids?

- [a] Cycooxygenase
- [b] Lipoxgenase
- [c] Adenylate cyclase
- [d] Phospholipase
- [e] Myeloperoxidase

287. Which inflammatory mediator is known to be normally sequestered in intracellular granules?

- [a] Histamine
- [b] Prostaglandin E2
- [c] Complement
- [d] Interleukin
- [e] Bradykinine

288. Which substances released from activated neutrophiles and macrophages may contribute to tissue damage during inflammation?

- [a] Free oxygen radicals
- [b] Platelet activating factors
- [c] Endothelial growth factors
- [d] Interleukines
- [e] Gamma interferons

289. Which influence results in arterial hyperemia development during inflammation?

- [a] histamine secretion
- [b] compression of vessels by the exudate
- [c] vessel wall elasticity decrease
- [d] endothelium swelling
- [e] blood viscosity increase

290. The main reason of the rapid onset of vasodilation after tissue injury is:

- [a] release of histamine from mast cells
- [b] neural reflexes
- [c] release of leukotrienes
- [d] release of prostaglandins from mast cells
- [e] activation of complement system

291. The main reason of the rapid onset of arterioles spasm after tissue injury is:

- [a] release of histamine from mast cells
- [b] neural reflex
- [c] release of leukotrienes
- [d] release of prostaglandins from mast cells
- [e] activation of complement system

292. Which mechanism is the most important for inflammatory exudate formation?

- [a] prostaglandin’s synthesis
- [b] tissue basophils degranulation
- [c] lysosomal enzymes release
- [d] leukocytes migration
- [e] increased vessels permeability

293. 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?

- [a] increased tissue colloid and osmotic pressure
b. prostaglandin’s synthesis
c. decreased tissue proteins level
d. increased lysosomal enzymes amount
e. leukocytes migration from vessels

294. Leakage of fluid out of blood vessels during acute inflammation is due to:
   a. increased vascular permeability, hydrostatic and tissue osmotic pressure
d. decreased tissue osmotic pressure
c. increased vascular permeability with decreased osmotic pressure
e. increased hydrostatic pressure and permeability
f. 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:
   a. transport of plasma-derived inflammatory mediators
d. transport of antibodies
c. elimination of toxins and metabolites from the vessels of inflammatory site
e. localization of the agent which caused inflammation
f. 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?
   a. macrophages
d. neutrophiles
c. lymphocytes
e. eosinophiles
f. monocytes

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?
   a. neutrophiles and adipose cells
d. eosinophiles and macrophages
c. adipose cells and lymphocytes
e. monocytes and lymphocytes
f. monocytes – neutrophiles – lymphocytes

298. Choose the sequence of leukocytes migration towards inflammation site:
   a. monocytes – neutrophiles – lymphocytes
d. neutrophiles – monocytes - lymphocytes
c. lymphocytes – neutrophiles - monocytes
e. neutrophiles – lymphocytes - monocytes
f. lymphocytes – eosinophiles - neutrophiles

299. During inflammation leukocytes emigrate from blood vessels by means of:
   a. natural holes in vessel walls
d. ruptures in the vessel wall
c. random active migration
e. passive pressure mediated mechanisms

300. The three steps involved in movement of leukocytes from blood vessels into the extravascular space during acute inflammation are:
   a. adhesion, margination, and chemotaxis
d. adhesion, margination, and emigration
c. margination, emigration, and chemotaxis
e. margination, emigration, and chemotaxis
f. adhesion, margination, and emigration

301. Patient K., 28 years old. Diagnosis: pleuritis. In pleural punctate the quantity of neutrophiles is high, some neutrophiles include intact microbe cells inside. Define the state of phagocytosis in this case:
   a. phagocytosis activation
d. phagocytosis inhibition
c. incomplete phagocytosis
e. immune phagocytosis
f. necrosis of margins

302. Which substances can act as opsonins (activate phagocytosis)?
   a. specific antibodies and oxygen
d. leukotrienes and prostaglandins
c. fibrinopeptides and C3
f. prostaglandins and C3b
c. specific antibodies and C3

303. Monocytes and activated macrophages are:
   a. rarely found in chronic inflammation
d. derived from different precursor cells
c. found only in acute inflammation
e. equivalent cells

304. The function of the enzymes of the activated macrophage (particularly in the lysosomes) is to:
   a. digest foreign material
d. remain in storage until the next chronic inflammatory event
c. synthesize new lysosomes
e. process antigen for lymphocytes
f. 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?
   a. fibrous
d. purulent
c. serous
e. putrescent
f. 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, neutrophiles, monocytes and purulent bodies. Which kind of inflammation does the patient have?
   a. fibrous
d. purulent
c. serous
e. putrescent
f. 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:
   a. neutrophiles
d. eosinophiles
c. fibroblasts
e. monocytes

308. Which cells secrete intercellular matrix components in a healing wound?
   a. Macrophages
d. Polymorphonuclear leukocytes
c. Multinucleated giant cells
e. Endothelial cells
f. Fibroblasts

309. The process of new capillary growth in granulation tissue during wound healing is called:
   a. recanalization
d. endothelialization
c. diapedesis
e. angiogenesis
f. hemogenesis

310. Patient K., 28 years old, has quickly healed wound without scar formation after furuncle cutting. How can you name this process?
   a. necrosis of margins
d. neoplastic transformation
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

Scar tissue is:

- nonfunctional collagenous and fibrotic tissue
- functional tissue that follows wound healing
- regenerated tissue formed in the area of injury
- fibrinogen which has entrapped phagocytes and neurons
- inflammation and wandering phagocytes

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

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

Which disease is an example of an autoimmune disease that leads to chronic inflammation?

