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 **ZOOLOGY**

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**Paper I**

**B.Sc-I**

**Place of Zoology in Science**

A One- World View: Genetic Unity, the Fundamental Unit of Life, Evolutionary Oneness and Diversity of Life, Environment and World Resources What are Zoology? The Classification of Animals; the Scientific: The Scientific Method.

1. **The Chemical Basic of Animal Life**

Atoms And Elements; Building Blocks Of All Matter; Compounds Molecules: Aggregates of Atoms; Acids, Bases, and Buffer; The Molecules Of Animals; Fractional Account of Carbohydrates, Lipids, Proteins, Nucleotides and Nucleic Acids Based on Their Structural Aspects.

1. **Cells, Tissues, Organs, and Organ System of Animals**

Structure and Function of Cell Membranes; Various Movements Across Membranes; Cytoplasm, Organelles and Cellular Components: Functional Account Of Ribosome, Endoplasmic Reticulum Golgi apparatus Lysosomes, Mitochondria Cytoskeleton Cilia and Flagella, Centrioles and Microtubules, and Vacuoles Based and on Their Structural Aspects: The Nucleus: Nuclear Envelope, Chromosomes and Nucleolus. Tissues Diversity in Epithelia Tissue, Connective Tissue, Muscle Tissue, and Nervous Tissue to Perform Various Functions. Structural Integrations for Functions in Organs and Organ Systems.

1. **Energy and Enzymes: Life’s Driving and Controlling Force**

Energy and The Laws of Energy Transformation; Activation Energy; Enzymes: Structure, Function and Factors Affecting Their Activity; Cofactors and Coenzymes; ATP: How Cells Convert Energy? An Overview.

1. **How Animals Harvest Energy Stored In Nutrients**

 **Glycolysis:** The First Phase of Nutrient Metabolism; Fermentation “Life With Out Oxygen” Aerobic Respiration: The Major Source of ATP; Metabolism of Fast And Proteins Control of Metabolism; The Metabolic Pool.

1. **Cell Division**

Mitosis Cytokines, and the Cell Cycle: An Overview: Control of the Cell Cycle Meiosis: The Basis of Sexual Reproduction, Gamete Formation.

1. **Inheritance Patterns**

The Birth of Modern Genetic; Medline Inheritance Patterns; Other Inheritance Patterns; Environmental Effects And Gene Expression.

1. **Chromosomes and Gene Linkage**

Eukaryotic Chromosomes Linkage Relationship Changes in Chromosomes Number and Structure

1. **Molecular Genetic Ultimate Cellular Control**

DNA the Genetic Material; DNA Replication in Eukaryotes; Genetic in Action; Controls Gene Expression in Eukaryotes; Motions; Applications of Genetic Technologies. Recombinant DNA

1. **Ecology I: Individuals and Populations**

Animals and Their A biotic Environment Populations; Inter specific Interaction.

1. **Ecology II: Communities and Ecosystems**

Community Structure and Diversity; Ecosystems: Ecosystems of Earth; (Terrestrial and A quite) Ecological Problems; Human Population, Recourse Depletion and Biodiversity.

1. **Animal Behavior**

Four Approaches to Animals Behavior; Proximate and Ultimate Causes; Anthropomorphism; Development of Behavior; Learning; Control of Behaviors; Communication; Behavioral Ecology; Social Behavior.

1. **Evolution A Historical Perspective**

Pre-Darwinian Theories of Change; Lamarck: An Early Proponent of Evolution; Early Development of Darwin’s Ideas of Evolution and Evidences; The Theory of Evolution by Natural Selection; Evolutionary Thought After Darwin; Biogeography.

1. **Evolution and Gene Frequencies**

The Modern Synthesis: A Closer Look; The Hardy-Weinberg Theorem; Evolutionary Mechanisms: Population Size, Genetic Drift, Neutral Selection, Gene Flow, Mutation, and Balanced Polymorphism; Species and Speciation; Rates of Evolution; Molecular Evolution, Mosaic Evolution.

**Practical’s (50 Marks)**

**PRINCIPLE OF ANIMAL LIFE**

1. Tests for Different Carbohydrates, Proteins and Lipids.

(Emphasis on the Concept That Tests Materials Has Been Ultimately Obtained From Living Organisms)

1. Study of the Prepared Slides of Squamous, Cuboidal, Columnar Epithelial Tissues, Adipose. Connective, Cartilage Bone, Blood, Nervous, Skeletal Muscle, Smooth Muscle and Cardiac Muscle Tissues.

