B.Sc. Semester System of Two Papers Patterns from Academic Session – 2019 Onwards

B.Sc. Zoology : Semester- I

Paper - I: Non-Chordata
Paper - II: Taxonomy, Evolution and Elementary Palaeontology

B.Sc. Zoology : Semester- II

Paper – I: Cell Biology and Genetics

Paper – II: Molecular Biology, Elementary Biotechnology and Biological Techniques

B.Sc. Zoology : Semester-III

Paper – I: Chordata
Paper – II: Ecology and Environmental Biology

B.Sc. Zoology: Semester-IV

Paper - I: Developmental Biology
Paper - II: Applied Zoology

B.Sc. Zoology: Semester-V

Paper - I: Microbiology, Toxicology and Histology
Paper -II: Animal Behaviour, Bioinformatics and Biostatistics

B.Sc. Zoology: Semester-VI

Paper - I: Animal physiology, Endocrinology and Biological Chemistry
Paper - II: Elementary Entomology and Ichthyology

B.Sc. Zoology : Semester- I

Paper - I: Non-Chordata

Section – A

Lower Non-Chordata

Salient features and outline classification (upto orders) of various Lower Non-chordate Phyla and related type study and topics as covered under respective Phyla.
Protozoa: *Paramecium* with particular reference to locomotion, nutrition, osmoregulation and reproduction.

Life History, pathogenicity and control measures of *Trypanosoma*, *Leishmania* and *Entamoeba histolytica.*

Porifera: *Sycon* with reference to structure, reproduction and development. Canal system and affinities of Porifera.

Coelenterata*: Aurelia* with reference to structure, reproduction and development. Polymorphism in Coelenterata. A brief account of Corals and Coral reefs.

Helminthes: Life cycle, pathogenicity and control measures of *Fasiola, Taenia solium, Ascaris.* Parasitic adaptations in Helminthes.

Section – B

Higher Non-Chordata

Salient features and outline classification (upto orders) of various Higher Non-chordate Phyla and related type study and topics as covered under respective Phyla.
Annelida*: Nereis*- External features, excretory organs and reproduction. Metamerism in Annelida, its origin and significance. Trochophore larva and its significance. Parasitic adaptations in Hirudinaria.

Arthropoda**:** *Palaemon*- External features and reproduction

Peripatus: Its distribution and zoological importance.

Mollusca: *Pila*- External features, Organs of Pallial complex and reproduction. A brief account of torsion in Gastropoda.

Echinodermata: *Asterias*- External features. Water vascular system. Mode of feeding and reproduction.

Paper - II: Taxonomy, Evolution and Elementary Palaeontology

Section – A

Taxonomy

Introduction to taxonomy and systematics their relationship and significance. Rules of nomenclature- Binomial and Trinomial . Components of classification – Linnean hierarchy. Species concept – species as a category, kinds of species. Taxonomic methodology and tools.

Elementary Palaeontology

Kinds of fossils and their significance. Formation of fossils. Methods for determining the age of fossils. Geological time scale. Palaeontological history of horse.

Section – B

Evolution

Brief concept and evidences of evolution. Lamarckism, Darwinism, Synthetic theory of evolution, Evolution at Molecular level (Evolution of proteins and nucleotide sequences). Variations and Speciation. Evolution of man.

B.Sc. Zoology : Semester- II

Paper – I: Cell Biology and Genetics

Section – A

Cell Biology

Prokaryotic and Eukaryotic cells; Ultrastructure of eukaryotic cell; Plasma membrane (Ultrastructure, chemical composition, models of plasma membrane and functions of plasma membrane).

Structure and functions of cell organelles: (a) Mitochondria (b) Ribosomes (c) Lysosomes (d) Centrioles (e) Golgi Complex (f) Endoplasmic reticulum. Structure and functions of Nucleus and nucleolus.

Cell division – (a) Cell cycle (b) Mitosis (Process of mitosis, mitotic poisons and significance of mitosis), (c) Meiosis (Process of meiosis, structure and functions of synaptonemal complex, significance of meiosis).

Eukaryotic chromosomes- Structure, chemical composition, classification and uninemic and multinemic concept of chromosome structure.

Structure and functions of polytene and lampbrush chromosomes.

Section – B

Genetics

Mendel's life, Pre-Mendelian experiments, symbols and terminologies, Laws of dominance, segregation and independent assortment.

Linkage: Coupling and repulsion hypothesis, Morgan's view of linkage, kinds of linkage, chromosome theory of linkage.

Crossing over: Types of Crossing over, kinds of crossing over, mechanism and its significance.

Determination of sex: chromosome mechanism, genetic balance theory and effects of external environment on sex determination.

