QUESTIONS OF COLLOQIUM No.2

«PHYSICS, MATHEMATICS» Anglophone Students of the 1 Course Specialty «GENERAL MEDICINE» 1 term of 2024/2025

- 1. Passive electrical properties of biological tissues. Specific Resistance, Conductivity and Relative Permittivity of biological tissues. Impedance of body tissues.
- 2. Dispersion of Relative Permittivity: α -, β and γ regions. The frequency dependence of the impedance of biological tissues. Dependence of impedance of tissues on the alternating current frequency. The equivalent electrical circuit of biological tissues.
- **3.** Direct electric current (DC). Electromotive power of current sources. Action of DC on body tissues. Application of DC in medicine.
- **4.** Alternating current (AC) and its basic characteristics. Active and Reactive Resistance of an AC circuit. AC circuit Impedance. Phasor diagrams of an AC circuits.
- **5.** Physical processes that occur in body tissues under the action of low and high frequency current. Thresholds of perceptible and non-released current. Methods in medicine which are based on the AC application.
- 6. Electric and magnetic fields and their general characteristics. Action on biological tissues and application in medicine of alternating electric and magnetic fields, and electromagnetic waves.
- 7. Biological membranes: structure and physical properties. Types of transport of molecules and ions across biological membranes. Fick's equation for homogeneous media and membranes. Osmotic resistance of erythrocytes.
- 8. Artificial membranes. Membrane technologies in medicine
- 9. Electrodiffusion. Transport of ions across membranes. The Nernst-Planck equation.
- **10.**Equilibrium membrane Potential. Nernst equation. Resting and Action membrane potentials. Goldman-Hodgkin-Katz equation. Biopotentials in human body.
- **11.** Electric dipole. The electric field of the dipole. A dipole electric generator (current dipole) and its electric field.
- **12.** Active electrical properties of biological tissues. Physical fundamentals of electrography of organs and tissues. Methods of electrography in medicine (electrocardiography, electroencephalography, electromyography).
- **13.**Einthoven's theory as the basis of electrocardiography. The heart as an equivalent electric generator. Genesis of electrocardiograms in three standard leads. The concept of bipolar and unipolar leads.

Утверждено на заседании кафедры 26 августа 2024 года, протокол № 11.

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