



Head of Department.....
Prof. V.Turiyski, PhD

Syllabus in Biophysics Dental Medicine 1-st year, 2-nd term

2024/2025

1. Thermodynamics. Thermodynamic systems and quantities. First law of thermodynamics and bio-systems.
2. Entropy. Free energy. Second law of thermodynamics applied to bio-systems. Stationary systems, Prigozhin/Prigogine theorem.
3. Bio-membranes: structure, dynamics, phase transitions, functions.
4. Passive membrane transport. Gradients. Equilibrium potentials. Diffusion types – nonspecific-, facilitated- and exchange diffusion.
5. Ion channels and ionophores.
6. Active membrane transport. Primary and secondary active transport. Na-K pump, Ca pump, Ca-Na exchanger.
7. Electric membrane potential. Equilibrium potential. Resting potential.
8. Nernst-Bernstein equation. Goldman equation. Membrane ion permeability.
9. Action potential. Alterations in the membrane permeability during an action potential. Ion currents measurement by fixed voltage scheme.
10. Ion theory of excitation (Hodgkin and Huxley theory).
11. Action potential propagation. Electrotonic potential. Blockage of AP spreading.
12. Bioelectrical activity, structure and contractile types of smooth muscles. Contractile mechanisms of smooth muscles.
13. Bioelectrical activity, structure and properties of skeletal and cardiac muscles. Contractile mechanisms of striated muscles.
14. Intercellular communications. Types of information systems: electrical and chemical information translation.
15. Receptors – receiving and translation of information. Intracellular system of signal spreading.
16. Electrokinetic phenomena. Biological significance of electrokinetic properties.
17. Ionizing radiation-tissues interactions.

26.02.2025

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Adopted by the Department Meeting with № 2 /26.02.2025