

Unit 1. INTRODUCTION TO SYSTEMATICS & NON-CHORDATES

Introduction to systematics: terms & definitions. Introduction & types of taxonomic characters. General characters and classification up to class level of Protozoa, Porifera, Coelenterata, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca & Echinodermata. Locomotion & nutrition in Protozoa. Canal system & skeletal elements in Porifera. Polymorphism in coelenterates. Morphology, life cycle and pathogenicity of *Taenia solium* & *Ascaris lumbricoides*. Filter feeding in polychaetes. Mouth parts in insects & insect metamorphosis. Modification of foot in molluscs & torsion in gastropods. Water vascular system & larval forms in Echinodermata.

UNIT 2. INTRODUCTION TO CHORDATES

Origin & evolution of Chordates. General characters and outline classification of chordates. Distribution of vertebrates in different Zoogeographical realms. General characters and classification of Protochordata, Pisces, Amphibia, Reptilia, Aves and Mammalia up to order level. Retrogressive metamorphosis in urochordates. Migration & osmoregulation in fishes. Parental care in amphibians. General features of poisonous and non- poisonous snakes. Flight adaptations in birds. Adaptive radiation in mammals with reference to locomotory organs.

UNIT 3. COMPARATIVE ANATOMY OF VERTEBRATES

Comparative structure of integument in vertebrates & its derivatives- scales, beaks, horns, digital tips- claws, hooves & nails. Feathers- structure & types. Hair- structure & development. Epidermal glands- mucous, preening, sweat, sebaceous & mammary. Structural organization of gastrointestinal tract and its associated glands. Teeth: development, structure & types; dental formula in mammals. Kidneys-structure & position: urinary ducts, bladders, structure of nephrons. Evolution of kidney. Heart-structure & types, blood vessels- structure & development. Formation & composition of blood & lymph. Structure of gills, lungs & air sacs; accessory respiratory organs. Origin and phylogeny of lungs. Nervous system: CNS& PNS, sense organs- eye & ear. Endocrine glands-structural organization. Skeletal & muscular system. Male & female reproductive systems.

UNIT 4. COMPARATIVE PHYSIOLOGY OF VERTEBRATES

Physiology of gastrointestinal tract and its associated glands, mechanical & chemical digestion. Absorption of food, neuro-endocrine control on digestion. Nature of excretory wastes & osmoregulation. Mechanism of urine formation & its regulation, urea cycle. Mechanism of respiration: respiratory volumes and capacities, respiratory pigments. Transport of respiratory gases, oxygen dissociation curve, regulation of respiration. Physiology of blood circulation: cardiac cycle, heart rate, cardiac output and its regulation. Physiology of blood and lymph, coagulation of blood. Conduction of nerve impulse: reflex action & its types. Physiology of vision & hearing. Hormones- nature, functions, mode of action & regulation, hormonal disorders. Physiology of muscle contraction. Physiology of male & female reproduction, reproductive cycle in female primates with regulation.

UNIT 5. FUNDAMENTALS OF IMMUNOLOGY

Historical background & scope of immunology. Cells, tissues and organs of the immune system. Innate immunity and acquired immunity. Vaccines and their types. Antigens: nature & types, antigen processing & presentation; MHC: functions & types. Antibodies: structure,

P.G. Zoology Entrance Syllabus (2 Year) as per NEP-2020 W.E.F. 2026

types & functions, theories of antibody formation, monoclonal antibodies. Cytokines: types, properties and functions. Complement system: components & pathways of its activation. Immune deficiencies: primary & secondary, stem cell, T & B-cell & complement deficiencies. Tumor immunology: immune surveillance, tumor associated antigens & tumor escape mechanisms. Tumor immunotherapy. Concept & classification of hypersensitivity reactions. Mechanism of type I & type II hypersensitivity reactions. Autoimmune diseases with emphasis on AI anemia's & rheumatoid arthritis. Transplantation immunology- types of grafts, mechanism of homograft rejection.

UNIT 6. FUNDAMENTALS OF PARASITOLOGY

Animal associations with special emphasis on parasitism: terms & definitions in parasitology. Origin, evolution and distribution of parasites in animal kingdom, parasitic adaptations. Host parasite relationships. Zoonosis: definitions & types. Protozoan parasites of man with emphasis on *Entamoeba* & *Plasmodium*. Trematode parasites of man with emphasis on *Schistosoma* & *Paragonimus*. Cestode parasites of man with emphasis on *Taenia* & *Diphyllobothrium*. Nematode parasites of man with emphasis on *Ascaris* & *Ancylostoma*. Protozoan parasites of poultry (*Eimeria*) & cattle (*Babesia*). Trematode parasites of fish (*Diplozoon*) & ruminants (*Fasciola*). Cestode parasites of fish (*Adenoscolex*) & ruminants (*Moneizia*). Nematode parasites of aves (*Heterakis*) & ruminants (*Haemonchus*). Introduction to phyto-nematodes with emphasis on their ecology & biology. Morphology, Life-cycle, pathogenicity and management of *Meloidogyne*. General account and distinguished features of acanthocephalans. Acanthocephalan parasites of fish (*Pomphorhynchus*).

