

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING FOR TEST FOR THE POST OF SENIOR DEMONSTRATOR – BIO-PHYSICS MEDICAL EDUCATION DEPARTMENT

Unit: I

Concept and Introduction of Bio-physics. Application of physico chemical laws in Biological system. Laws of thermodynamics. Concept of Entropy. Living body as a thermodynamic system. Ionization theories of electrolyte dissociation, Ostwald's dilution law. dielectric constant. Common ion effect.

Unit: II

Physical principles of microscopy, Introduction and application of microscope, light microscope, phase contrast, electron-microscopes (Transmission and Scanning) Fluorence microscope, polarising microscope.

Unit: III

Cell Biology, structure and functions of cell and cell organelles, plasma membrane, Nucleus, Nuclear membrane, Nucleoli Endoplasmic reticulum, Golgi apparatus, Lysosomes, Peroxisomes, Mitochondria, Electron transport system in mitochondria and Energy metabolism. ATP synthesis.

Unit: IV

Detailed structure and functions of Nucleus, nucleolus. Nuclear membrane, Structure of DNA and RNA, gene, structure, genetic code, operon, DNA-microarrays, DNA sequencing, cloning spectroscopic study of DNA, oncogenes.

Unit: V

Proteins: Their primary, secondary, tertiary and quaternary structures, protein bio-synthesis, replication, transcription and translation process. Method of protein sequencing enzymes, enzyme kinetics, receptors, types of DNA & RNA Enzymes involved in molecular biology DNA Polymerase RNA polymerase reverse transcriptase, restriction endonucleases DNA, Polymerization, mutation, DNA cloning expression and purification.

Unit: VI

Cell membrane : structure, function, Transport across the cell membranes, Diffusion, facilitated diffusion, physicochemical criteria for diffusion across the membranes, active transport Primary and secondary active transport co and counter transport, Osmosis, Osmotic pressure, endocytosis, phagocytosis and pinocytosis, receptor mediated endocytosis, secretion and exocytosis, absorption, adsorption, hydrophobicity, Viscosity; its determination and its significance, surface tension, Donnan membrane equilibrium. Dialysis, Ultrafiltration.

Unit: VII

Potentials in excitable tissues, resting membrane potential action potential in muscles and nerve fibers. Determination and recording of action potentials. ECG, EMG, EEG, and their significance. Mechanism of action potential and its relation with transport of ions. Plateau in action potential. Structure and function of skeletal, smooth and cardiac muscles, their mechanism of contraction. rhythmicity in contraction. Neuromuscular transmission, regulation of neuromuscular transmission, myasthenia gravis.

Unit: VIII

Structure of atom and its decay, radioactivity, detection of nuclear radiation. Isotopes and their application in diagnosis as well as in therapeutics. Biological effects of radiation: merits and demerits of different diagnostics and therapeutic methods, radiation hazards in man, atmosphere and space. x-ray and x-ray diffraction technique for determination of nucleic acid and protein structures. Radio Immuno assays and its application, hormone and protein assays, bone scan, brain scan, renal and cardiac imaging.

Unit: IX

Biological effect of light, field of vision, illumination of retina. The eye as an optical instrument: formation of image, electroratnogram, its principle and clinical application. Bioluminescence, Sound and its characteristics, functions of ear as hearing organ, physical basis of hearing transmission of sound waves in the ear, mechanism of hearing. Physical basis of voice, effect of noise in the body, measurement of sound intensity and loudness.

Influence of gravity, weightlessness, temperature regulation in space, effect of G-force. Effect of low barometric pressure. Higher altitude changes in body. Decompression: physical factors involved in diving, physiological vibrations. Raynaud's phenomenon microwaves and their biological effects, penetration and propagation.

Unit: X

Biophysical properties of plasma. viscosity of blood. Concept of viscosity for Newtonian and non-newtonian. Windkessel function, Perisewille's law. Blood flow-laminar and turbulant flow measurement of blood flow, laplace's law. Physical laws determining blood pressure measurement and recording of arterial blood pressure.

Unit: XI

True and colloidal solutions and its comparison, their biological importance. General properties, Separation colloids. Ultracentrifugation, artificial kidney. Concept of macromolecules. Methods of expression of concentration of solution. Hydrogen ion concentration (PH) and its determination. Acid, base and salt and their biological significance buffers and buffering system. Hendeson-hasselbatch, equation. Acid- base balance.

Unit: XII

Principle of computer, application of computers in biology and medicine. Bio-statistic-mean median, mode, standard deviation. correlation and regression. T-test, chi-square test, frequency distribution, hypothesis test for means and propositions, ANOVA.

Note :- Pattern of Question Paper

1. Objective type paper
2. Maximum Marks :180
3. Number of Questions :180
4. Duration of Paper : Three Hours
5. All questions carry equal marks.
6. There will be Negative marking.
