

Zoology

B.Sc.Part I

Paper I: Lower Non Chordate and Organic Evolution

Section A : Lower Non-Chordata

General survey and outline classification (upto orders only) of Protozoa, Porifera, Cnidaria (Coelenterata), Platyhelminthes and Nematoda Nutrition and locomotion in Protozoa ; Parasitism in Protozoa and Human diseases;

Canal system and skeleton in Porifera ;

Polymorphism and colony formation in Coelenterata ;

Parasitic adaptations in helminthes;

Helminthes and Human diseases; Classification, habit, habitat, structure, reproduction and life history of the following types Plasmodium, Paramecium, Sycon, Obelia, Fasciola and Taenia & Ancylostoma.

Section B : Organic Evolution

Origin of Life ; Evidences of organic evolution ; Theories of evolution (Lamarckism / Neo Lamarckisms / Darwinism / Neo Darwinism / Mutation Theory and Synthetic Theory) ; Evolution through ages and geological time Scale ; Zoogeographical realms and their characteristic fauna.

Paper II : Higher Non-Chordata (Anelida to Echinodermata) and Ecology.

Section A : Higher Non-Chordata

General characters and outline classification (upto orders only) of Annelida, Arthropoda, Mollusca and Echinodermata ; Classification, habit habitat, structure, reproduction and life history of the following types Hirudinaria, Palaemon, Pila, Unio (Lamellidens) and Asterias & Balanoglossus

Section B : Ecology

Organisms and their environment - Abiotic (temperature, light and moisture) and biotic (mutualism, commensalism, predation, parasitism, etc.) factors. Concept of ecosystem - types, components, energy flow, food chains and trophic levels and food web. Elementary knowledge of biogeochemical cycles (Water, carbon, nitrogen, phosphorus etc.) ; Biomes (Fresh water and terrestrial)

Paper III : Cell Biology and Genetics

Section A : Cell Biology

Basic concepts of microscopy - light microscope, phase contrast microscope and electron microscope ; Ultrastructure of prokaryotic and eukaryotic cell ; Ultrastructure, chemistry and functions of cell organelles (Plasma membrane, Mitochondrion, Golgi complex, Endoplasmic reticulum, Ribosome and Lysosome) ; Cell cycle, its regulation and cell divisions - mitosis and meiosis.

Section B : Genetics

Structure and types of chromosomes ; Linkage and crossing over Chromosomal and gene mutations ; DNA as genetic material - structure and replication ; RNA structure and its role in protein synthesis ; Human genetics - Karyotype, autosomal and sex chromosomal disorders, multiple births, sex linked inheritance ; Blood group and its inheritance

B.Sc.Part II :

Paper I : Protochordata, Cyclostomata Developmental Biology

Section A : Protochordata and Cyclostomata

General characters and outline classification (upto orders only) of Protochordata : Habit , habitat , structure, development, life history and affinities of : Urochordata : Herdmania ; Cephalochordata : Amphioxus (Branchiostoma) ; Cyclostomata : Habit, habitat and external features of Petromyzon and Myxine ; Comparison of Petromyzon and Myxine.

Section B : Developmental Biology

Basic concepts of gametes and gametogenesis Types of eggs and fertilization ; Process of cleavage and gastrulation with particular reference to frog and chick ; Metamorphosis ; Development of extraembryonic membranes in chick ; Placentation in mammals.

Paper II : Vertebrate Zoology

General characters and outline classification (upto orders only) of Craniata and the classification, habits, structure and life history of the following types :

Pisces: Scoliodon (Dogfish);

Reptilia : Uromastix ;

Aves: Columba (Pigeon)

Parental care in Amphibia ; Identification of poisonous and non-poisonous snakes ; Biting mechanism in snakes ; Snake venom and antivenin ; Adaptive radiation, general characteristics and affinities of Prototheria, Metatheria and Eutheria ; Comparative Study of integument, ceflimentary canal, Hert, Brain & Urinogenital system of Vertebrates.