- Viral pneumonia
- Chronic pyelonephritis
- Silicosis
- Rheumatoid arthritis
- Asbestosis

Substances or conditions that typically lead to or cause chronic inflammation include all of the following EXCEPT of:

- foreign bodies
- highly virulent bacteria such as Staphylococcus aureus
- persistent infections
- factors that lead to autoimmune reactions
- inert, inhaled particles

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

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

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

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

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
dema
- hyperemia

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
- pavemtting
- margination
dhesion
- rolling

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
dhemotactic diffusion
dhesion

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
- phagolym
phagocytosis
d phagophobia

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
c lymphogenic
d membranogenic
e mixed

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
c emigration of lymphocytes
diapedesis of erythrocytes
d proliferation of fibroblasts

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?
1. primary alteration  
2. secondary alteration  
3. violation of microcirculation  
4. exudation  
5. proliferation  

328. 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?  
   a. epinephrine  
   b. cortisone  
   c. insulin  
   d. thyroid hormone  
   e. vasopressin  

329. 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?  
   a. decrease of onotic pressure in the vessels  
   b. increase of onotic pressure in the site of inflammation  
   c. increase of chemotactic substances in the site of inflammation  
   d. increase of hydrostatic pressure in the vessels  
   e. decrease of hydrostatic pressure in the vessels  

330. 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?  
   a. activation of antibodies synthesis  

331. Edema is an obligatory local sign of inflammation. One of its mechanism is the increase of vascular permeability. Increased vascular permeability caused by endothelial cell retraction and contraction affect the following level of circulation:  
   a. pre-arterioles  
   b. arterioles  
   c. capillaries  
   d. venules  
   e. lymphatics  

332. Killing of pyogenic bacteria by neutrophils in the site of inflammation is brought about by the following mechanism:  
   a. by active oxygen radicals  
   b. by nitric oxide mechanism  
   c. by oxygen independent bactericidal mechanism  
   d. by hydrolytic enzymes  
   e. all from the listed  

333. 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?  
   a. single cells presence  
   b. low protein content  
   c. specific gravity  
   d. fluid color  
   e. fluid transparency  

Thermoregulation pathology  

334. It is known that inflammation is often accompanied by fever development. Which primary mechanism onset fever reaction under inflammation?  
   a. C-reactive protein formation in inflammation center  
   b. increased leukocytes quantity  
   c. phagocytosis activation  
   d. humoral immune response activation  
   e. secondary alteration  

335. Primary bacterial pyrogens are starting fever onset. What bacteria component can be the primary pyrogen?  
   a. Membrane proteins  
   b. Membrane lipids  
   c. Lysosomal content  
   d. Membrane lipopolysaccharides  
   e. Bacterial cell nucleus  

336. Pyrogens are known to be the cause of the fever onset. What from the following may be the source of the secondary pyrogens?  
   a. Bacteria  
   b. Necrotic tissue  
   c. Platelets  
   d. Macrophages  
   e. Erythrocytes  

337. Which mechanism of temperature increase is the earliest one in the first stage of fever development?  
   a. tachycardia  
   b. increase of basal metabolism rate  
   c. shivering  
   d. skin vessels constriction  
   e. sweat secretion decrease  

338. Patient I., 24 years old, soldier has got radiation dose 8 Gray. Diagnosis: double lobar pneumonia. Temperature was increased up to 37°C. Blood count: anemia, leukopenia with marked granulocytopenia, increased erythrocytes sedimentation rate. What is the cause of low fever reaction in this clinical situation?  
   a. hemic hypoxia development  
   b. formation of a barrier around the site of inflammation  
   c. stimulation of leukopoesis  
   d. intensification of vascularization in the site of inflammation  
   e. activation of phagocytosis the site of inflammation  

339. 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?  
   a. decreased endogen pyrogens production  
   b. violation of heat loss through lungs  
   c. inflammatory barrier formation in injection place  
   d. violation of heat-producing mechanisms  
   e. thermoregulation center inhibition  

340. Patient with infectious disease has fever. How can you estimate thermoregulation of the patient with fever 1st stage?  
   a. Thermoregulation is in normal balance  
   b. Heat loss prevails  
   c. Heat production prevails  
   d. Heat production is decreased  
   e. Heat loss is normal  

341. Patient with infectious disease has fever. How can you estimate thermoregulation of the patient with fever 2nd stage?  
   a. Thermoregulation is in normal balance  
   b. Heat loss prevails  
   c. Heat production prevails  
   d. Heat production is decreased  
   e. Heat loss is decreased  

342. Patient with infectious disease has fever. What mechanism is the main in the 3rd stage of fever?  
   a. increased heat production  
   b. shivering  
   c. peripheral vessels dilatation  
   d. diuresis increase  
   e. breathing frequency increase
343. Overload of which functional system may be fatal to the patient who has critical decrease of the temperature in the 3\textsuperscript{rd} fever stage?
   a. nervous  
   b. respiratory  
   c. circulatory  
   d. endocrine  
   e. digestive

344. The child with gastroenteritis, 10 years old, had high fever reaction (38\textdegree 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?
   a. disturbances in digestion  
   b. increased contractive thermogenesis  
   c. pancreatic cells damage  
   d. loss of appetite under fever  
   e. lipolysis activation

345. Obesity

346. At what fever pathogenesis stage do antipyretic drugs (aspirin, paracetamol, indometacin) influence on?
   a. decrease receptors sensitivity  
   b. inactivate cyclooxygenase  
   c. break temperature increase mechanisms  
   d. inhibit phospholipase A2 activity  
   e. destroy prostaglandin E

