# QUESTIONS OF COLLOQIUM No.1

## «FUNDAMENTALS OF PHYSICAL METHODS OF DIAGNOSTICS AND THERAPY»
## FOR ANGLOPHONE STUDENTS OF THE 1 COURSE
## 2 Term of 2020/2021

1. The basic groups of medical apparatus: medical devices; medical apparatus. Electrical safety of medical apparatus. Reliability of medical apparatus.
2. Block diagram of the device for reading, transmission and recording of biomedical information. Electrodes for reading of biopotentials.
3. Amplifiers: appointment; gain (amplification factor); amplitude characteristic; frequency characteristic; amplifier pass band. Features of bioelectric signals amplification.
4. Electrical converters (sensors). Generative and parametric sensors. Sensor characteristics: transformation function; sensitivity; threshold of sensitivity; limit of sensitivity. Examples of sensors.
5. Physical basis of electrocardiography. Dipole electric generator (current dipole). Electric field of a dipole. Fundamentals of the theory of Einthoven's leads. Electrocardiogram.
6. Block diagram of an electrocardiograph, the appointment of individual elements. Frequency characteristic of an electrocardiograph.
7. Physical processes that occur in the tissues of the body under the action of: direct current, low frequency current. Thresholds of perceptible and nonreleasing current.
8. Physical processes that occur in the body tissues under the action of: high frequency current, alternating magnetic field, alternating electric field.
9. Passive electrical properties of biological tissues. Impedance of body tissues.
10. Frequency dependence of the impedance of biological tissues. α -, β - and γ - areas of dispersion impedance. Equivalent electrical circuit of biological tissue.
11. Sound. Physical characteristics of sound: frequency, intensity, intensity level, sound pressure. Relationship between intensity and sound pressure. Acoustic spectrum.
12. Characteristics of the auditory sensation, their connection with the physical characteristics of sound. Weber-Fechner's law. Physical basis of sound research methods in the clinic: auscultation, percussion, phonocardiography, audiometry.
13. Functions and physical properties of biological membranes. Transport of molecules across membranes. Fick's equation and its expression for membranes.
14. Transport of ions across membranes. Nernst-Planck's equation.
15. Varieties of passive transport of molecules and ions. Osmotic stability of erythrocytes.

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