Paper III : Mammalian Physiology and Biochemistry

Section A : Mammalian Physiology

Nutrition : Nutritional requirements, Physiology of digestion, Absorption and Assimilation, Role of hormones in digestion;

Respiration: Mechanism and regulation of breathing, Transport of oxygen and carbon dioxide,Respiratory disorders ;

Blood and Circulation : Structure of blood and its clotting, Cardic cycle,Heart beat and its regulation,Rhythmicity of heart beat,Arteriosclerosis, ECG and Pacemaker ; Excretion and Osmoregulation , Nitrogenous waste products,Nephron & Urine formation,Role of kidney in osmoregulation kidney failure and Dialysis ;

Structure and Mechanism of muscle contraction.

Nervous system: Conduction of nerve impulse, Reflex action;

Endocrine coordination: Hormones and functions of major endocrine glands (Pituitary, thyroid, parathyroid, thymus, adrenal cortex and medulla, pancreas etc.); Sex hormones and Menstrual cycle

Section B : Biochemistry

Metabolism : Protein , Carbohydrates liquids ; Structure , classification Chemistry and properties of Carbohydrates, lipids & protein ; Hydrogen ion concentration and Buffering mechanism ; Enzymes classification, Chemistry, properties, nomenclature and mechanism of enzyme action.

B.Sc.Part III

Paper I : Environmental Biology and Toxicology

Section A : Environmental Biology

Ecosystem :Types and dynamics , Trophic structure , Energy flow and Biological Amplification, Ecological Pyramids ;Community: Basic structure, Species Diversity, Dominance, Distribution and Succession ; Population : Human Population Growth and Control through Family Planning ; Environmental Pollution : Air , Water, Land , Noise, Thermal and Pesticide Pollution Wild Life Conservation : Causes for Wildlife Depletion, Chief endangered Animal species, Sanctuaries and National Parks.

Section B : Toxicology

Survey of Environmental Toxicants (heavy metals, pesticides, food additives, fertilizers and automobile emissions) and their Biological ill-effects on human beings ; Dose Response Relationship : Graded , Quantal and Cumulative Responses ; Outline of toxicological Testing Method ;Principal idea of mortality tests (LC50 / LD50) and safety margins / limits, acute subacute and Chronic Testing of local and systemic effects (reproductive, teratogenic and carcinogenic) ;Translocation of Chemicals: Membrane Barriers, Storage depots, Biotransformation Sites, Mixed Multifunction Oxidases, Selective Toxicity, Biotransformation and their Applications

Paper II : Economic Zoology , Biostatistics and Animal Behavior

Section A : Economic Zoology

Classification, Life History, Damage and Control of following insects pests: Vegetable - Red Pumpkin Beetle, Stored Grain - Rice Weevil ; Wheat – army worm ; Paddy - Rice Bug ; Sugar-Cane sugarcane white fly, Cotton –spotted bollworm ; Fruit - Banana weevil & Plant Parasitic nematodes ; Methods of pest control :Natural and applied (physical, chemical and biological control) Brief outline of Pisciculture, Poultry and Dairy Farming ; General survey of important edible freshwater fishes of Uttar Pradesh ; Economic importance of Fishes : Preservations, Processing and Marketing ; General feature, life-history and useful products and Apes, Bombyx and Tachardia and Termites; Rat meance and its control

Section B: Biostatistics and Animal Behavior

Biostatistics: Statistical Terms and Symbols, Graphic representation of data Measures of Central Tendency: Mean, Median and Mode; Measures of Variability: Mean Deviation, Variance and Standard Deviation; Probability: Definition, Important Terms, Rules and Types of probability. Animal Behavior : The Basic Concepts of ethology - Motivation, Learning, Conflict Orientation (Taxis) ; Biological Clock/Kinesis & Language of Honey Bee ; Animal Communication : Chemical, Visual, Auditory, Tactile etc; Courtship and Mating Behavior ; Territorial Behavior ; Fish and Bird Migrations.

Paper III : Microbiology, Molecular Biology and Biotechnology

Section A : Microbiology, Molecular Biology

The Scope of Microbiology ; Methods of studying Microorganisms ; Survey and Classification of Microorganisms ; Structure of Bacteria and Viruses ; Microorganisms and Human Diseases.

Section B : Molecular Biology

Cells and Macromolecules; Nucleic acid structure, Physical and Chemical Properties & Nucleo Protein; DNA damage, repair and recombination; Protein Synthesis its regulation.

