

Credit questions

1. Structural diagram of medical and biological measuring. Electrodes for detection and biomonitoring
2. Electric conductivity of metals and semiconductors. Resistance thermometer and thermistor. Thermoelectricity. Thermocouple
3. Piezoelectric effect
4. Sensors: passive and active. Sensor characteristics
5. Different types of sensors: temperature sensors, sensors of parameters of cardiovascular system, sensors of parameters of breathing system
6. Physical basics of the high frequency therapy and electrosurgery
7. LC Oscillator. Technical and therapeutic circuits of apparatus for UHF-therapy
8. Influence on a biological tissue by the high frequency alternating magnetic field
9. Influence on a biological tissue by the high frequency alternating electric field
10. Influence on a biological tissue by the electromagnetic waves
11. Darsonvalization, surgical diathermy
12. Geometrical optics. Reflection of light. The law of reflection. Refraction of light. Index of refraction. Snell's law of refraction
13. Total internal reflection and critical angle. Fiber optics and its medical application
14. Refraction in triangular prisms
15. Refractometry. Dependence of refractive index of solution on its concentration. Determination of unknown concentration of solution
16. The compound microscope
17. Magnification. Resolution of optical microscope, Abbe's diffraction limit
18. Specialized Microscopy Techniques
19. De Broglie hypothesis. Electron diffraction
20. Electron microscopy. Resolution of electron microscope
21. Scanning probe microscopy

22. Optical system of the human eye and accommodation
23. Imperfections of optical system of human eye
24. Biophysics of visual perception Eye sensitivity to light and color
25. Electromagnetic waves and their properties.
26. Natural and polarized light. Linear and circular polarization
27. Polarizers: absorptive polarizers, polarization by reflection, Brewster's angle; birefringent polarizers; Malus law. Polarizing instruments.
28. Optical activity. Polarimetry.
29. Stimulated emission and its properties. Light amplification. Laser construction
30. Three- and four-level laser systems of pumping
31. Properties of laser radiation, its use in therapy and surgery
32. Energy levels of atoms and molecules.
33. Light absorption. Beer-Lambert-Bouguer law. Absorption coefficient.
34. Transmittance. Optical density (absorbance)
35. Spectrophotometry (colorimetry). Photocolorimeter
36. Light scattering. Rayleigh scattering. Nephelometry
37. Bohr atomic model. Spectrum of atomic hydrogen
38. Luminescence. Stokes Law. Kasha–Vavilov Law.
39. Fundamentals of atomic and molecular spectrum analysis. Luminescent analysis in medicine
40. Photobiological processes
41. Photodynamic therapy
42. Thermal radiation and its characteristics
43. Thermal radiation laws and their quantum interpretation
44. Thermography and thermal imaging and their medical application
45. Electron magnetic dipole moment. Orbital magnetic dipole moment. Spin magnetic dipole moment. g-factor. Bohr magneton
46. Electron paramagnetic resonance and its medical applications
47. Nuclear Magnetic Resonance. Nuclear magnetic resonance imaging (NMRI)

48. Bremsstrahlung X-radiation nature. Bremsstrahlung X-radiation spectrum
49. X-radiation tube
50. Characteristic X-radiation nature. Moseley's law
51. Attenuation of radiation in matter. Linear attenuation coefficient, mass attenuation coefficient
52. Interaction of X-radiation with matter.
53. Physical principles of medical uses of X-radiation. X-ray imaging. X-ray therapy
54. X-ray protection techniques
55. The basics of computed tomography
56. Natural radioactivity
57. Radioactive decay. Different types of radioactive decay
58. The radioactive decay law. Half-life time. Mean life time
59. Characteristics of interaction of the ionizing radiation with matter: linear specific ionization, linear energy transfer, mean linear range
60. Activity of a radioactive substance. Specific mass activity. Specific volume activity. Specific surface activity
61. Principles of radionuclide diagnostics
62. Radiation therapy
63. Absorbed dose, exposure, equivalent dose, dose rate and their units. Their interrelation
64. Effective dose equivalent. Collective effective dose
65. Radiation monitoring instruments. Dosimeter. Radiometer. Measure of exposure rate
66. Natural background radiation and man-made radiation sources