347. Patient D, 27 years old, had body temperature increase up to 38\textdegree 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?
   a. heat producing decrease  
   b. phagocytes activity decrease  
   c. heat loss increase  
   d. thermoregulation center inhibition  
   e. primary pyrogens destruction

348. 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?
   a. peptic ulcer  
   b. heart failure  
   c. obesity  
   d. hypoxia  
   e. allergy

349. 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?
   a. No. The patient should be prescribed antipyretic drugs  
   b. Yes. Because fever activates immune system  
   c. Yes. Because body temperature is relatively low  
   d. Yes. Because flu is not treated at all

350. 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?
   a. hot baths  
   b. hot drinks  
   c. cauterization of the body specific sites  
   d. injection of bacterial pyrogen  
   e. using of local warming with infrared rays

351. 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?
   a. tissues oxygen need decrease  
   b. decrease of heart contraction frequency  
   c. arterial pressure decrease  
   d. nervous cells activity inhibition  
   e. cellular membranes stability increase

352. 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?
   a. non-shivering heat production  
   b. heat loss by conduction  
   c. thermoregulation center activity  
   d. shivering  
   e. thermoreceptors sensitivity

353. 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?
   a. Subfebrile temperature  
   b. Febrile temperature  
   c. Pyretic temperature  
   d. Hyperpyretic temperature  
   e. Hyperpyretic temperature

354. Fever can be divided into several types due to level of body temperature increase. Which type of fever usually accompanies chronic local infections?
   a. Subfebrile temperature  
   b. Febrile temperature  
   c. Pyretic temperature  
   d. Hyperpyretic temperature

355. 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?
   a. Exogenous hyperthermia  
   b. Endogenous hyperthermia  
   c. Fever  
   d. Heat shock  
   e. Neurogenous hyperthermia

356. 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?
   a. Hyperthermia  
   b. Infectious fever  
   c. Hypothermia  
   d. Noninfectious fever  
   e. Burn disease

357. 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:
   a. stimulating effect of interleukin-1 on hepatocytes  
   b. the destructive effect of elevated temperature on the body's cells  
   c. proliferative effect of interleukin -2 on T-lymphocytes  
   d. degranulation of tissue basophils  
   e. activation of the complement system

358. The patient with acute pneumonia developed febrile fever. Which mediator of inflammation plays a role of endogenous pyrogen?
   a. interleukin-1  
   b. histamine  
   c. bradykinin
359. The patient with acute respiratory viral infection has developed subfebrile fever. He was not prescribed anti-pyretic drugs. In two days his body temperature returned to normal range. What is the most probable mechanism of temperature decrease in this case?

360. It is known, that the state of the organism plays an important role in the cancer development. The group of individuals most susceptible to the cancer often.

a. are anemic
b. are immunodeficient
c. have neurologic dysfunction
d. have chronic diseases
e. have high Ca blood level

361. Carcinogens influence results in the transformation of the proto-oncogenes to oncogenes, which leads to tumor development. What substances synthesis is controlled by the proto-oncogenes?

a. innate immunity humoral factors
b. growth factors
c. growth hormones
d. neuropeptides
e. complement proteins

362. 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 carcinogenesis mechanism?

a. protooncogenes transformation into oncogenes
b. cell division regulation violation
c. mRNA synthesis violation
d. ATP synthesis violation
e. Ca++ insufficient entrance in cell

363. A liver tumor was diagnosed in the patient. What process underlies epigenetic carcinogenesis mechanism?

a. protooncogenes transformation into oncogenes
b. activation of the cell mitosis rate
c. mRNA synthesis violation
d. ATP synthesis violation
e. Ca++ insufficient entrance in cell

364. 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?

a. anaerobic glycolysis activity increase
b. anaerobic glycolysis activity decrease
c. aerobic glycolysis activity increase
d. no changes after oxygen adding
e. aerobic glycolysis activity decrease

365. Patient K., complaints about weight loss. Diagnosis: mediastinum tumor with intestinal metastases. Which alterations of carbohydrate metabolism are observed in malignant tumor cells?

a. positive Paster’s effect
b. activation of ATP formation
c. aerobic glycolysis activation
d. negative Paster’s effect
e. glycogen synthesis activation

366. 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?

a. protein metabolism violation in tumor surrounding cells
b. iRNA synthesis violation
c. cell division regulation violation
d. ATP synthesis violation in consequence of tumor intoxication

367. Patient N., 50 years old, complaints about weight loss, and fatigability. Blood analysis: hypoglycemia, hyperinsulinemia. Pancreatic islet tumor was found after further examination. Why insulin synthesis is increased in the patient?

a. morphological anaplasia
b. biochemical anaplasia
c. functional anaplasia
d. physical and chemical anaplasia
e. immunological anaplasia

368. Patient K., 54 years old. Diagnosis: lung tumor. Biopsy: cells with different shape and size, invasive growth. Which type of acid-base imbalance is possible in this case?

a. respiratory acidosis
b. metabolic acidosis
c. respiratory alkalosis
d. metabolic alkalosis
e. negative Paster’s effect

369. Patient K., complaints about weight loss. Diagnosis: mediastinum tumor with intestinal metastases. Blood analysis: uncompensated acidosis. Which possible mechanism can lead to acidosis development?

a. positive Paster’s effect in tumor cells
b. carbon dioxide accumulation in the blood
c. alkaline accumulation in the intestines
d. anaerobic glycolysis in tumor cells
e. buffer systems blocking by tumor toxins