Section C: Biotechnology

Basics of recombinant DNA technology, Gene Clone ;Plasmids and restriction endonucleases ;
The Polymerase Chain Reaction ; Transgenic Animals DNA Fingerprinting ; The Human Genome
Project ; Uses of Genetic engineering (Medical , Agriculture & Industry) ; Immune System,

Botany

B.Sc.Part I

Paper I : Fungi and Microbiology

Unit - I Fungi

1. Outline classification of fungi with particular reference to Alexopolous & Mims classification.
2. Systematic position, occurrence, structure and mode of reproduction in fungi based on the following genera: *Albugo* , *Aspergillus* , *Puccinia* , *Agaricus* , *Altemaria*
3. Economic importance of fungi 4. Lichens - a general account.

Unit - II Microbiology

1. Classification and distribution of micro-organisms in nature.
2. Elementary knowledge of isolation and culture of micro-organisms.
3. Structure, nutrition and reproduction in Bacteria & Mycoplasma.
4. Structure and multiplication of viruses with particular reference to T.M.V. & Bacteriophage
5. Applications of Microbiology.

Practical

Fungi : Study of fungal types by preparing suitable slides of the materials prescribed in theory course. Microbiology: Study of types of bacteria with the help of prepared slides and photographs, Gram Staining technique of bacteria.

Paper II : Algae & Bryophytes

Unit - I (Algae)

1. Brief classification of algae with special reference to Fritsch.
2. Organisation of thallus in algae
3. Systematic position, occurrence, structure and mode of reproduction in the following genera : *Chlamydomonas*, *Volvox*, *oedogonium*, *Vaucheria*, *Chara*, *Ectocarpus*, *Polysiphonia*, *Nostoc*.
4. Economic importance of algae.

Unit - II (Bryophytes)

1. Outline classification of bryophytes with special reference to Rothmaler.
2. Systematic position, occurrence, morphology, anatomy and reproductive structures in : *Riccia* , *Marchantia* , *Pellia*, *Anthoceros* & *Sphagnum*
3. Evolution of sporophyte in bryophytes - a general account.
4. Economic importance of bryophytes.

Practical :

Algae : Study of algal types with the help of temporary preparations prescribed in the theory course. Bryophytes : Study of the types with the help of suitable preparation, section cutting and mounting based on theory syllabus.

Paper III : Pteridophytes, Gymnosperms & Palaeobotany

Unit : I (Pteridophytes)

1. Outline classification and importance of Pteridophytes with special reference to Sporne's classification.
2. Systematic position, occurrence, morphology, anatomy and reproductive structures in the following genera : *Rhynia* , *Selaginella* , *Equisetum* & *Marsilea*.
3. Stellar systems and its evolution in pteridophytes.
4. Heterospory and seed habit.

Unit : II (Gymnosperms)

1. General characteristics, affinities and classification of gymnosperms as given by Sporne.

2. Systematic position, occurrence, morphology, anatomy and structure of reproductive parts of the following genera : *Cycas* , *Pinus* , *Ephedra*.
3. Economic importance of gymnosperms.

Unit : III (Palaeobotany)

1. A general account of palaeobotany with special reference to types of fossils and methods of fossilization and geological time scale.

Practical : Study of the following types with the help of specimens, photographs, section cutting and temporary slide preparations ; Pteridophytes : *Selaginella*, *Equisetum* and *Marsilea* ; Gymnosperms : *Cycas*, *Pinus*, & *Ephedra* ; Palaeobotany : Study of the available specimens and fossil slides as prescribed in theory course.

B.Sc.Part II

Paper I : Plant Taxonomy and Economic Botany

Unit - I (Plant Taxonomy)

1. Binomial Nomenclature
2. Classifications of Bentham and Hooker and Hutchinson.
3. Preservation of Plant Material and Herbarium Techniques; Herbaria and Botanical Gardens
4. Systematic position, distinguishing characters and economic importance of the following families : (A) Dicotyledons :
 - (a) Polypetale : Ranunculaceae, Papaveraceae, Caryophyllaceae, Rutaceae, Rosaceae and Apiaceae.
 - (b) Gamopetalae : Rubiaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Acanthaceae, Lamiaceae and Asteraceae.
 - (c) Monochlamydae : Euphorbiaceae.(B) Monocotyledons : Arecaceae, Poaceae

Unit - II (Economic Botany)

