Syllabus for PET-2026 (Zoology)

UNIT I

1. A) MOLECULES AND THEIR INTERACTION RELAVENT TO BIOLOGY, B) CELLULAR ORGANIZATION C) FUNDAMENTAL PROCESSES

A) a) Structure of atoms, molecules and chemical bonds. b) Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins). c) Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). d) Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties). e) Stability of proteins and nucleic acids. f) Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins.

B) a) Structural organization and function of intracellular organelles (Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility). b) Organization of genes and chromosomes (Operon, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, chromatin, transposons). c) Cell division and cell cycle (Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle). Stress response.

C) a) DNA replication, repair and recombination (Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extra chromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination). b) 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). c) Control of gene expression at transcription and translation level (regulating the expression of phage, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing).

UNIT II

2. A) Cell communication and cell signalling, B) Developmental biology

A) a) Host parasite interaction Recognition and entry processes of different pathogens like bacteria, viruses into animal, b) Cell signalling Hormones and their receptors, c) Cancer Genetic rearrangements in progenitor cells, oncogenes, tumour 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. d) Innate and adaptive immune system Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity. B and T cell epitopes, structure and function of antibody molecules, humoral and cell mediated immune responses, the complement system, cell-mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial

(Tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiency, vaccines.

B) a) Basic concepts of development : Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenic in analysis of development b) Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals, zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals. c) Morphogenesis and organogenesis in animals, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination. Programmed cell death, aging and senescence

UNIT III

3 A) SYSTEM PHYSIOLOGY- ANIMAL , B) INHERITANCE BIOLOGY

A) a) Blood and circulation - Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis. b) Blood and circulation,

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiac cycle, heart as a pump m ,. Respiratory system , Nervous system, Sense organs, Excretory system ,.Thermoregulation , Stress and adaptation, Digestive system ,Endocrinology and reproduction, Endocrine glands, mechanism of hormone action, hormones and diseases; reproductive processes, gametogenesis, ovulation, neuroendocrine regulation

B) a) Mendelian principles: Dominance, segregation, independent assortment. Co- dominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity. b) Concept of gene : Allele, multiple alleles, c) Concept of gene: Allele, multiple alleles, pseudo allele, gene interactions, linkage and crossing over, sex linkage, sex limited and sex influenced characters, Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, Genetic disorders. d) Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications. e) Homologous and non-homologous recombination including transposition.

UNIT IV

4 A) DIVERSITY OF LIFE FORMS, B) ECOLOGICAL PRINCIPLES C) EVOLUTION AND BEHAVIOUR

A) a) Principles & methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitative methods of taxonomy of plants, animals and microorganisms. b) Levels of structural organization: Unicellular, colonial and multicellular forms. Levels of organization of tissues, organs & systems. Comparative anatomy, adaptive radiation, adaptive modifications. c) Outline classification of animals important criteria used for classification in each taxon. Classification of animals. Evolutionary relationships among taxa, d) Organisms of conservation concern: Rare, endangered species. Conservation strategies.

B) a) The environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept of habitat and niche; resource, biodiversity. b) Ecosystem ecology, Ecosystem structure, ecosystem function. c) Applied ecology; Environmental pollution, Global environmental change d) Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

C) a) Emergence of evolutionary thoughts Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection, Mentalism, The first cell; Evolution of prokaryotes; b) Origin of eukaryotic cells; Evolution of unicellular eukaryotes, c) The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale; Stages in primate evolution including Homo, d) Molecular Evolution: Population genetics – e) Population genetic , Gene pool, Gene frequency; natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms, Speciation. ; Isolating mechanism, Convergent evolution; Sexual selection co-evolution \

UNIT V

5 A) APPLIED BIOLOGY, B) METHODS IN BIOLOGY

A) Microbial fermentation and production of small and macro molecules, Application of immunological principles, vaccines, diagnostics. Tissue and cell culture methods for animals, transgenic animals, and molecular approaches to diagnosis and strain identification, Genomics and its application to health including gene therapy, Bio resource and uses of biodiversity, Breeding in animals.

B) Molecular Biology and Recombinant DNA methods, Histochemical and Immune techniques, Biophysical Method, Statistical Methods, Radio labelling techniques, Microscopic techniques, Electrophysiological methods, Methods in field biology.