370. 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?

a. metastasis
b. cancer cachexia
c. germination in surrounding tissue
d. infiltrative growth
e. expansive growth

371. Patient A., 45 years old. Breast tumor with increased surrounding lymph nodes was found after clinical examination. Biopsy: cancerous growth. What is the main mechanism of infiltrating pattern of cancer growth?

a. contact inhibition absence
b. tumor cells ability to amoeboid movement
c. tumor cells adhesion increase
d. growth factors activation in tumor cells
e. lysosomal enzymes activity increase

372. 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?

a. nutrients consumption alteration due to digestion violation
b. substrates and energy deficiency due to metabolism violation
c. consumption of substrates and energy by tumor
d. organism intoxication due to metabolism violation
e. increase of substrates and energy use by antitumor protective system
373. 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...
   a. an alteration in normal cell growth
   b. growth of benign or malignant neoplasm
   c. the ability of secondary tumor nodes growth
   d. a mutation in normal cells

374. Which of the following is the correct sequence of events during the process of metastasis?
   a. vascularization, adherence of neoplastic cells, invasion into lymph and vascular system
   b. transport, vascularization, adherence of neoplastic cells
   c. vascularization, extravasation, transport
   d. cell detachment, invasion into lymph and vascular system, migration

375. Worker M., works at factory, where chemical carcinogens are used, but he doesn’t have tumor. What type of represented below phenomenon is referred to anticellular mechanisms of anti-tumor defense?
   a. tumor cell elimination
   b. oncogenes elimination in cell
   c. oncogene expression inhibition
   d. cancerogenes elimination in cell
   e. blastogenic factors inactivation

376. Which one from the following processes underlies antimitational mechanism of anti-tumor defense?
   a. inactivation of carcinogens by phagocytosis
   b. activation of cells anti-oxidative system
   c. inactivation of carcinogens by the natural metabolic processes
   d. activation of cytotoxic T-lymphocytes
   e. elimination or inhibition of oncogenes

377. Patient R., 53 years old. Stomach tumor with metastases in perigastrial lymphatic nodes was found. Distant metastases are absent. What stage of tumor pathogenesis is present in this case?
   a. tumor promotion
   b. tumor progression
   c. protooncogene transformation into oncogene
   d. oncoproteins formation
   e. tumor initiation

378. It is known, that proto-oncogenes mutations may result in cancer development. Which substances synthesis is encoded by proto-oncogenes?
   a. growth factors
   b. growth suppressors
   c. natural antioxidants
   d. apoptosis inhibitors
   e. immunoglobulins

379. 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

380. 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

381. 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

382. 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

383. 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

384. 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

385. 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

386. 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. blastogenic factors inactivation
   e. oncogenes expression inhibition

387. 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

388. 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

389. 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

390. 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?

a. skin pallor
b. decreased AP
c. increase of frequency and intensity of breath
d. acrocyanosis development
e. increased sweat secretion

391. 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

392. 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

393. 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

394. 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?

a. hemoglobin joining with sulfonamides
b. reconstructive enzyme systems inactivation
c. iron oxidation in hemoglobin
d. protein damage in hemoglobin
e. oxidative enzyme systems inactivation

395. Woman has aniline intoxication. She complains of: nausea, headache, tinnitus, midges 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?

a. hemic
b. circulatory
c. hystotoxic
d. substrate
e. hypoxic

396. 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?

a. skin pallor
b. decreased AP
c. increase of frequency and intensity of breath
d. acrocyanosis development
e. increased sweat secretion

397. 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?

a. skin pallor
b. decreased AP
c. acrocyanosis development
d. tachycardia
e. increased sweat secretion

398. Patient M., was given hypoxic trainings in normobaric conditions. What urgent protective adaptation reactions could develop in reply to acute hypoxia in first session?

a. erythropoesis stimulation
b. parasympathetic nervous system activation
c. venous inflow decrease to heart
d. breath frequency increase
e. reserve alveoli are included into breath

399. 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?

a. won’t be changed in hypoxia first stages
b. is decreased as a result of erythrocytes hemolysis
c. is increased, by means of hemopoiesis increase
d. is decreased as a result of blood accumulation in depot
e. is increased, by means of their leaving blood depot

400. Patient M., 35 years old, lives in mountains from his childhood. Which index of external respiration will be changed in this patient?

a. increased lungs vital capacity
b. increased inspiration duration
c. increased expiration duration
d. lung breathlessness development
e. breath frequency increase

401. 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?

a. respiratory arrhythmia
b. heart stroke volume increase
c. bradycardia
d. heart minute volume decrease
e. tachycardia

402. 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?

a. blood clotting
b. increased arterial pressure
c. increase quantity of erythrocytes
d. increased respiration frequency
e. leukocytosis

403. 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?
a. leukocytosis
b. AP increase
c. respiration frequency increase
d. myocardium hypertrophy
e. blood clotting

404. 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?
a. increased vitamin B12 synthesis
b. increased blood clotting
c. changes in spleen function
d. increased erythropoietin production
e. increased blood circulating volume

405. 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?
a. methemoglobin formation
b. oxyhemoglobin formation
c. reduced hemoglobin formation
d. carbohemoglobin formation
e. carboxyhemoglobin formation

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 cyanide poisoning from the following:
a. Fulminant
b. Acute
c. Subacute
d. Chronic
e. Endogenous

407. 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:
a. Fulminant
b. Acute
c. Subacute
d. Chronic
e. Endogenous