Sex linked inheritance: Inheritance of X-linked gene (Colour blindness and haemophilia in man), Sex linkage in Drosophila.

Mutation: Historical background, chromosomal aberrations and gene mutations.

Paper – II: Molecular Biology, Elementary Biotechnology and Biological Techniques

Section – A

Molecular Biology

Nucleic acids (DNA & RNA): DNA chemistry, nucleosides, nucleotides, polynucleotide chain, Watson and Crick DNA double helix model, identification of genetic material (DNA-as genetic material). RNA-chemistry, genetic and non-genetic RNAs. Elementary knowledge of genetic code. Expression of gene-protein synthesis.

Section – B

Biotechnology

Origin and definition, scope and importance of Biotechnology. Restriction enzymes and cloning techniques used in recombinant DNA technology. DNA fingerprinting.

Biological Techniques

Introductory knowledge of the application of following biological techniques:

(a) Spectrophotometery

(b) Chromatography (Paper and thin layer)

(c) Electrophoresis (Agarose and PAGE)

(d) Microscopy (Light and compound of microscopy, Phase contrast microscopy)

(e) A Brief knowledge of PCR machine (Thermal cycler) and its significance.

B.Sc. Zoology : Semester-III

Paper – I: Chordata

Section –A

Lower Chordata

Salient features and outline classification (up to order) of various Lower chordate groups.

Protochordata: Salient features body organisation, systematic position and affinities of *Balanoglossus, Hardmania* and *Amphioxus*.

Agnatha**:** External features of *Petromyzon*.

Pisces: Scales and fins in fishes. Migration in fishes. Parental care in Fishes.

Amphibia: General characters and affinities of Gymnophiona . Parental care in Amphibia.

Section –B

Higher Chordata

Salient features and outline classification (up to order) of various Higher chordate groups. Reptilia A brief knowledge of extinct reptiles. Poisonous and non- poisonous snakes. Poison apparatus of snake. Snake venom and anti-venom. Adaptive radiation in reptiles.

Aves: Flightless birds and their distribution. Flight adaptations in birds.

Mammalia: General organisation, distribution and affinities of Prototheria, Adaptive radiation in aquatic mammals.

Paper – II: Ecology and Environmental Biology

Section –A

Ecology

Definition and scope of Ecology.

Environmental Factors: Abiotic factors, biotic factors, edaphic factors.

Concept of ecosystem with reference to pond ecosystem. Energy flow in ecosystem. Pyramids of number, biomass and energy. Food chain- grazing and detritus, Food web and trophic levels. Biosphere: Hydrosphere, Lithosphere and Atmosphere. Biogeochemical cycles: Carbon and Nitrogen cycles.

Population: Definition and characteristics: density, natality, mortality, migration, emigration and immigration, growth and growth-curves. Dispersion and aggregation. Negative and positive interactions including commensalism, mutualism, predation, competition and parasitism.

Section – B

Environmental Biology

Biodiversity: Conservation and management of biodiversity.

Brief introduction to the concept of protected areas- Sanctuary, National Parks and Biosphere Reserves. IUCN and Red data book.

Pollution and its control: Air, Water, Soil pollution, Green house effect, Global warming, Climate change, Acid rain, Ozone layer depletion.

Bio-accumulation and Biomagnifications.

B.Sc. Zoology: Semester-IV

Paper - I: Developmental Biology

Section – A

Gametogenesis: Spermatogenesis and Oogenesis. Types of eggs.

Fertilization: Types of fertilization, approximation of gametes, capacitation, acrosome reaction, formation of fertilization membrane, egg activation and blockage to polyspermy.

Cleavage: Types of cleavage and chemical changes during cleavage, totipotency.

Blastulation and gastrulation in frog and chick.

Fate maps, their formation and significance.

Section – B

Foetal membranes: Their formation and functions in chick.

Retrogressive metamorphosis: As exhibited by an ascidian.

Regeneration: Morphallaxis and Epimorphosis, Blastema and its significance, mechanisms as exhibited by invertebrates *(Hydra* and *Planaria*) and Vertebrates (Limb regeneration in Amphibia).

Placentation in mammals.

Organizer concept: Origin, structure and significance of primary organizer.

Paper - II: Applied Zoology

Section – A

Introduction to:

(a) Pisciculture: Cultivable fishes.

(b) Sericulture: *Bombex mori,* types of silk worm and its rearing.

(c) Apiculture: Types of honey bees, typical honey and culture of *Apis melifera* and natural enemies.

(d) Lac culture

(e) Pearl culture

(f) Piggery

(g) Poultry

(h) Vermiculture

Section – B

Bionomics and control measures of the common pests of fruits (*Papilio demoleus* and *Quadraspidiotus perniciosus*), Vegetables (*Thrips tabaci* and *Aulacophora foveicollis*) and stored grains (*Callosobruchus chinensis* and *Trogoderma granarium*). Polyphagous pests (Locust and Termites).

