

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR ZOOLOGY

UNIT-1: BIOMOLECULES AND THEIR INTERACTION

Structure of atoms, molecules and chemical bonds, Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). Proteins: Levels of organization, Primary, Secondary, Tertiary, Quaternary, General properties and classification, Denaturation, Carbohydrates: General features and classification, Saturated & Unsaturated fatty acids, lipids triacylglycerols, waxes, Phospholipids, Glycolipids, Steroids, Lipoprotein, Prostaglandins, Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA, Glycolysis, Glycogenesis, Glycogenolysis & Gluconeogenesis, Citric acid cycle, Fatty acid oxidation, Coenzymes and their types, Isoenzymes, Inhibition of enzyme activity. Irreversible inhibition, Reversible inhibition, Competitive, Non-competitive, Uncompetitive, Feedback inhibition: Allosteric site - a concept, Allosteric inhibition,

UNIT-2: FUNDAMENTAL PROCESSES

Unit of replication, enzymes involved, replication origin and replication fork, the fidelity of replication, extra-chromosomal replicons, DNA damage and repair mechanisms, RNA synthesis and processing, Transcription factors and machinery, the formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure, and function of different types of RNA, Protein synthesis and processing: Ribosome, the formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post-translational modification of proteins, Control of gene expression at transcription and translation level

UNIT-3: ECOLOGY AND ENVIRONMENTAL PROCESSES

The Environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement, Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and k selection); concept of metapopulation - demes and dispersal, interdemec extinctions, age structured populations. Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Ecological Succession: Types;

mechanisms; changes involved in succession; concept of climax. Trophic pyramids and food webs.

UNIT-4: GENETICS AND INHERITANCE BIOLOGY

Structure of chromatin: heterochromatin, euchromatin, Nucleosome model, Chromosome structure: Prokaryotes, Eukaryotes, Telomere structure, Centromere, Kinetochore, Specialized chromosomes: Lampbrush chromosomes, Polytene chromosomes, Mitochondrial Genome and Chloroplast Genome Numerical and structural chromosomal Variations in Human, Numerical Changes and their genetic implications, Polyploidy, Aneuploidy, Numerical Change associated disorders in humans, Structural chromosome alterations: Deletions, Duplications, Inversions, Translocations, Structural changes associated disorders in humans, Mutation: Types, causes and detection, mutant types - lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants, insertional mutagenesis

UNIT-5: CELLULAR ORGANIZATION

Membrane structure and function (Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes). Structural organization and function of intracellular organelles, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, vacuoles. Operon, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, Cell division, cell cycle (Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle)

UNIT-6: CELL SIGNALLING AND IMMUNOLOGY

Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, 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. Cancer Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, apoptosis, Immune cells and organs of immune system, Primary, Secondary and Tertiary tissues and organs of immune system, B-Lymphocytes and T-Lymphocytes, Antibody: Types, Structure.

UNIT-7: ANIMAL PHYSIOLOGY

Animal Nutrition: Modes of animal nutrition, Digestion and its control, Salivary digestion, Gastric digestion, Intestinal digestion and digestion enzymes, Absorption in Gastro-intestinal tract: Carbohydrates, Amino acids, Lipids and other substances, Blood: Composition and Functions, Blood coagulation, Blood groups and transfusion, Heart and its working, Heart Beats (in mammals), Origin, rhythmicity and conduction, Nervous regulation, Chemical regulation, Electro-cardiogram, Cardiac cycle in man, The exchange vessels, Respiration, Nervous regulation of respiration (in mammals), Excretory physiology (in mammals), Detailed structure of nephron, Glomerular functions, Tubular functions, The rennin-angiotensin system, Aldosterone system, Nerve impulse origin and propagation, ion channels, Synapsis and transmitters, Endocrinology and reproduction - Endocrine glands, basic mechanism of hormone action, hormones and diseases.

UNIT-8: EVOLUTIONARY BIOLOGY

Lamarck; Darwin—concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concept of Oparin and Haldane; Experiment of Miller; The first cell; Evolution of prokaryotes; Origin of eukaryotic cells, Evolutionary time scale: Eras, period and epoch, Population genetics - Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution; Stages in primate evolution including Homo; Altruism and evolution-Group selection, Kin selection, Reciprocal altruism

UNIT-9: DEVELOPMENTAL BIOLOGY

Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; gonadotropin: types and functions, Sex steroids: Biosynthesis & Role in Reproduction, Corpora lutea, their structure and function, Atresia: formation and significance, Spermatogenesis: Process, Ultra structure of sperms, Spermiogenesis, Oogenesis: Process, Vitellogenesis, Types of eggs and Egg membranes, Fertilization process, Capacitation, Recognition between male and female gamete, Acrosome reaction of sperm, Cortical reaction of egg, Sperm penetration into egg, Amphimixis, Menstrual cycle, Cleavage and blastulation, Characteristics and Mechanism of cleavage, Patterns of cleavage, Types of blastula, factors involved in shaping the blastula (Blastulation in sea urchin, frog), Gastrulation, Process of gastrulation, Metamorphosis in Amphibians, axes and pattern formation in *Drosophila*, organogenesis - vulva formation in *Caenorhabditis elegans*.

UNIT-10: ANIMAL DIVERSITY

Invertebrates: General characters and classification up to order level. Locomotion in Protozoa. Canal system in *Sycon*, Polymorphism in Hydrozoa, Parasitic adaptations in roundworms, Metamerism of Annelids, Social organization in insects-Honey bee, Torsion of Mollusca. Water vascular system in Asterozoa, Retrogressive Metamorphosis in Urochordata, Vertebrates: General characters and classification up to class level, Scales in fishes, Flight adaptations in birds. Plankton and benthos: definition, classification and its role in fishery, Concept and Types of Symbiotic Relationships, Types of Parasite, Vectors and Hosts.