408. Which from the listed hypoxia types is observed more frequently than others?
a. respiratory
b. hemic
c. circulatory
d. histotoxic
e. combined

409. 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

410. 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

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411. 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

412. 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

413. Which type of hypoxia develops during shock and collapse?
a. circulatory
b. respiratory
c. hypoxic
d. hemic
e. tissue

414. 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

415. 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 this patient?
a. hemic
b. respiratory
c. histotoxic
d. overload
e. substrate

416. 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 prostaglandin E

e. poisoning with carbon monoxide

417. 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

418. 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

419. 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. neuroparalytic
b. neurotic

420. 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

421. 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
e. thromboembolism

422. 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

423. 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?

a. Embolism
b. Blood ‘sludge’ phenomenon
c. Thrombosis
d. Venous hyperemia
e. Arterial hyperemia

424. 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?

a. Erythrocyte aggregation
d. Increased blood pressure
c. Increased permeability of the vessel wall
d. Decreased resorption of pleural fluid
e. Hypoproteinemia

425. 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?

a. Serous
b. Proliferative
c. Croupous
d. Granulomatous
e. Diphtheritic

426. 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?

a. Interleukin-1
d. Interleukin-3
c. Interleukin-2
e. Interleukin-4

427. 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:

a. exudative inflammation
b. traumatic edema
c. vacuolar degeneration
d. alternative inflammation
e. proliferative inflammation

428. A 7-year-old child has acute onset of disease: temperature rise up to 38 °C, rhinitis, cough, lacerination, 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?

a. catarrhal inflammation
b. serous inflammation
c. suppurrative inflammation
d. hemorrhagic inflammation
e. fibrinous inflammation

429. 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?

a. neutrophil granulocytes
d. eosinophilic granulocytes
b. basophils
c. monocytes
e. macrophages

430. 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:

a. C-reactive protein
c. Fibrinogen
d. G immunoglobulin
e. A immunoglobulin

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

a. Collapse
d. Alkalosis
b. Hyperthermia
c. Hypothermia
e. Noninfectious fever

432. 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?

a. Hypothermia
d. Alkalosis
b. Infectious fever
c. Hyperthermia
e. Noninfectious fever

433. 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?

a. Reduced heat transfer
d. Reduced heat product
b. Increased heat transfer and reduced heat production
c. Increased heat transfer and heat production
e. Increased heat production with no changes to the heat transfer

434. This year influenza epidemic is characterised by patients’ body temperature varying from 36, 90°C to 37, 90°C. Such fever is called:

a. Subfebrile
d. Hyperpyretic
b. High
e. Apyreptic

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e. Moderate

435. 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:
   a. Persistent
   b. Hectic
   c. Remittent
   d. Hyperpyretic
   e. Recurrent

436. 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 oC. Specify the leading mechanism in this 3rd stage of fever:
   a. Peripheral vasodilation
   b. Increased heat production
   c. Development of chill
   d. Increased diuresis
   e. Increased respiratory rate

437. 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?
   a. Monocytes
   b. Eosinophils
   c. Neutrophils
   d. Endotheliocytes
   e. Fibroblasts

438. 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:
   a. Febris intermitiens
   b. Febris recurrens
   c. Febris hectica
   d. Febris continua
   e. Febris atypica

439. Febris atypicaDuring 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?
   a. Febris intermitiens
   b. Febris recurrens
   c. Febris hectica
   d. Febris continua
   e. Febris atypica

440. 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?
   a. Febris continua
   b. Febris recurrens
   c. Febris hectica
   d. Febris intermitens
   e. Febris atypica

441. This year influenza epidemic is characterized by patients’ body temperature varying from 36.9 to 37.9°C. Such fever is called:
   a. subfebrile
   b. moderate
   c. hyperpyretic
   d. high
   e. apyretic

442. A female patient has been diagnosed with cervical erosion, which is a precancerous pathology. What defense mechanism can prevent the development of a tumor?
   a. Increase in natural killer level (NK cells)
   b. High-dose immunological tolerance
   c. Increase in the activity of lysosomal enzymes
   d. Simplification of the antigenic structure of tissues
   e. Low-dose immunological tolerance

443. 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:
   a. lack of contact inhibition
   b. negative Pasteur’s effect
   c. increased contact inhibition
   d. tight intercellular junctions
   e. presence of embryonal antigens

444. 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:
   a. benzpyrene
   b. aminoazotoluol
   c. ahtatoxin
   d. methylcholanthrene
   e. diethylnitrozamine

445. 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?
   a. progression
   b. transformation
   c. promotion
   d. activation
   e. implantation

446. 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 then in malignant tumor cells. Which alteration in carbohydrate’s metabolism is present in malignant tumor cells?
   a. increase of anaerobic glycolysis
   b. activation of oxidative reactions
   c. activation of reduction reactions
   d. increase of aerobic glycolysis
   e. decrease of anaerobic glycolysis

447. 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?
   a. Insufficiency of met-Hb-reductase
   b. Insufficiency of superoxidismutase
   c. Block cytochrome oxidase
   d. Insufficiency glutathione pyroidase
   e. Insufficiency of catalase

448. Measurements of the arterial pCO2 and pO2 during an attack of bronchial asthma revealed hypercapnia and hypoxemia respectively. What kind of hypoxia occurred in this case?
   a. Respiratory
   b. Hemic
   c. Circulatory
   d. Tissue
   e. Histotoxic

449. 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?
   a. Cytochrome oxidase (aa3)
   b. Flavin enzymes
   c. Cytochrome 5
   d. NAD+-dependent dehydrogenase
   e. Cytochrome P-450

450. 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:

a. Lactic acid
b. Pyruvic acid
c. Glutamic acid
d. Citric acid
e. Fumaric acid

451. 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?

a. tissue
b. caridiovascular
c. hemic
d. respiratory
e. hypoxic

452. 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?

a. hemic
b. respiratory
c. circulatory
d. overload
e. tissue

453. 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?

a. hypoxic
b. hemic
c. cardiac
d. circulatory
e. tissue

SECTION 3. “METABOLISM DISTURBANCES”

Disturbance of carbohydrate metabolism. Diabetes mellitus.