(Prepared Microscopic and/or Projection Slides and/or C D Rom Computer Projections Be Used)

1. Plasmolysis and Deplasmolysis In Blood.
2. Protein Digestion by Pepsin.
3. Study of Mitosis in Onion Root Tip.
4. Study Of Meiosis Grasshopper Testis (Students Should Prepare The Slide )
5. Problem Based Study of Mendilian Ratio in Animals.
6. Multiple Ales Study in Blood Groups.
7. Survey and Study of a Genetic Favors in Population and Its Frequency.
8. Study of Karyotypes of drosophila */*Mosquito.
9. Study of Cytochemical Demonstration of DNA and RNA in Protozoa and Avian Blood Cell.
10. Study of Early Stages in the Development of an Echinoderm.
11. Study of Early Stages in the Development of a Frog, Chick and a Mammal.
12. Demonstration Of Social Behaviors (Documentary Film Be Shown).
13. Ecological Notes on Animals of Few Model Habitats.
14. Field Observation And Report Writing On Animals In Their Ecosystem (A Terrestrial And An Aquatic Ecosystem Study).

**PAPER- II**

**INVERTEBRATES AND CHORDATES DIVERSITY:**

**(Classification, Phylogeny and Organization)**

1. **Introduction:**

Classification of Organism; Evolutionary Relationships and Tree Diagrams; of Organization.

1. **Animal –Like Porticos: The Protozoa.**

**Evolutionary Prospective;** Life within a Single Plasma Membrane; Symbolic Life Styles. Protozoan Taxonomy: (Up to Phyla, Subphyla and Super Classes, Wherever Applicable) Pseudopodia and Amoeboid Locomotion; Cilia and Other Pellicle Structures; Nutrition/ Genetic Control and Reproduction; Symbiotic Ciliates; Further Phylogenetic Considerations.

1. **Multi cellular and Tissue levels of organization**

Evolutionary perspective origins of multicellularity animals origins phylum poreferia cell types body wall and skeleton water currents and body forms maintenance functions phylum cnidaria (Coelentrarta) The body wall and nematocysts Alteration of Generation maintenance functions reproduction and classification up to class phylum ctenophora further phylogenic consideration.

1. **The Triploplastic Accelomate body plants**

Evolutionary perspective phylum platyhelminthes classification up to class the free living flatworm and the tape worm , phylum nemertea phylum gastrotricha further phylogenetic considerations.

1. **The pseudocoelemate body Plan: Aschelminths**

Evolutionary perspective : General characteristics classification up to phyla with external features feeding and the digestive system other organ systems reproduction and development of phylum Rotifera and phylum Nematoda Phylum Kinorhyncha some important nematode parasites of Human Further Phylogenetic Considerations

1. **Molluscan Success:**

Evolutionary perspective Relationship to other animals origin of coelom , Molluscan characteristics classification up to class The Characteristics of shell and associated structure feeding digestion gas exchange locomotion reproduction development other maintenance functions and diversity in gastropods Bivalves and cephalopods Further phylogentic considerations.

1. **Annelida The Metameric Body Form**

Evolutionary Perspective Relationship to other animals metamerisdm and tagmatization classification up to class External structure and locomotion feeding and digestive system gas exchange and circulation nervous and sensory functions

Excretion regeneration reproduction on polychacta oligochacta and Hirudinca further phylogenetic consideration.

1. **The arthropods : Blue print for success**

Evolutionary perspective Classification and relationship to other animals metamerism and tagmatization The Exoskeleton Metamorphosis Classification up to class further phylogenetic consideration.

1. **The Hexapods and Myriapods :** Terrestrial Triumphs

 Evolutionary perspective classification up to class external structure and locomotion nutrition and digestive system Gas exchange circulation and temperature regulation nervous and sensory functions excretion chemical regulation reproduction and development in hexapods insect behavior insect and human further Phylogenetic consideration .

1. **The Echinoderms**

Evolutionary perspective ; Relationship to other animals echinoderm characteristics up to class maintenance functions , regenerations reproductions and development in asteroids ophiuroidea ,Echonoidea holothuroidea and crinoidea further polugenetic consideration some lesser known invertebrates The lophorporates Entoprocts ,Cycliophores and chaectognaths.

