

Biophysics semifinal exam, topic list for the starting of talk 2022/23 I. semester (Pharmacy)(EP)

1. Absorption of X-ray and γ -radiation, X-ray diagnostics, radiation protection.
2. Basis of quantum physics (state function). Bound and free states of the electron.
3. Basis of wave optics. What phenomena can be explained by it?
4. Defects in crystals, effects of doping.
5. Fluids. Physical properties of water and their explanation. (surface tension)
6. How can you apply the wave-particle duality for light?
7. Interaction of high energy photons with atoms and molecules.
8. Interpretation of bonds and interactions between atoms.
9. Laws for the description of gases (macro- and microscopic). Real and ideal gases.
10. Light amplification, properties and generation of laser radiation.
11. Light scattering and absorption (macro- and microscopic laws) Interaction of light and matter.
12. Luminescence, discrimination of its types, practical applications, spectra.
13. Production of X-ray radiation, comparison of Bremsstrahlung and characteristic radiation by spectra and generation.
14. Radioactive decay law. Properties and applications of radioactive isotopes.
15. Radioactive decay types, interactions of nuclear radiations with matter.
16. Resolution limit of the light microscope, Abbe's principle, special light microscopes.
17. Spatial and energetic structure of crystalline materials. relation to optical and electric properties.
18. Structure and properties of liquid crystals, applications.
19. Summary of the atomic models with their critiques. (Thomson, Rutherford, Bohr)
20. Summary of the important experiments about the atomic structure. (Thomson, Rutherford, Franck-Hertz)
21. The basis of geometrical optics. What phenomena can be explained by it?
22. The Boltzmann-distribution and its applications.
23. Thermal radiation, laws, principles, spectra in different representations.
24. What quantities and laws can be used to describe radiations?

Practice

1. Absorption of gamma radiation, basis of radiation protection.
2. Analysis of the amplifier, signal processing.
3. Basis of nuclear measurement techniques.
4. Concentration determination with the refractometer.
5. Dosimetry, dose(rate) measuring devices.
6. Force measurement with a spring/cantilever; resonance.
7. Image formation (lens, mirrors), microscope.
8. Light absorption and its laboratory applications.
9. Light emission and its laboratory applications
10. Material identification and concentration determination by polarimetry.
11. Optics of the eye, image formation in the eye.
12. Special microscopy methods.