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

a. anabolism stimulation
b. hypoglycemic
c. catabolism inhibition
d. cellular division stimulation

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

a. anabolism stimulation
b. hypoglycemic
c. catabolism inhibition
d. cellular division stimulation

d. increase in glucose consumption in insulin-dependent tissues

c. increased tissues insulin-resistance
d. increased contra-insulin hormones secretion

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

a. consume glucose with the help of insulin
b. functions are determined by insulin
c. consume glucose directly from the blood
d. are affected in type 1 diabetic patients
e. are affected in type 2 diabetic patients

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

a. increased glucagon secretion by alpha-cells
b. inhibition of insulin secretion by beta-cells
c. decreased glucose consumption in insulin-dependent tissues
d. increased tissues insulin-resistance
e. increased contra-insulin hormones secretion

458. Choose the characteristic feature of type 1 diabetes mellitus:

a. Middle age at onset
b. Associated obesity
c. Low plasma level of endogenous insulin
d. Presence of antibodies to beta-cells
e. Endogenous insulin resistance

459. 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?

a. alpha-cells destruction
b. beta-cells destruction
c. tissues insulin resistance increase
d. glucose toxic action
e. metabolism violation

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

a. absolute insulin deficiency
b. glucose tolerance test violation
c. tissues’ insulin-resistance
d. plasma ketone bodies high level
e. stable hyperglycemia

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

a. hereditary predisposition
b. obesity
c. ageing
d. tissues’ insulin resistance
e. viral infection

462. The patient with obesity has diabetes. What is obesity for diabetes?

a. complication
b. risk factor
c. outcome
d. stage of development
e. obesity is not connected with diabetes

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

a. hyperketonemia
b. hyperlipidemia
c. hyperglycemia
d. hyperaminoacidemia
e. hyperphagia

464. 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?

a. blood proteins concentration decrease
b. hyperproteineemia
c. gluconeogenesis inhibition
d. aminoacidemia
e. alpha-fetoprotein presence in blood

465. 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

466. 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

467. 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

468. 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

469. 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. ketonic  
e. hypoglycemic

470. 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 dehydation  
d. metabolic acidosis development  
e. glycation of proteins in nervous tissue

471. 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

472. Patient with diabetes mellitus type 1 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

473. 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. glycated hemoglobin  
c. albumin  
d. ceruloplasmin  
e. C-reactive protein

474. 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

475. 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 coma  
b. hyperglycemic coma  
c. hyperlactacidemic coma  
d. hyperosmolar coma  
e. ketonic coma

476. 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

477. A patient with constant thirst and increased urination was done oral glucose tolerance test that proved diabetes mellitus diagnosis. Which sign of coma is typical only to type 1 diabetes mellitus?  
a. hyperglycemia  
b. hypoglycemia  
c. relative insulin deficiency  
d. obesity  
e. absolute insulin deficiency

478. A patient with type 1 diabetes mellitus demonstrates high level of aminoacidemia. Which mechanism is responsible to aminoacidemia development?  
a. hyperproteinaemia  
b. increased proteolysis  
c. decreased amino acids blood concentration  
d. increased blood osmotic pressure  
e. increased activity of lipid metabolism

480. 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. diabetic nephropathy  
e. diabetic retinopathy

481. 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
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

A patient with diabetes mellitus was delivered to the hospital in the unconscious state. ABP – 80/50 mmHg, aceto 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

The patient who suffered from chronic glomerulonephritis has general weakness, tachycardia with medium bronchi level. What kind of acid-base balance disorder may develop in this patient?

a. Non-gas acidosis  
b. Excretory acidosis  
c. Gas alkalosis  
d. Non-gas alkalosis  
e. Gas acidosis

A boy 12 years old in 6 months after a severe viral  

acidosis

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483. A patient with diabetes mellitus was delivered to the hospital in the unconscious state. ABP – 80/50 mmHg, aceto 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

484. 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

485. 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.

486. 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


a. Metabolic ketoacidosis  
b. Metabolic lacticacidosis  
c. Respiratory alkalosis  
d. Metabolic alkalosis  
e. No disorders of ABB

488. 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

489. 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

490. 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

491. 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 aceto 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 acidosis  
d. Non-gas metabolic alkalosis  
e. Non-gas excretory alkalosis

492. A group of alpinists had done blood analysis in mountains at height 3000 meters. Blood analysis: decrease of HCO3- to 15 mmol/l (norm is 22-26 mmol/l). What is the mechanism of HCO3- decrease in the blood?

a. Decrease of HCO3- reabsorption in kidneys  
b. Hyperventilation  
c. Activation of acidogenesis  
d. Hypoventilation  
e. Decrease of ammoniogenesis

493. 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-phosphoglycercate  
c. lactic acid  
d. pyruvic acid  
e. 1,3-biphosphoglycercate

494. 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. Hypernatremia  
c. Hypokalemia  
d. Hypernatremia  
e. Hyperphosphatemia

495. 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

496. 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
497. 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

