**AL-FARABI KAZAKH NATIONAL UNIVERSITY**

**Faculty of Medicine and Healthcare**

**Department of Fundamental Medicine**

**Аssessment tools** **on discipline**

**6BM10103 - Medicine**

**Mechanisms of Defense and Health - 11 ECTS**

**Questions**

**BIOCHEMISTRY**

**Approved final exam form - written exam**

**7 ECTS**

1. Describe the types of chemical bonds and their functions.
2. Explain processes of anabolism and catabolism with reactions and energy conversion.
3. Determine the interactions of substances in water and how it forms its properties as: solvent, buffer and catalyst.
4. Describe the role of water in biochemical reactions and buffer.
5. Describe the sequencing method of Sanger.
6. Describe and compare the primary, secondary, tertiary and quaternary structures of proteins. Give examples to each structure.
7. Compare alpha helices, beta sheets and beta turns, give examples of protein structure and their function?
8. Describethe function of an enzyme based on kinetics and thermodynamics.
9. Describe the Michaelis-Menten constant. Define Km and Vmax.
10. Describe the regulation of enzyme functions based on allosteric inhibition, competitive inhibition, and phosphorylation.
11. Explain the regulation of enzyme functions based on allosteric inhibition, competitive inhibition and phosphorylation.
12. Define carbohydrates. Give examples of mono-, oligo-, and polysaccharides.
13. Outline the structure and chemistry of nucleic acid. Compare DNA and RNA. Describe the steps of DNA amplification by PCR.
14. Describe structural lipids in membranes and their functions.
15. Describe how temperature, entropy, enthalpy determine the spontaneity of a reaction.
16. Describe the meaning of each stage of glycolysis: energy, enzymes.
17. Describe the main points of the pentose phosphate pathway.
18. Define the principles of four ways to regulate enzyme activity.
19. Describe the function, synthesis and degradation of glycogen.
20. Explain all non-essential amino acids and write down their anabolic precursors.
21. Describe methods for determining protein and enzymatic activity.
22. Explain the reason (from the point of view of the theory of the formation of an enzyme-substrate complex), as a result of the addition of a poison molecule to an enzyme, enzymatic activity is suppressed?
23. Explain how glucose can be detected in urine and if galactose is present, why might an analyst mistakenly detect the presence of glucose?
24. Explain what relationships exist between apoenzymes, vitamins, metal ions and enzymes.
25. Explain what inborn errors of metabolism can disrupt the breakdown of amino acids.
26. Describe how nucleotide mono-, di- and triphosphates are interconverted.
27. Explain the information related to the synthesis of pyrimidine.
28. Explain information related to purine synthesis.
29. Explain the decomposition of proteins into amino acids.
30. Describe how protein metabolism is regulated.
31. Explain why atoms containing degraded amino acids are part of the main intermediate products of metabolism.
32. Explain the relationship between the phenomena of proteins, lipids and nucleic acids.
33. Define vitamins and provitamins.
34. Define the role of vitamin B12 in the processes of blood formation.
35. Describe stages of energy metabolism.
36. Explain the biosynthesis of triacylglycerols, phospholipids and cholesterol.
37. Describe the process of fatty acid oxidation.

**IMMUNOLOGY**

**Approved final exam form - written exam**

**Questions of immunology**

**4 ECTS**

1. Explain the concepts: immunology, immunity, immune system. Describe the structure and features of the functioning of the immune system.
2. Describe the levels, functions and significance of the external (natural) barriers of the innate immunity.
3. Describe the components of the innate immunity, explain the features of recognition of genetically foreign substances by cells of innate immunity.
4. Describe the structure and features of the cellular component of innate immunity in the immune response.
5. Describe the humoral factors of innate immunity and their features in the immune response.
6. Describe the components of adaptive immunity and their features in the immune response.
7. Explain cell-mediated immune response and its features in immunological reactions.
8. Describe humoral immune response and its features in immunological reactions.
9. Compare functional characteristics of the cells of innate and adaptive immunity.
10. Compare types of immune response, their main properties and features.
11. Describe the structure of the major histocompatibility complex (MHC=HLA) and the principle of MHC inheritance.
12. Describe the structure and function of MHC I and MHC II molecules in the immune response in comparison.
13. Explain the role of MHC gene products in the immune response and give examples of the association of HLA antigens with diseases.
14. Describe the main properties of antigens. Explain the terms and their features in the initiation of the immune response: antigen, hapten, carrier, superantigen.
15. Describe the concepts of terms: primary and secondary autoantigens, explain their significance in practice.
16. Explain the features of maturation and differentiation of B-lymphocytes, describe the main markers and functions of B-cells.
17. Describe and compare antigen-independent and antigen-dependent differentiation of B-lymphocytes and their features.
18. Describe the development, main markers and functions of T-cells, the mechanism of action of cytotoxic T-lymphocytes (CD8+ CTL) in the immune response.
19. Compare cytotoxic T cells (CTL) and natural killer (NK) cells, their features, mechanism of action.
20. Describe the features of the structure and functions of the main classes of immunoglobulins and their significance in practice.
21. Describe the functions of Fab, Fc fragments of immunoglobulins and their significance in the immune response.
22. Define monoclonal antibodies and examples of their use in therapy.
23. Describe the role of the complement system in the immune response. Describe the factors and ways of activation in immune reactions.
24. Describe the mechanisms and features of the activation pathways of the complement system: classical, alternative, lectin.
25. Describe the role of the complement system in the immune response, the significance of the membrane attack complex (MAC) in immunopathological processes.
26. Describe the main groups of cytokines: common properties, mechanisms of biological effects, functions
27. Describe the types of interferons, their general characteristics and mechanisms of biological effects in the immune response.
28. Describe the role of interleukins in the immune response, the features of pro-inflammatory and anti-inflammatory cytokines in immune responses.
29. Describe the role of innate and adaptive immune systems against viruses.
30. Describe the role of innate and adaptive immune systems against bacterial infections.