Exam questions of Medical Physics and Biophysics
Faculty of Pharmacy

1. **Physical basics of structural organization and functioning of biomembranes:**
   Membrane functions in a living organism. Cell membrane structure (modern fluid-mosaic model). Membrane lipids. Membrane lipids.

2. **Membrane proteins:**
   Biophysical mechanisms of interaction between membrane components (lipids and proteins).

3. **Selective permeability of plasma membrane. Molecular basics of passive transport of substances:**
   Membrane permeability; the role of membrane in the regulation of water homeostasis in a living organism. Mechanism of Passive and active transports across the biological membrane. Mechanisms of simple passive transports: Diffusion, Osmosis, filtration.

4. **Principle mechanisms of facilitated passive transport:**
   Selective channels (ligand- and potential-dependent channels), facilitated diffusion, mobile carriers.

5. **Mechanisms of active transport of substances**:
   Primary and secondary active transport. Primary active transport (pumps coupled with ATP-hydrolysis (Na^+/K^+-ATP -ase, Ca^{2+}- ATP -ase, H^+-pump, CPx- ATP –ase). Primary active transport (Mitochondrial proton pump (H^+ ATP-ase), ABC-transporters), pumps coupled with absorption of light quantum. Secondary active transport

6. **Basic concepts and laws of electromagnetism:**
   Charge, Law of charge constancy, Coulomb's law; electric field, Electric field tension and potential. Conductors and dielectrics in electric field. Electric current, Ohm's law.

7. **Bioelectric phenomena in excitable tissues. Electric properties of plasma membrane**;
   Transmembrane potential, Nernst's equation. Membrane potential generation mechanisms (diffusion potential, Donnan's potential, electrogenic ion pumps).

8. **Resting potential:**
   Membrane resting potential generation mechanisms (osmotic forces, ion fluxes, selective channels, active transport). Goldman equation. Functions of membrane Resting potential.

9. **Action potential:**

Ionic mechanisms of action potential generation. Mechanisms of propagation of action potential.

10. Muscle compression biophysical mechanisms.

Muscular excitability, muscles excitation and compression mechanisms; mechanisms of activation of the aromatological complex.