498. 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

499. 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

500. 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

501. 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

502. 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

503. 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

504. 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

505. 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

506. 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

507. 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

508. 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

509. 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

510. 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

511. What mechanism activation in renal tubules underlies metabolic alkalosis development in the person with primary hyperaldosteronism?
   a. Excessive Na` secretion
   b. Lack of H+ reabsorption
   c. Decrease of H+ secretion
   d. Excessive Na` reabsorption
   e. Decrease of Na` secretion

512. 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?
   a. Hyperosmolar hyperhydration
   b. Hypoosmolar hypohydration
   c. Isoosmolar hypohydration
   d. Hyperosmolar hypohydration
   e. Hypoosmolar hyperhydration
513. A woman with intractable vomiting was admitted to the infectious disease ward. What changes of water-salt metabolism are likely to be observed?

a. Isoosmolar dehydration
b. Hyperosmolar dehydration
c. Hyponormal dehydration
d. Hypoosmolar dehydration
e. Hypersmolar dehydration

514. 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?

a. Lymphogenous
b. Membranogenous
c. Disregulation
d. Hydrodynamic
e. Hyperosmolar

515. 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?

a. Mixed
b. Hydrodynamic

disturbance of lipid and protein metabolism.

518. 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?

a. Hyperlipidemia
b. Hyperproteinemia
c. Hyperuricemia
d. Hypoproteinemia
e. Hypouricemia

519. The precipitation of monosodium urate crystals in specific tissues underlies the clinical manifestation of the gout. Which tissues are primarily affected?

a. Kidneys
b. Cartilages and tendons
c. Vessels and connective tissue
d. Lungs and bronchi
e. Muscles

520. 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?

a. Chylomicrons
b. High-density lipoprotein
c. Very-low-density lipoprotein
d. Intermediate-density lipoprotein
e. Low-density lipoprotein

521. 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?

a. Chylomicrons
b. High-density lipoprotein
c. Very-low-density lipoprotein
d. Intermediate-density lipoprotein
e. Low-density lipoprotein

522. 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?

a. Chylomicrons
b. High-density lipoprotein
c. Very-low-density lipoprotein
d. Intermediate-density lipoprotein
e. Low-density lipoprotein

523. 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?

a. Chylomicrons
b. High-density lipoprotein
c. Very-low-density lipoprotein
d. Intermediate-density lipoprotein
e. Low-density lipoprotein

516. A patient who suffers from heart failure has enlarged liver, edema of lower extremities, ascites. What is the leading mechanism of the development of this edema?

a. Colloid osmotic
b. Hydrodynamic
c. Lymphogenous
d. Membranogenous

517. 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. Alimentary
b. Allergic
c. Cardiac
d. Inflammatory
e. Hepatic

524. 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?

a. Cholecystokinin
b. Grelin
c. Glucagon
d. Leptin
e. Insulin

525. Hypersecretion of which hormones may result in specific abdominal obesity?

a. Glucocorticoids
b. Thyroid hormones
c. Epinephrine
d. Mineralocorticoids
e. Parathyroid hormones

526. A man 35 years old is 175 cm tall and weighs 95 kilograms. His body mass index is 31. How would you classify his state of nutrition?

a. Underweight
b. Normal
c. Overweight
d. Obesity
e. Extreme obesity

527. A woman 25 years old is 162 cm tall and weighs 48 kilograms. Her body mass index is 18.3. How would you classify her state of nutrition?

a. Underweight
b. Normal
c. Overweight
d. Obesity
e. Extreme obesity

528. A man 35 years old is 175 cm tall and weighs 76 kilograms. His body mass index is 24.8. How would you classify his state of nutrition?

a. Underweight
b. Normal
c. overweight
d. obesity
e. extreme obesity

A woman 25 years old is 162 cm tall and weighs 67 kilograms. Her body mass index is 25.5. How would you classify her state of nutrition?
a. underweight
b. normal
c. overweight
d. obesity
e. extreme obesity

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

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

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)

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

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

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

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

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

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

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

Which stage of starvation is accompanied with the maximal body weight loss?
a. early starvation
b. prolonged
c. adapted
d. terminal phase

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. amino acids
e. free fatty acids

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. amino acids
e. free fatty acids

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

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

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

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

547. Choose obesity type which is more often complicated with hyperinsulinaemia, diabetes mellitus and hypertension:
a. hyperplastic obesity
d. abdominal obesity
c. general obesity
e. peripheral obesity

548. Which type of obesity will you suppose in a child 9 years old, body weight 52 kg?
a. hyperplastic obesity
c. general obesity
d. abdominal obesity
e. peripheral obesity

549. 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
d. insulin
c. leptin
e. cortisone

550. Endocrine mechanisms of obesity determine fat accumulation due to abnormalities in hormones metabolism. Which substance from the listed stimulates appetite and feeding behavior?
a. leutein
d. cortisone
c. thyroxine
e. insulin

551. 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. leutein
d. cortisone
c. thyroxine
e. insulin

552. 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. Protomic
d. Complete
c. Incomplete
e. Absolute

553. 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
d. glucose
c. fatty acids
e. lactate

554. One of the factors that cause obesity is inhibition of fatty acids oxidation due to:
a. impaired phospholipid synthesis
d. excessive consumption of fatty foods
c. choline deficiency
e. low level of carnitine

555. 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
d. High-density lipoproteins
c. Low-density lipoproteins
e. Very low-density lipoproteins

556. 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
d. increase of ketone bodies synthesis
c. increase of glycogenolysis
e. decrease of gluconeogenesis

