QUESTIONS OF COLLOQIUM No.1

«MEDICAL AND BIOLOGICAL PHYSICS»
Anglophone Students of the 1 Course
Specialty «GENERAL MEDICINE»
2 term of 2024/2025

1. Classification of medical equipment. Electrical safety of medical equipment: general requirements and measures to ensure electrical safety, classes of medical equipment for electrical safety. The threshold of perceptible current, the threshold of non-releasing current.
2. Reliability of medical equipment. Quantitative characteristics of reliability.
3. General scheme of acquisition, transmission and registration of medico-biological information. Transfer and registration devices. Biotelemetry.
4. Sensors. Types of sensors: generative and parametric. Sensor characteristics: conversion function, sensitivity, sensitivity threshold, sensitivity limit.
5. Electrodes, their types and basic requirements for them. Amplifier. Amplifier characteristics: gain, amplitude response, frequency response, amplifier bandwidth.
6. Interference of light. Conditions for the greatest amplification and attenuation of light. Interferometer, interference microscope and Optical Coherence Tomography in medicine.
7. Interference in thin films: ray path, maximum and minimum interference. Principle of antireflection coating and examples of its application in medicine and/or biology.
8. Light diffraction. Diffraction grating. Diffraction spectrum. X-ray diffraction analysis.
9. Polarization of light. Natural and polarized light. Polarizing devices. Passage of light through the polarizer-analyzer system. Malus' law.
10. Rotation of the polarization plane by optically active substances. Application of polarized light for solving biomedical problems: polarimetry, polarizing microscopy, photoelasticity.
11. Rectilinear propagation of light. Speed of light. The refractive index of the medium. Laws of refraction and reflection of light. Mirror and diffuse reflection of light. Total internal reflection of light. Fiber optics and its application in medicine.
12. Lenses. Types of lenses. Image construction in thin lenses. Thin lens formula. The optical power of the lens. Lens aberrations.
13. Optical microscope, the path of rays in a microscope. Microscope magnification. Limit of resolution and useful magnification of the microscope. Micro-projection and microphotography methods.
14. Types and special techniques of microscopy. Phase contrast microscopy, ultraviolet microscopy, immersion microscopy, ultramicroscopy, confocal microscopy, darkfield microscopy (definition, areas of application).
15. Electron microscopy. The principle of operation and the resolution limit of an electron microscope. Scanning and Transmission Electron Microscopy.