

## ZACHOT ON PATHOLOGY (PATHOPHYSIOLOGY)

### Order of conducting and evaluation procedure

The zachot is held at the end of the 5th semester in the format of electronic testing and written solution of one case on the KFU platform. The total time of the zachot is 80 minutes.

In testing the student is offered to solve the 70 MCQ, for each correctly solved question the student receives 0.5 points. So, the total maximum for MCQ is 35 points. If a question has more than 1 correct answer in brackets after the question, you will see how many options you need to select. If there is no number after the question, then one answer is correct.

A case is a short clinical situation in which one has to answer the questions concerning the causes. Each case has 3 questions, each question is evaluated up to 5 points. So, the total maximum for a case is 15 points.

### Examples of tasks

#### MCQ test

QUESTION 1. THE STRONG CONNECTION BETWEEN LEUKOCYTES AND THE ENDOTHELIUM IN THE FOCUS OF INFLAMMATION

PROVIDES

- A. L-selectins
- B. Immunoglobulins
- C. E-selectins
- D. Integrins
- E. Prostaglandins

QUESTION 2. PROINFLAMMATORY MEDIATORS ARE: (6)

- A. Kinins
- B. The complement system
- C. Histaminase
- D. E prostaglandins
- E. Leukotrienes
- F. Interleukins 1 and 6
- G. Interleukins 4 and 10
- H. Coagulation and fibrinolysis system

### Case example

Patient B., 46 years old, came to the emergency room with complaints of generalized weakness, chills, fever up to 38.8°C, pulsating pain in the right gluteal region.

The patient's wife was administering intramuscular nafcillin to him for joint pain. four days ago. On examination in the external upper quadrant of the right gluteal region, there's a purple-blue infiltrate, the skin is pasty, hot. In the center of the infiltration there is an area of fluctuation. Answer in detail each of the three proposed questions.

1. Describe the pathogenesis of the local symptoms described in patient B.
2. What other common symptoms (clinical and laboratory) may be present in the patient, summarize their pathogenesis.
3. The patient underwent drainage of an abscess, and a green-colored exudate was obtained. What cells can you see under light microscopy in the obtained exudate?

### Questions necessary for preparation and successful passing of the zacht

1. Cell injury: causes, types. Progression of cell injury. Specific and unspecific manifestations of injury.
2. Mechanisms of cell injury. Depletion of ATP, membrane damage, oxidative stress, ions and fluid imbalance, endoplasmic reticulum stress, DNA damage. Selected examples of cell injury.
3. Compensatory and adaptive mechanisms in cell injury. Cellular and subcellular adaptation.
4. Cell death: classification. Distinctive features of apoptosis, necrosis, necroptosis, autophagy, cornification, NETosis, pyroptosis.
5. Apoptosis: definition, causes, types, pathways, stages. Role of apoptosis in physiological and pathological conditions.
6. Necrosis: definition, causes, mechanisms, role in human diseases. Cornification.
7. Definition, mechanisms, role in human diseases of other important cell death types: autophagy, NETosis, necroptosis, pyroptosis.
8. Acid-base balance: pH, definition, buffer systems, regulatory mechanism of lungs, kidneys, gastrointestinal tract and bones in pH control.
9. Acidosis (acute and chronic, respiratory and metabolic). Diagnostic criteria, causes, symptoms.
10. Alkalosis (acute and chronic, respiratory and metabolic) Diagnostic criteria, causes, symptoms.
11. Hypohydration: causes, types, pathogenesis, clinical manifestations.
12. Hyperhydration: causes, types, pathogenesis, clinical manifestations.
13. Alterations in calcium, potassium, magnesium and phosphate balance.
14. Hypoglycemia: etiology, pathogenesis, diagnosis, treatment.
15. Diabetes mellitus: definition, types, risk factors. Etiology, pathogenesis of type 1, type 2 and other types of diabetes. Clinical manifestations of hyperglycemia in diabetes.
16. Acute complications of diabetes mellitus: causes, mechanisms, clinical manifestations. Chronic complications of diabetes mellitus: causes, mechanisms, clinical manifestations.
17. Proteins metabolism disorders: causes, pathogenesis, clinical manifestations. Nucleic acids metabolism disorders: causes, pathogenesis, clinical manifestations of hyperuricemia and gout.

