****

**ÖMER HALİSDEMİR UNIVERSITY FACULTY OF MEDICINE**

**FIRST YEAR PHASE-II**

**TIP1200: Basic Sciences-II Phase**

**BASIC SCIENCES-II PHASE**

**AIM:**

At the end of this phase, first year students will have learned the basics of medical physics, general organic chemistry and biochemistry, the basic concepts of biostatistics and medical informatics, the basic elements of scientific research, the cell, which is the building block of all living organisms on earth and general information on the basis of molecular biology.

**INTENDED LEARNING OUTCOMES:**

At the end of this phase, first year students will be able to:

1. Comprehend why the SI-base units, derived units and operators used in biomedical physics are necessary, understand why biophysics is necessary in health sciences and explain the physical-mathematical models of biological systems,
2. Distinguish the electrostatic, magnetostatic concepts and determine their sources, distinguish electric current, electro-magnetic fields and alternating currents, understand how the potential via induction occurs, comprehend why resistance/(Impedance), inductor/(muscle) and electrical capacity/(membrane) are necessary in health sciences,
3. Understand the biophysical meaning of normal electrography and that the hearth operates as two poles, use the triangular hangman model, learn what is important when taking ECG, calculate the heart electrical axis using QRS complex,
4. Observe and evaluate the neurobiophysical phenomena, membrane potentials, equilibrium potential, comprehend how to calculate sedimentation speed and constant by centrifugation, distinguish between subthreshold, threshold and suprathreshold events in excitable cells, explain the types of membrane potential in block diagrams, draw the electrical equivalent circuits of unit membrane,
5. Calculate the changes in membrane potential by time and distance, observe the action potential, graphically show the ionic basis of the action potential, explain whether the ion currents are inward or outward, draw the sodium channel model schematically, explain voltage-clamp and patch-clamp methods,
6. Have knowledge about cybernetic control systems,
7. Introduction to organic chemistry and biochemistry: organic chemistry is the chemistry of carbon compounds. This branch of science covers a very wide area. Work in the field of organic chemistry continues to find new substances that enrich our lives, new medicines and new information about the chemical nature of life. As the chemical behavior of a material is closely related to the atoms it is composed of and the way they are connected, we need to know the structure of molecules to understand organic chemistry. In this section, we will examine some basic principles of chemical bonds and molecular structures in organic chemistry. By using these principles, the students will learn more stable bond models and will be able to comment more easily on the structural formulas encountered in organic chemistry and biochemistry studies.
8. Chemical Bonds: In this section, the formation and effects of chemical bonds such as covalent, ionic, van der Waals, peptide bonds will be examined.
9. Basic Organic Compounds in Biological Systems: In this section, the students will be able to recognize and name the basic organic compounds using the information they have learned so far such as carbohydrates, amino acids, lipids, proteins. They will recognize and write basic organic compounds such as carbohydrates, amino acids, lipids, proteins.
10. Chemical Reactions: In this chapter, students will be able to write chemical reactions that occur in biological systems by comprehending the basic chemical reactions that take place in the human body.
11. Students will learn the molecule structure of water and its bio-functions, explain the place and importance of water for the metabolism and know the composition and distribution of body water.
12. Define acid, base and pH,
13. List the buffer systems that protect and maintain the acid-base balance,
14. List the consequences of disruptions in the balance of bodily buffer systems,
15. Learn the definition, variations and preparation of solutions, explain the concept of concentration and solve the problems related to it,
16. After distinguishing the amino acids present in nature as protein forming (standard) / not forming, they will be able to classify standard amino acids according to the properties of their side chains and recognize their chemical structures.
17. Classify standard amino acids according to their "polarity and essentiality" properties and learn the polar/nonpolar properties, water solubility and protein structure properties of amino acids in each class,
18. Learn the amino acids present in the organism and their catabolic and anabolic reactions, as well as their classification as glucogenic and/or ketogenic,