557. Prolonged fasting causes hypoglycemia which is amplified by alcohol consumption, as the following process is inhibited:
a. gluconeogenesis
d. glycolysis
c. glycogenolysis
e. proteinolysis

558. 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
d. Hypoglycemic
c. Ketonic
e. Lacticacidemic

559. 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
d. Insulin-dependent diabetes mellitus
c. Myxedema
e. Type 1 glycogenosis

560. Before the cells can utilize the glucose, it is first transported from the extracellular space through the plasmatic membrane inside them. This process is stimulated by the following hormone:
a. Insulin
d. Glucagon
c. Thyroxin
e. Aldosterone

561. According to the results of glucose tolerance test, the patient has no disorder of carbohydrate tolerance. Despite that, glucose is detected in the patient’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
d. Increased activity of glucose reabsorption enzymes
c. Exceeded glucose reabsorption threshold
e. Increased glucose secretion

562. 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 lipoprotein

563. 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. Ketoneemia
d. Increased lipid catabolism
e. Anemia

564. A 40-year-old woman with Cushing’s disease presents
with steroid diabetes. On biochemical examination she has
hyperglycemia and hypochloremia. What process activates in
the first place to such patient?

a. Gluconeogenesis
b. Glycogenolysis
c. Glucose reabsorption
d. Glucose transport to the cell
e. Glycolysis

565. 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?

a. Microangiopathy
b. Macroangiopathy
c. Atherosclerosis
d. Neuropathy
e. Glomerulopathy

566. A 30-year-old man with diabetes mellitus type 1 was
hospitalised. The patient is comatose. Laboratory tests revealed
hyperglycemia and ketonemia. What metabolic disorder can be
detected in this patient?

a. Metabolic acidosis
b. Metabolic alkalosis
c. Respiratory acidosis
d. Respiratory alkalosis
e. Normal acid-base balance

567. 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:

a. Subclinical diabetes mellitus
b. Diabetes mellitus type 1
c. Diabetes mellitus type 2
d. Healthy person
e. Cushing’s disease

568. A 50-year-old inpatient during examination presents
with glucosuria and blood glucose of 3.0 mmol/L, which are
the most likely to be caused by:

a. Renal disorder
b. Diabetes insipidus
c. Pellagra
d. Myxedema
e. Essential hypertension

569. 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?

a. Drop of oncotic blood pressure
b. Increase of vascular permeability
c. Rise of hydrodynamic blood pressure
d. Lymphostasis
e. Increase of lymph outflow

570. A patient was stung by a bee. Examination revealed that
his left hand was hot, pink and swollen; there was a big red
blist on the site of sting. What is the leading mechanism of
edema development in this case?

a. Increased vessel permeability
b. Reduced vessel filling
c. Injury of vessels caused by the sting
d. Drop of oncotic pressure in tissue

571. A newborn child with pylorostenosis has often
repeating vomiting accompanied by apathy, weakness,
hypertonicity, sometimes convulsions. What disorder of acid-
base balance is it?

a. Nongaseous alkalosis
b. Gaseous alkalosis
c. Gaseous acidosis
d. Metabolic acidosis
e. Excretory acidosis

572. An infant has pylorospasm, weakness, hypodynamia,
convulsions as a result of frequent vomiting. What kind of acid-
base disbalance is it?

a. Excretory alkalosis
b. Excretory acidosis
c. Metabolic acidosis
d. Exogenous nongaseous acidosis
e. Gaseous alkalosis

573. 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?

a. Hypo-osmolar hypohydration
b. Hyperosmolar hypohydration
c. Osmolar hypohydration
d. Hypo-osmolar hyperhydration
e. Hyperosmolar hyperhydration

574. 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?

a. Rise of hydrostatic pressure in venules
b. Drop of oncotic pressure in capillaries
c. Increase of capillary permeability
d. Disorder of lymph outflow
e. Positive water balance

575. 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?

a. Increase in hydrostatic pressure of blood in veins
b. Decrease in hydrostatic pressure of blood in veins
c. Decrease in hydrostatic pressure of blood in arteries
d. Increase in oncotic pressure of blood plasma
e. Increase in systemic arterial pressure

576. 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:

a. Nongaseous acidosis
b. Gaseous acidosis
c. Nongaseous alkalosis
d. Gaseous alkalosis
e. Metabolic alkalosis

577. A patient with diabetes developed a diabetic coma due
to the acid-base imbalance. Specify the kind of this imbalance:

a. Metabolic acidosis
b. Metabolic alkalosis
c. Respiratory acidosis
d. Gaseous alkalosis
e. Non-gaseous alkalosis

578. A patient with respiratory failure has blood pH of 7.35.
pCO2 test revealed hypercapnia. Urine pH test revealed an
increase in the urine acidity. What form of acid-base imbalance is the case?

a. Compensated respiratory acidosis
b. Compensated metabolic acidosis
c. Decompensated metabolic acidosis
d. Compensated respiratory alkalosis
e. Decompensated respiratory alkalosis

579. 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?

a. Hypochloremic alkalosis
b. Metabolic acidosis
c. Hyperkalemia
d. Hypermagnesemia
e. Increase in circulating blood volume

580. 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

581. A patient has severe blood loss caused by an injury. What kind of dehydration will be observed in this particular case?

a. Iso-osmolar dehydration
b. Hyposmolar
c. Hyperosmolar
d. Normosmolar

582. 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

583. A patient developed increased blood content of HCO₃⁻ 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

584. 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

585. 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

586. A 62 year old 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

587. 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

588. 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

589. 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

590. 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

591. 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