

Portal:Questions for final examination in biophysics (1. LF UK, GM)

List of questions - Biophysics 2010

Structure of matter

1. Wave properties of particles, quantum properties of waves
2. Quantum numbers
3. Ionization and excitation
4. Structure of electron shells in atoms
5. Atomic nucleus
6. Binding energy in atomic nucleus
7. Potential barrier of atomic nucleus
8. Physical principles of mass spectrometry
9. Physical principles of nuclear magnetic resonance

Molecular biophysics

1. International system of units, transformation of units
2. Phase states of matter
3. State equation of ideal gas
4. Bernoulli equation, equation of continuity
5. Law of Laplace
6. Gibbs's phase rule, phase chart of water
7. Water as solvent
8. Dispersion systems and their classification
9. Properties of colloid particles
10. Principle of electrophoresis, electrokinetic potential
11. Transport phenomena
12. Viscosity and its measurement
13. Diffusion, 1. law of Fick
14. Surface tension, adsorption
15. Colligative properties of solutions
16. Osmotic pressure
17. Blood pressure measurement

Thermodynamics

1. Thermodynamic system, state quantities
2. First law of thermodynamics
3. Second law of thermodynamics
4. Definitions of thermodynamic functions (U, H, S, F, G)
5. Chemical potential
6. Thermoregulation in homeothermic organisms
7. Measurement of temperature
8. Calorimetric measurements
9. Specific heat, latent heat

Physical and physiological acoustics

1. Physical properties of acoustic waves
2. Acoustic impedance
3. Sound intensity and loudness, units
4. Field of hearing
5. Weber-Fechner's law in acoustics
6. Ultrasound generators
7. Physical principles or diagnostic use of ultrasound
8. Audiometry

Optics in medicine

1. General classification of electromagnetic waves
2. Planck's law, Stefan-Boltzmann and Wien laws
3. Lens equation

4. Extinction, Lambert-Beer law
5. Scattering of light
6. Dispersion of light
7. Refraction and its use in spectroscopy
8. Interference and light reflection
9. Refractometry, Polarimetry
10. Biophysics of vision
11. Eye defects
12. Absorption spectral analysis
13. Optical properties of colloids
14. Principle of laser
15. Optical and electron microscopy

Electricity in medicine

1. Coulomb's law, permittivity
2. Intensity, voltage, resistance, impedance and their measurement, units
3. Donnan's equilibrium on cell membrane
4. Rest membrane potential
5. Electrochemical potential
6. Nernst equation
7. Measurement of el. conductivity in solutions
8. Action potential and its detection
9. Action potentials of heart muscle and their detection
10. Principle of oscilloscope
11. Use of electricity in diagnostics
12. Use of electricity in therapy

Use of X-rays in medicine

1. Production of X-rays, energy spectra
2. Control of the energy and intensity of X-rays
3. X-ray apparatus
4. X-ray lamp
5. X-ray absorption
6. X-ray contrast
7. Use of X-rays for diagnostic purposes
8. X-ray therapy
9. Depth dose
10. Principle of computed tomography

Radioactivity and ionising radiation

1. Radioactive decay
2. Energy spectra of α and β radiation
3. Energy spectrum of γ radiation
4. Radioactive equilibrium
5. Physical, biological and effective half-life
6. Absorption of γ radiation
7. Absorption of α and β radiation
8. Nuclear reactions
9. Cosmic rays
10. Selective and integral detection of γ radiation
11. Principles of detection of ionising radiation
12. Detectors of ionising radiation
13. Scintillation detector
14. Geiger-Muller tube
15. Accelerators of particles
16. Ionisation chamber
17. Methods of personal dosimetry
18. Units of exposition and absorbed dose of irradiation