19. Comprehend the importance of the asymmetric carbon atom for amino acids, stereoisomers that arise from it and their optical properties,
20. Draw and interpret titration curves by learning the ionization behaviors of amino acids in aqueous media, similar to these in living organisms,
21. Understand the functional groups of amino acids, their reactions and their importance for the organism,
22. Learn how amino acids come together to form peptides, polypeptides and proteins,
23. Understand the importance of partial double bond characteristics of the peptide bonds for stable protein structures,
24. Learn the general physical/chemical properties of peptides and some physiologically active peptides such as glutathione,
25. Classify proteins according to structure, shape and biological functions,
26. Comprehend the importance of proteins as a biomolecule in terms of its functions in the organism,
27. Have a better understanding of some specific proteins such as collagen, hemoglobin, albumin and lipoproteins,
28. Learn hydrogen bonds, electrostatic and hydrophobic interactions and other types of bonds, link these bonds with primer, secondary, tertiary and quaternary protein structures and compare the properties of these structures,
29. Learn the physical and chemical properties of proteins, quantitative determination methods based on these properties and the concepts of denaturation/renaturation,
30. Learn about protein purification methods such as homogenization, extraction, dialysis, ultrafiltration, centrifugation/ultracentrifugation, fractional precipitation, column chromatography (gel filtration, ion exchange, affinity, HPLC etc.), electrophoresis, PAGE, isoelectric focusing,
31. Learn how to determine the primary structure of a purified protein, the enzymatic/chemical agents used for this purpose, and the overlapping method; and more importantly to be able to discuss the significance of sequencing analysis,
32. Understand the necessity of biostatistics in medical sciences,
33. Identify variable types,
34. Describe the concepts of population and sample, sampling, parameter and sample statistics,
35. Describe scientific research,
36. List the steps of a scientific research,
37. Plan a scientific research,
38. Choose a subject for a scientific study,
39. Explain the concept of literature,
40. Identify goals in a scientific study,
41. Define the research population,
42. Describe observational research,
43. List the types of observational research,
44. Define experimental investigations,
45. List the types of experimental research,
46. ​​Identify measurement tools,
47. Distinguish survey, scale and test concepts,
48. List the rules for survey preparation,
49. List the sampling methods,
50. Determine the suitable sampling method according to the characteristics of research population,
51. Understand the necessity of randomization,
52. Apply randomization methods in scientific research,
53. Understand the importance of power analysis,
54. List the necessary concepts in determining the size of the sample,
55. Determine sample size using population averages and ratios,
56. Interpret descriptive statistics for qualitative variables,
57. Interpret position measures for quantitative variables,
58. Interpret prevalence measures for quantitative variables,
59. Distinguish between the concepts of mean, median, peak value, quarter and percentage,
60. Comprehend the importance of probability distributions in biostatistics,
61. Predict the population parameter,
62. Interpret the parameter estimates,
63. Form a hypothesis,
64. Make a statistical decision using the p-value,
65. Explain the concept of normality,
66. Decide on normality of the data,
67. Describe parametric and non-parametric concepts,
68. Apply single sample t-test,
69. Compare two independent groups for variables that display normal and homogeneous distribution,
70. Compare more than two independent groups for variables that display normal and homogeneous distribution,
71. Interpret differences between groups,
72. Apply multiple comparison tests,
73. Compare repeated measures for numerical variables,
74. Apply the sign test,
75. Compare two independent groups for variables that do not display normal and distribution,
76. Compare more than two independent groups for variables that do not display normal and distribution,
77. Prepare data files,
78. Control and manipulate data,
79. Find sampling populations in computer environment,
80. Perform calculations on variables,
81. Through an overview of the all kingdoms of life, grasp the relationship between humans and other living organisms,
82. Understand the cell membrane, cell structure and organelles,
83. Explain the structure, synthesis and degradation of DNA, RNA and protein macromolecules, as well as the structure of the human genome,
84. Use light microscopy to examine and recognize living and dead cell types.