18. Lipids metabolism disorders. Typical forms of lipids deficiency and lipids exceed. Dyslipoproteinemia. Obesity: definition, types, risk factors, causes, pathogenesis, obesity as a cause of other diseases.
19. Atherosclerosis: causes, risk factors, pathogenesis, clinical manifestation in different organs, complications, diagnostic principles.
20. Vitamin deficiencies and excess: causes, clinical manifestations.
21. Arterial hyperemia: definition, causes, mechanisms, symptoms, features of microcirculation and outcomes of arterial hyperemia.
22. Venous hyperemia (congestion): definition, causes, mechanisms, symptoms, features of microcirculation and outcomes of venous hyperemia.
23. Ischemia: definition, causes, mechanisms, symptoms, features of microcirculation and outcomes of ischemia.
24. Reperfusion injury (syndrome): causes, pathogenesis, features of cell injury, role in clinical practice after revascularization.
25. Stasis: definition, causes, mechanisms, symptoms, features of microcirculation and outcomes of stasis.
26. Thrombosis: definition, causes, mechanisms, Virchow's triad. Types of the thrombi. Features of microcirculation and outcomes of thrombosis.
27. Embolism: definition, causes, mechanisms of emboli formation. Types of embolisms. Microcirculation in embolism.
28. Edemas: definition, causes, mechanisms, clinical types of edemas, features of different types (e.g. nephrotic syndrome, hypothyroidism, liver insufficiency, inflammatory edema, heart failure).
29. Inflammation: definition, classification, etiology, phases. Recognition of microbes and damaged cells. Outcomes of acute inflammation.
30. Primary and secondary alteration in inflammation: local metabolic changes at the site of inflammation.
31. Mediators of inflammation: classification, effects, role in local and systemic symptoms.
32. Leukocytes recruitment to site of inflammation: adhesion, transmigration and chemotaxis.
33. Phagocytosis: definition, stages, chemoattractants, opsonization, role in local and systemic response. Neutrophil extracellular traps.
34. Vascular reactions in acute inflammation. Blood flow changes, phases and mechanisms.
35. Exudation. Mechanisms of inflammatory edema. Types and contents of exudates.
36. Tissue repair: cell and tissue regeneration, connective tissue deposition, abnormalities in tissue repair.
37. Local and systemic symptoms of inflammation.
38. Wound healing: phases, mechanisms, clinical features.
39. Fever: definition and classification. Pyrogens: origin, types and mechanism of action. Fever stages and thermoregulation at the different stages of fever.
40. Role of fever. Positive and negative effects of fever. Differences between fever and hyperthermia. Principles of antipyretic therapy.
41. Hypothermia: definition, causes, pathophysiology, stages, clinical aspects.
42. Hyperthermia: definition, causes, pathophysiology, stages, clinical aspects.
43. Immunodeficiency: definition, classification. Primary immunodeficiency: classification, clinical presentation, consequences.
44. Secondary immunodeficiency: causes, clinical manifestation, diagnosis. HIV/AIDS-infection.
45. Hypersensitivity reactions, type I. Stages, mediators, mechanisms. Clinical manifestation, examples.
46. Hypersensitivity reactions, type II. Stages, mediators, mechanisms. Clinical manifestation, examples.

47. Hypersensitivity reactions, type III. Stages, mediators, mechanisms. Clinical manifestation, examples.
48. Hypersensitivity reactions, type IV. Stages, mediators, mechanisms. Clinical manifestation, examples.
49. Autoimmune diseases: definition, classification, etiology, pathogenesis. Mechanisms of tissue injury: cell-mediated, immunoglobulin-mediated, role of innate immune response. Examples.
50. Rejection of tissue transplants: causes, mechanisms, clinical manifestations.
51. Neoplasia: definition, characteristics of benign and malignant neoplasms. Cancerogenic agents (etiology). Stages of malignant transformation: initiation, promotion, progression.
52. Mechanisms of malignant transformation: role of genetics and epigenetics alterations. Proto-oncogenes, oncogenes, tumor suppressor genes.
53. Hallmarks of cancer: monoclonality, genomic instability, immortalization, limitless replication, avoiding immune destruction, cancer-enabling inflammation, metabolic alterations, angiogenesis.
54. Invasion and metastasis: routes of metastasis, stages, mechanisms.
55. Clinical aspects of neoplasia: clinical manifestations, laboratory diagnosis of cancer
56. Chromosomal disorders: examples with clinical manifestations and karyotype. Multigenic (polygenic) disorders: examples with clinical manifestations.
57. Autosomal dominant disorders, X-linked disorders: examples with clinical manifestations.
58. Autosomal recessive disorders, single-gene disorders with nonclassic inheritance: examples with clinical manifestations.