Pest management, including insect pest control and integrated pest management.

B.Sc. Zoology: Semester-V

Paper - I: Microbiology, Toxicology and Histology

Section – A

Microbiology

Introduction to microbiology: Types of microbes, typical structure of a bacterium, (Gram positive and Gram negative bacteria), phages and viruses.

Pathogenic microbes: Mycobacterium, Rickettsia, Actinomycetes and Mycoplasma.

A brief knowledge of HIV: Modes of transmission and control.

Microbial bioremediation.

Industrial microbiology: Dairy products, fermented food, alcoholic beverages, microbial spoilage.

Introductry account of prebiotic, probiotic and antibiotics.

Section – B

Toxicology

Introduction and brief history of toxicology: General principles of toxicology.

Environmental toxicology (kinds and sources of toxic agents- animal toxins, plant toxins, pesticides, metals and food additives).

Dose response relationship: Frequency and cumulative responses, determination of TL_m values, Ld_{50}, Lc_{50}, margin of safety, threshold limits.

Histology

Histology: Structure of epithelium, connective tissue, cartilage, bone, smooth,, striped and cardiac muscles, and nervous tissue.

Histological structure of liver, lung, pancreas, kidney and gonads of rabbit.

Paper -II: Animal Behaviour, Bioinformatics and Biostatistics

Section – A

Animal Behaviour

Patterns of behaviour*:* Stereotype innate behaviour: Kinases, Taxes and Reflexes. Concepts of (i) Fixed action patterns (FAPs) (ii) Sign stimulus or releasers and (iii) Innate releasing mechanism, Instinctive behaviour. Learned behaviour: Habituation, Conditioned reflexes, Selective learning , Insight learning, Imprinting and Birds songs.

Communication: Chemical, Visual, Auditory, Electric and tactile, Dance language of honey bees, Biological clocks. Bird migration. Introduction to Socio-biology.

Section – B

Bioinformatics

Elementary knowledge of computers: Organisation of computer, input and output devices. Elementary idea of biological databases: Protein and nucleotide data bases.

Biostatistics

Data collection- Random and non-random sampling, data tabulation and data presentation (Graph, Histogram, Scatter diagram),

Concept of mean, mode, median and of standard deviation and standard error.

B.Sc. Zoology: Semester-VI

Paper - I: Animal physiology, Endocrinology and Biological Chemistry

Section – A

Nutrition: Food constituents, intracellular and extracellular digestion, Digestion and absorption of carbohydrate, fat and protein in mammals.

Respiration: Pulmonary ventilation, respiratory pigments, gaseous transport and control of respiration in mammals.

Blood vascular system: Haemopoiesis, composition and functions of blood, blood coagulation. A brief account of immunity. Types of heart, origin and conduction of heart beat.

Muscular System: Mechanism of muscle contraction. A brief idea of tetanus and fatigue.

Nervous system: Transmission of nerve impulse through axon and synapse.

Excretion: Concept of ammonotelic, ureotelic and guanotelic animals, urine formation in mammal.

Section – B

Endocrine system: A brief knowledge of the structure and hormonal functions of the glands-Pituitary, Thyroid, Pancreas, Adrenal, Testis and Ovary.

Elementary knowledge of the Dwarfism, gigantism, acromegaly, diabetes insipidus , Goitre, Cretinism, Myxoedema, Diabetes mellitus and Addison's disease.

Introduction to biological molecules: Carbohydrates, Protein and Lipids (structure, classification and significance).

Enzymes, Vitamins and Minerals.

Paper - II: Elementary Entomology and Ichthyology

Section – A

Entomology

Classification of insects up to orders: Brief knowledge of general characters of following insect orders- Thysanura, Collembola, Orthoptera, Odonata, Isoptera, Herteroptera, Coleoptera, Lepidoptera, Hymenoptera and Diptera.

Methods of insect collection and preservation.

Social life in insects: Ants and termites. Insect pollinators.

A brief account on the life-cycle, pathogenecity and control measures of the following:

Household insects: Cockroach and Silverfish.

Insect injurious to man and Livestock: Mosquitoes, House fly and Bedbug.

Economic importance of insect as food medicine.

Section – B

Ichthyology

Classification of fishes up to orders. Integrated fish farming.

Ornamental fishes: Construction of aquaria and its maintenance. Exotic fishes.

Carp farming.

Hill stream fishes and their adaptations.

Induced breeding: Induction agents and their applications.

Methods of fish collection and types of nets. Fish processing and preservation techniques.

Fish processing and preservation techniques.

Methods of fish collection and types of nets.