UNIT 7. ANIMAL ECOLOGY

Ecosystem components: biotic & abiotic. Ecosystems types: terrestrial & aquatic. Energy flow and mineral cycling (CNP). Ecological laws (Shelford's & Liebig' laws), food chain, food web, & ecological pyramids. Attributes of population: natality, mortality, immigration, emigration, life tables & survivorship curves. Population growth– exponential and logistic growth patterns, growth models. Life history strategies: r and k selection, clutch size and sex ratio. Population regulation– extrinsic and intrinsic factors. Community characteristics: dominance, diversity, species richness, abundance, stratification. Biotic interactions: intra-specific & inter-specific. Ecological succession: types & mechanisms: concept of climax community. Ecology niche: concept, types and examples.

UNIT 8. CELL & MOLECULAR BIOLOGY

Structural features of prokaryotic & eukaryotic cells. Cell Membranes: structure (models) & functions- active & passive transport. Eukaryotic cell organization: brief idea of structure and function of main cell organelles. Cell division & Cell cycle: mitosis and meiosis, regulation & control. Cell-cell interactions and modes of cell signalling. Signalling receptors & cellular response. Signal transduction pathways: MAP kinase and JAK/STAT pathways. Cancer biology: cancer and its types. Apoptosis. Carbohydrates, Lipids, Proteins, & Nucleic acids - structure, types & functions. Replication in prokaryotes & eukaryotes. DNA damage & repair. Transcription & its regulation in prokaryotes and eukaryotes. Translation and post translational modifications in eukaryotes.

UNIT 9. FUNDAMENTALS OF ENTOMOLOGY

Structure and composition of integument. Structure of head, thorax and abdomen. General features and outline classification of Apterygota up to order and sub-order level. General features and outline classification of Pterygota up to order level. Insect anatomy-digestive, excretory, respiratory, circulatory & nervous system. Sense organs: simple & compound eyes. Endocrine system & reproductive system. Insect physiology-digestion and assimilation, respiration. Physiology and biochemistry of haemolymph, haemocytes and their functions. Physiology of excretion and formation of uric acid.

UNIT 10. ANIMAL BEHAVIOUR

Home range, territoriality, dispersal & habitat selection. Food selection and optimal foraging theory. Genetic and environmental components in the development of behavior. Neural basis of behaviour: stimulus filtering & biological rhythms. Social organization in insects. Social behaviour in primates. Parental care in vertebrates. Communication in animals: auditory, visual, chemical and tactile. Courtship and mating systems. Learning behaviour in vertebrates. Migration in fishes. Migration in birds.

UNIT 11. PRINCIPLES OF ANIMAL GENETICS

Mendelian and non-Mendelian inheritance. Concept of gene: allele, multiple alleles, pseudoalleles & lethal alleles. Sex determination and sex-linked characteristics, dosage compensation in mammals. Gene interactions: complementary and supplementary genes, Pleiotropy. Concept of genomics and human genome project. Genetic mutations: gene & chromosomal. Genetic disorders and pedigree analysis. Linkage & Linkage maps. Ecological genetics & polymorphism - phenotypic & genotypic polymorphisms. Genetic drift & genetic equilibrium. Hardy-Weinberg law & its applications. Inbreeding & outbreeding: causes & reasons of inbreeding, heterosis. Gene cloning: an overview. Restriction endonucleases: types & end modification enzymes. Extraction and purification of nucleic acids: PCR & gel electrophoresis. Vectors: plasmid & cosmid, gene library.

UNIT 12. FUNDAMENTALS OF ICHTHYOLOGY

Outline classification of fishes with distinguishing characters up to orders. Adaptive radiation in Elasmobranchii and Actinopterygii. Structure, types and modification of scales & fins. Colouration in fishes. Digestive system and physiology of digestion in fishes. Structure and function of gills, Accessory respiratory organs, Swim bladder. Structure and function of heart and blood vessels. Structure and function of kidneys (Excretion and Osmoregulation). Reproductive organs in fishes (Teleost). Structure and function of the nervous system (Teleost). Sense organs and their function. Structure and function of endocrine organs. Endoskeleton in fishes: axial skelton (Typical trunk vertebrae and caudal vertebrae), appendicular skeleton (girdles). Structure & significance of Weberian ossicles. Musculature in fishes. Locomotion in fishes.