1. **PRACTICAL PAPER-II**

**INVERTEBRATE AND CHORDATE DIVERSITY.**

**PHYLOGENY AND ORGANIZATION**

1. Study of Euglena, Amoeba, Entamoeba, Plasmodium, Trypanosoms, Paramecium as Representative of Animal like protects (prepared slides)
2. Study of sponges and their various body forms.
3. Principal of representatives of classes of phylum Cnidaria (Coelenterate)
4. Principal of representatives of classes of phylum Platyhelminthes.
5. Representatives of phylum Rotifera, phylum Nematoda.
6. Principal of representatives of classes of phylum Mollusca
7. Principal of representatives of classes of phylum Amelida
8. Principal of representatives of classes of phylum Arthropoda
9. Representatives of hemichordate and invertebrate chordate (Echinodermata)

**PAPER- III**

**CHORDATES DIVERSITY:**

**(Classification, Phylogeny and Organization)**

1. **Hemichordate and Invertebrates chordates**

Evolutionary perspective : phylogenic relationship ,classification up to subphylum or class where applicable further phylogenic consideration

1. **The Fishes : vertebrate success in water**

Evolutionary perspective : phylogenic relationship survey of super class agenda and Gnathostomata ,Evolutionary pressure : adaption in locomotion nutrition and the digestive system circulation gas exchange nervous and sensory functions excretion and osmo regulation ,reproduction and developmen5t further phylogenic consideration.

1. **Amphibians : The First terrestrial vertebrate:**

Evolutionary perspective ,polygenetic relationship survey of order caudate , gymnophiona and Anura evolutionary pressure adaption in external structure and locomotion nutrition and digestive system circulation ,gas exchange Temperature regulation nervous and sensory function excretion and osmoregulation ,reproduction development and metamorphosis further phylogenetic consideration

1. **Reptiles: The First Amniotes:**

**Evolutionary Prospective:** Cladistic Interpretation of the Amniotic Lineage; Survey of Order test Dines or Chelonian, Rhynchocephalia, Squamata, and Crocodilian; Evolutionary Pressure: Adaptation in External Structure and -------- Locomotion, Nutrition and the Digestive System, Circulation Gas Exchange, and Temperature Regulation, Nervous and Sensory Functions, Excretion and Osmoregulation, Reproduction and Development Further Phylogenic Consideration.

1. **Birds: Feathers, Flight, and Endothermic.**

Evolutionary Prospective: Phylogenic Relationships; Ancient Birds and the Evolution of Flight Diversity of Modern Birds; Evolutionary Pressure: Adaptation External Structure and Locomotion, Nutrition and the Digestive System, Circulation Gas Exchange, and Temperature Regulation, Nervous and Sensory Function, Excretion and Osmoregulation, Reproduction and Development

1. **Mammals: Specialized Teeth, Hair and Viviparty.**

Evolutionary Prospective: Phylogenic Relationships; Ancient Birds and the Evolution of Flight Diversity of Modern Birds; Evolutionary Pressure: Adaptation External Structure and Locomotion, Nutrition and the Digestive System, Circulation Gas Exchange, and Temperature Regulation, Nervous and Sensory Function, Excretion and Osmoregulation, Behavior, Reproduction and Development.

**PRACTICAL PAPER-III**

**CHORDATE DIVERSITY, PHYLOGEMY AND ORGANIZATION.**

1. Representative group of class fishes
2. Representative group of class Amphibia
3. Representative group of class Reptelia
4. Representative group of class Ayes
5. Representative group of class Mammalia
6. Field tips to study animal diversity with emphasis on their adaptions.
7. Brief notes on mercical/ economics importance of the following:

Plasmodium, Entamobia, histoltica, Leishmania, Liverfluke, Tapeworm, Earthworm, Silkworm, Cites butterfly,.

1. Preparation of permanent stained slides of the followings:

Paramecium, Obelia, Daphnia, Cestode, Parapodia of Nereis:

**Paper-IV**

**ANIMAL FORM AND FUNCTION-II**

**A Comparative perspective**

1. Protection, Support, and Movement Protection: the integumentary system of invertebrates and vertebrates; movement and support: the skeletal system of invertebrates and vertebrates; movement: non-muscular movement; an introduction to animal muscles; the muscular system of invertebrates and vertebrates.

