

## **71. ZOOLOGY**

### **Part-A (40 Marks)**

#### **Physiology and Biochemistry:**

**Digestion** Digestion definition and extra and intracellular digestion. Digestion of Carbohydrates, Proteins, Lipids and Cellulose. Absorption and Assimilation of digested food; role of Gastrointestinal hormones in digestion **Respiration** Definition of Respiration and Respiratory mechanisms-External, Internal and cellular.

Respiratory Pigments; Transport of oxygen, Oxygen dissociation curves. Bohr's effect. Transport of CO<sub>2</sub> – Chloride shift; Regulation of respiration – nervous and chemical **Circulation** Types of circulation - Open and Closed circulation Structure of Mammalian Heart, Types of hearts – Neurogenic and Myogenic; Heart function -Conduction and regulation of heart beat. Regulation of Heart rate – Tachycardia and Bradycardia; Blood Clotting mechanism. **Excretion** Classification of Animals on the basis of excretory products- Ammonotelic, Uricotelic, Ureotelic, Structure and function of Nephron. Urine formation, Counter current mechanism.

#### **Physiology**

**Muscle Contraction:** Types of Muscles, Ultra structure of skeletal muscle fibre, Sliding Filament theory, muscle contraction mechanism and energetics. **Nerve Impulse** Structure of Neuron, Nerve impulse - Resting potential and Action potential and Conduction of Nerve impulse, Synapse, types of synapses and Synaptic transmission. **Endocrine System** Endocrine glands - Structure, secretions and functions of Pituitary, Thyroid, Parathyroid, Adrenal glands and Pancreas, Hormone action and concept of Secondary messengers, Male and Female Hormones, Hormonal control of Menstrual cycle in humans.

#### **Physiology and Biochemistry:**

**Homeostasis and Enzymes** Concept of Homeostasis. Mechanism of Homeostasis. Osmoregulation - Water and ionic regulation by freshwater, brackish water and marine animals, Enzymes: Definition, Classification, Inhibition and Regulation. **Biomolecules and Metabolism** Carbohydrates: Classification and function of Carbohydrates, Carbohydrate metabolism - Glycolysis, Krebs cycle, , Electron transport and oxidative phosphorylation. Proteins: Classification of proteins based on functions and Chemical nature, Protein Metabolism - Transamination, Deamination and Urea Cycle, Lipids: Classification of Lipids, Lipid Metabolism - Fatty acid synthesis and Fatty acid oxidation.

#### **Immunology and Animal Biotechnology:**

**Immunology – Basic concepts; antigens and antibodies** Basic concepts of immunology. Cells of immune system, Primary and secondary Organs of immune system, Types of Immunity – Innate and acquired, Basic properties of antigens, Structure, function and types of an antibody. B and T cell epitopes, haptens, adjuvants. Antigen-antibody reactions, T-Cell and B-Cell activation, Monoclonal antibodies and their production. **Working of an Immune system; Immune system in health and disease** Structure and functions of major histocompatibility complex. Basic properties and functions of Cytokines, Interferons and complement proteins, Humoral and Cell mediated immunity. Types of hyper sensitivity. Concepts of autoimmunity and immunodeficiency. Introduction to Vaccines and types of Vaccines. **Animal Biotechnology and Genetically modified organisms** Concept and Scope of Animal Biotechnology. Cloning vectors - Plasmids, Cosmids, Lambda bacteriophage, YAC Cloning- Cloning methods (Cell, Animal and Gene cloning) Animal Cell culture - Equipment and materials for animal cell culture; applications of cell culture techniques Recombinant DNA technology and its applications, Transgenesis – Methods of Transgenesis. Production of Transgenic animals and Application of Transgenic animals in Biotechnology. Stem cells –types and their applications.

**Part-B (60 Marks)****Animal Diversity – Invertebrates**

**Brief history of Invertebrates:** Kingdom Animalia, Brief history of Invertebrates. **Protozoa** General characters Classification up to classes with examples, Type study – *Elphidium*, Life cycle of *Plasmodium*. Locomotion, Reproduction and Diseases. **Porifera** General characters, Classification of Porifera up to classes with examples, Type study – *Sycon*, Canal system in sponges and Spicules. **Cnidaria** General characters, Classification of Cnidaria up to classes with examples, Type study – *Obelia*, Polymorphism in hydrozoa, Corals and coral reef formation. **Platyhelminthes** General characters Classification of Platyhelminthes up to classes with examples, Type study-*Schistosoma*. **Nemathelminthes** General characters Classification of Nemathelminthes up to classes with examples Type study-*Dracunculus*, Parasitic Adaptations in Helminthes.

**Annelida** General characters, Classification of Annelida up to classes with examples Type study - *Hirudinaria granulosa*. Evolutionary significance of Coelome and Coelomoducts and metamerism.

