

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF LECTURER IN ZOOLOGY FOR COLLEGE EDUCATION DEPARTMENT

PAPER-II

- 1 **Cell and Molecular Biology:**
 - (a) Microscopic techniques: Florescence, Phase contrast, Confocal, Electron and Atomic force microscopes.
 - (b) Tissue preparation for different microscopes- Histochemical and immunochemical techniques- Histochemical staining of Nucleic acids and Enzymes. Antibody generation, ELISA, RIA, Blotting techniques, Immunocytochemical techniques, FISH, GISH.
 - (c) Radiolabelling Techniques; Types and properties of Radio isotopes, Tracer techniques, Autoradiography and safety guidelines.
 - (d) Electrophoresis, Centrifugation, Chromatography, Colorimetry Spectrophotometry.
 - (e) Structure and function of cell and cytoplasmic constituents: Structure of nucleus, plasma membrane, mitochondria, Golgi bodies, endoplasmic reticulum, lysosomes and ribosomes. Cell cycle and cell division.

- 2 **Gene structure and function:**
 - (a) Structure and types of nucleic acids.
 - (b) **DNA replication, repair and recombination** (Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination).
 - (c) **RNA synthesis and processing** (transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and polyadenylation, structure and function of different types of RNA, RNA transport).
 - (d) **Protein synthesis and processing** (Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Postranslational modification of proteins).
 - (e) **Control of gene expression at transcription and translation level** (regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing).

- 3 **Cell to Cell Communication and Cell signaling:**
- (a) **Host parasite interaction** Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.
 - (b) **Cell signaling** Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, light signaling in plants, bacterial chemotaxis and quorum sensing.
 - (c) **Cellular communication** Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.
 - (d) **Cancer:** Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.
- 4 **Genetics:**
- (a) Mendelian laws of inheritance, recombination, linkage, linkage maps and crossing over. Multiple alleles.
 - (b) Mutation – Natural and induced mutations. Chromosome number and forms, structural rearrangements; Polyploidy.
 - (c) Cytoplasmic inheritance.
 - (d) Elements of human genetics – normal and abnormal karyotypes, genes and diseases, eugenics.
 - (e) Sex chromosomes and sex determination.
- 5 **Biotechnology-**
- (a) Isolation and purification of RNA , DNA (genomic and plasmid) and proteins. Different separation methods.
 - (b) Analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, Isoelectric focusing gels.
 - (c) Molecular cloning of DNA & RNA fragments in bacterial and eukaryotic systems.
 - (d) Expression of recombinant proteins using bacterial, animal and plant vectors.
 - (e) Isolation of specific nucleic acid sequences, Generation of genomic and cDNA libraries.
 - (f) Plasmid, phage, cosmid, BAC and YAC vectors.
 - (g) *In vitro* mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms.
 - (h) Protein sequencing methods, detection of post translation modification of proteins. DNA sequencing methods, strategies for genome sequencing.
 - (i) Methods for analysis of gene expression at RNA and protein level, large scale expression, such as micro array based techniques.

- (j) Isolation, separation and analysis of carbohydrate and lipid molecules.
- (k) RFLP, RAPD and AFLP techniques.

6 **Human Physiology:**

- (a) Chemistry of carbohydrates, proteins, lipids and nucleic acids. Enzymes and hormones. Biological oxidation. Metabolism of carbohydrates, protein and lipids.
- (b) Cell Physiology- Structure, types and mechanism of muscle contraction. Structure of neuron and transmission of axonic and synaptic nerve impulse.
- (c) Functions of sensory organs concerned with vision, sound perception, taste, smell and touch.
- (d) Physiology of Gastrointestinal tract: Contractility, Secretion of digestive juices, GI hormones. Mechanism of digestion and absorption.
- (e) Physiology of Respiration: Pulmonary ventilation and gaseous exchange.
- (f) Structure and Circulation of Blood: Blood structure and functions, blood groups, clotting of blood, elementary idea of immunology. Structure and functions of the heart, Cardiac Cycle, Heart Beat, and its chemical regulation.
- (g) Physiology of Excretion: Kidney structure, urine formation, counter current mechanism, regulation of electrolyte and water balance of the body.
- (h) Endocrine Physiology: Structure, functions of Pituitary, Thyroid, Parathyroid, Adrenal, Islets of langerhans and pineal gland.
- (i) Physiology of Reproduction: Structure and hormones of Ovary & Testis. Hormonal control of gametogenesis and menstrual cycle.
- (j) Placentation, Gestation and Parturition.

7 **Statistical application in Biology –**

- (a) Mean, median, mode, students "t" test, chi-square test, standard deviation.
- (b) Correlation and regression, variance and analysis of variance.
- (c) Computer applications in biology – fundamentals of computers, history and generations.

Note :-

Pattern of Question Paper

1. **Objective type paper**
2. **Maximum Marks : 75**
3. **Number of Questions : 150**
4. **Duration of Paper : Three Hours**
5. **All questions carry equal marks.**
6. **There will be Negative Marking.**