1. Economic importance with special reference to plants yielding :
 - (a) Food : Cereals (Rice, Wheat, Maize) ; Millets (Pearl millet and Jowar) ; Potato ; Sugarcane ; Legumes (Soybean, Gram and Pea) ; Oil yielding plants (Mustard, Til, Groundnut and Cotton) ; Fruits - (Apple , Guava and Citrus)
 - (b) Common Fibre yielding plants : Cotton, Sunnhemp, Jute, Coir and Ramie
 - (c) Medicinal Plants : (Poppy, Serpgandha, Neem and Belladonna)
 - (d) Timber yielding plants : Shisham , Sal , Teak , Mahogany

Practical :

1. Taxonomy : (a) Detailed description and identification of locally available wild plants of the families as prescribed in course.
 - (b) Submission of Herbarium collection of at least 25 local wild plants.
2. Economic Botany : Identification and comment on the Plant products as prescribed in theory course.

Paper I I : Plant Anatomy and Embryology

Unit - I (Plant Anatomy)

1. Tissues, meristems, structure and function of permanent tissues.
2. Primary anomalous structures in dicot stems.
3. Normal secondary growth in dicot stem and dicot root including abnormal behaviour in stems of (a) Bignonia (b) Boerhaavia (c) Salvadora (d) Leptadenia.
4. Secondary growth in Dracaena (Monocot stem)
5. Leaf abscission and healing of wounds.

Unit - II (Embryology)

1. Structure of anther , microsporogenesis and development of male gametophyte.
2. Structure and forms of ovule , mega-sporogenesis and development of female gametophyte.
3. Pollination , adaptation for self-pollination (autogamy) and cross-pollination (allogamy) ; Fertilization and Double fertilization.
4. Endosperm and its types , development of nuclear endosperm haustoria , Xenia and metaxenia.
5. Development of Embryo : (a) Dicot (in Capsella sp.) (b) Monocot (in Sagittaria)

6. Apomixis(Non Recurrent and Recurrent) ; Polyembryony and Parthenocarpy.

Practical :

1. Plant Anatomy :Anatomy of the following stems: Nyctanthes, Bougainvillea, Capsicum, Bignonia, Boerhaavia, Salvadora, Lepadnia, Dracaena.
2. Embryology : (a) Study of pollinia in Calotropis flower
(b) Study of permanent slides - L.S. of ovule types. T.S. of another ; Germinating pollen, Embryosac Polygonum type ; T.S. of Ovary showing placentation , Embryos.

Paper I I I : Plant Physiology

Unit : I (General Principles and Mechanisms)

1. Diffusion, Imbibition, Osmosis, Plasmolysis ; water relations of a plant cell with reference to diffusion pressure deficit (D.P.D.) and water potential.
2. Mechanism of active and passive water absorption. 3. Ascent of sap.
4. Transpiration:Mechanism of stomatal regulation significance , antitranspirants , guttation, Factors affecting transpiration.
5. Mechanism of absorption of Mineral salts.
6. Respiration : Aerobic and anaerobic ,Glycolysis , Krebs cycle , Electron Transport System(ETS), Factors affecting respiration , Respiratory quotient (RQ) and its measurement.
7. Mechanism of Translocation of solutes.

Unit : II (Growth and Nutrition)

1. Photosynthesis : Light and Dark reactions;Factors affecting photosynthesis ; C3 and C4 plants ; Photorespiration ; autotrophic bacteria (Photosynthetic and Chemosynthetic)
2. Nitrogen Metabolism : N₂ fixation (Symbiotic and Asymbiotic) ; Assimilation into Amino-acids.
3. Plant Growth Regulator : Auxins, Gibberellins, Cytokinins and abscissicacid (ABA).
4. Physiology of Flowering : Photoperiodism and Vernalization.
5. Seed Domancy and Germination : Method of breaking dormancy such asscarification impaction and stratification ; Photoblasticity ; Physiology of seed germination.
6. Mineral Nutrition : Macro and microelements and their physiological role ; Symptoms of mineral deficiency ; Hydroponics and Aeroponics.

Practicals :

1. Demonstration of Endosmosis,Exosmosis,Plasmolysis and imbibition.
2. Demonstration of root pressure and guttation,temporary and permanent wilting.
3. Measurement of transpiration.
4. Evolution of O₂ during photosynthesis under different conditions ; determination of starch.
5. Measurement of R.Q. of different seeds.
6. Effect of hormones & light on the germination of seeds.