**Arthropoda** General characters, Classification of Arthropoda up to classes with examples, Type study – Prawn, Mouth parts of Insects, Insect metamorphosis, *Peripatus* - Structure and affinities. **Mollusca** General characters, Classification of Mollusca up to classes with examples, Type study – *Pila*, Pearl formation, Torsion and detorsion in gastropods. **Echinodermata** General characters, Classification of Echinodermata up to classes with examples, Water vascular system in star fish, Echinoderm larvae and their significance. **Hemichordata** General characters, Classification of Hemichordata up to classes with examples, *Balanoglossus* - Structure and affinities.

**Ecology, Zoogeography and Animal Behavior:**

**Ecology-I:** Ecosystem structure and functions. Types of Ecosystems –Aquatic and Terrestrial. Biogeochemical cycles - Nitrogen, Carbon, Phosphorus and Water. Energy flow in ecosystem. Food chain, food web and ecological pyramids. Animal Associations - Mutualism, commensalism, parasitism, competition, predation.

**Ecology-II:** Concept of Species, Population dynamics and Growth curves. Community Structure and dynamics and Ecological Succession. Ecological Adaptations. Environmental Pollution – Sources, Effect and Control measures of Air, Water, Soil and Noise Pollution. Wildlife conservation-National parks and Sanctuaries of India, Endangered species. Biodiversity and hotspots of Biodiversity in India.

**Zoogeography:** Zoogeographical regions – Palaeartic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities, Wallace line, Discontinuous distribution Continental Drift. **Animal Behaviour** Types of Behaviour- Innate and Acquired, Instinctive and Motivated behavior, Taxes, Reflexes, Tropisms, Physiology and phylogeny of learning, trial and error learning, Imprinting, habituation, Classical conditioning, Instrumental conditioning, Social behavior, Communication, Pheromones, Biological rhythms, Biological clocks, Circadian rhythms.

**Animal Diversity- Vertebrates and Developmental Biology:**

**Urochordata, Cephalochordata, Cyclostomata:** Salient features of Urochordata, Retrogressive, metamorphosis and its significance in Urochordata, Salient features and affinities of Cephalochordata General characters of Cyclostomata, Comparison of the *Petromyzon* and *Myxine*, General characters and classification of Chordata upto orders with examples. **Pisces** General characters of Fishes, Classification of fishes up to order level with examples, *Scoliodon* – Respiratory, Circulatory and Nervous system. Types of Scales and types of Fins

**Amphibia** General characters of Amphibians, Classification of Amphibians up to orders with examples. *Rana tigrina*-Respiratory, Circulatory and Nervous system. Parental care in amphibian; neoteny and paedogenesis.

**Reptilia:** General characters of Reptilia, Classification of Reptilia up to orders with examples, *Calotes* – Respiratory system, Circulatory and Nervous system. Temporal fosse in reptiles and its evolutionary importance, Distinguished characters of Poisonous and Non poisonous snakes. Rhynchocephalia. **Aves** General characters of Aves, Classification of Aves up to orders with examples. *Columba livia* -, Digestive system, Circulatory systems, Respiratory system and Nervous, system. Migration in Birds, Flight adaptation in Birds, **Mammalia** General characters of Mammalia, Classification of Mammalia up to orders with examples Rabbit-Digestive, Respiratory, Circulatory and Nervous system. Dentition in mammals. Aquatic adaptations in Mammals. **Developmental Biology and Embryology** Gametogenesis (Spermatogenesis and Oogenesis) Fertilization, Types of eggs, Types of cleavages, Development of Frog up to formation of primary germ layers Formation of Foetal membrane in chick embryo and their functions, Types and functions of Placenta in mammals, Regeneration in Turbellaria and Lizards.

### **Cell Biology, Genetics & Evolution:**

**1. Cell Biology** Cell theory, Differences of Prokaryotic and Eukaryotic cells, Ultrastructure of animal cell, Structure and functions of plasma membrane proteins. Structure and functions of cell organelles –Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, centrosomes, Mitochondria and Nucleus Chromosomes – Structure, types, giant chromosomes, Cell Division - Mitosis, Meiosis. Cell cycle and its regulation. **2. Molecular Biology** DNA (Deoxyribo Nucleic Acid) – Structure, RNA (Ribo Nucleic Acid) - Structure, types, DNA Replication, Protein Synthesis – Transcription and Translation, Gene Expression – Genetic Code; operon concept, Molecular Biology Techniques- Polymerase Chain Reaction, Electrophoresis **3. Genetics** Mendals laws of Inheritance and Non-Medelian Inheritance, Linkage and Crossing over, Sex determination and sex-linked inheritance, Chromosomal Mutations- Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy. Gene mutations- Induced versus Spontaneous mutations. Inborn errors of metabolism. One gene one enzyme, one gene one polypeptide theory. **4. Evolution** Theories of evolution – Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism, Modern synthetic theory. Evidences of Evolution and Hardy Weinberg Law. Forces of Evolution – mutation, gene flow, genetic drift, and natural selection. Isolation – Pre-mating and post mating isolating mechanisms, Speciation: Methods of speciation- Allopatric and sympatric Causes and Role of Physiology and Biochemistry.