2. **Communication** I: Nerves Neurons: structure and function; neuron communication: introductory accounts of resting membrane potential, action potential (nerve impulse) and transmission of the action potential between cells; invertebrate and vertebrate nervous systems: the spinal cord, spinal nerves, the brain, cranial nerves and the autonomic nervous system.

3. **Communication II:** Senses Sensory reception: baroreceptors, chemoreceptors, georeceptors, hygroreceptors, phonoreceptors, photoreceptors, proprioceptors, tactile receptors, and thermoreceptors of invertebrates; lateral-line system and electrical sensing, lateral-line system and mechanoreception, hearing and equilibrium in air, hearing and equilibrium in water, skin sensors of damaging stimuli, skin sensors of heat and cold, skin sensors of mechanical stimuli, sonar, smell, taste and vision in vertebrates. 27

4. **Communication III:** The Endocrine System and Chemical Messengers Chemical messengers: hormones chemistry; and their feedback systems; mechanisms of hormone action; some hormones of porifera, cnidarians, platyhelminthes, nemerteans, nematodes, molluscs, annelids, arthropods, and echinoderms invertebrates; an overview of the vertebrate endocrine system; endocrine systems of vertebrates, endocrine systems of birds and mammals.

5. **Circulation, Immunity, and Gas Exchange** Internal transport and circulatory systems in invertebrates: characteristics of invertebrate coelomic fluid, hemolymph, and blood cells; transport systems in vertebrates; characteristics of vertebrate blood, blood cells and vessels; the hearts and circulatory systems of bony fishes, amphibians, reptiles, birds and mammals; the human heart: blood pressure and the lymphatic system; immunity: nonspecific defenses, the immune response; gas exchange: respiratory surfaces; invertebrate and vertebrate respiratory systems: cutaneous exchange, gills, lungs, and lung ventilation; human respiratory system: gas transport.

6. **Nutrition and Digestion** Evolution of nutrition; the metabolic fates of nutrients in heterotrophs; digestion; animal strategies for getting and using food, diversity in digestive structures of invertebrates and vertebrates; the mammalian digestive system: gastrointestinal motility and its control, oral cavity, pharynx and esophagus, stomach, small intestine: main site of digestion; large intestine; role of the pancreas in digestion; and role of the liver and gallbladder indigestion.

7. **Temperature and Body Fluid Regulation** Homeostasis and Temperature Regulation; The Impact of Temperature on Animal Life; Heat Gains and Losses; Some Solutions to Temperature Fluctuations; Temperature Regulation in Invertebrates, Fishes, Amphibians, Reptiles, Birds and Mammals; Heat Production in Birds and Mammals; Control of Water and Solutes (Osmoregulation and Excretion); Invertebrate and Vertebrate Excretory Systems; How Vertebrates Achieve Osmoregulation; Vertebrate Kidney Variations; Mechanism in Metanephric Kidney Functions.

8. **Reproduction and Development** Asexual reproduction in invertebrates; advantages and disadvantages of asexual reproduction; sexual reproduction in invertebrates; advantages and disadvantages of sexual reproduction; sexual reproduction in vertebrates; reproductive strategies; examples of reproduction among various vertebrate classes; the human male reproductive system: spermatogenesis, transport and hormonal control, reproductive function; the human female reproductive system: folliculogenesis, transport and hormonal control, reproductive function; hormonal regulation in gestation; prenatal development and birth: the placenta; milk production and lactation.

9. **Descriptive Embryology** Fertilization; embryonic development: cleavage, and egg types; the primary germ layers and their derivatives; echinoderm embryology; vertebrate embryology: the chordate body plan, amphibian embryology, development in terrestrial environments, avian embryology, the fate of mesoderm.

**PRACTICAL PAPER-IV**

**ANIMAL FORM AND FUNCTION:**

**A Comparative Perspective**

1. Study of insect cuticle, fish scales, amphibian skin, reptilian scales, feathers and mammalian skin.
2. Study and notes on skeleton of labeo, Rana Tigrina Snake, Fowl and Rabbit, e.g. student are required to examine the snake skeleton, identify the parts, and write notes on its adaptive features.
3. Earthworm or leech; cockroach, freshwater mussel, Channa Catla or Lebeo or any othr local fish, Frog Pigeon and rat or mouse or rabbits are representative animals for study in dissection.