



## DEPARTMENT OF ZOOLOGY

### COURSE OUTCOME & PROGRAM OUTCOMES

## B.Sc. First Year

### Theory Paper 1: Animal Diversity (Non-Chordata)

#### Time Allotted for B.Sc-1 Year

1. Theory Class period of duration 45 minutes for 6 days a week while 2.30 hours for 2 days a week for practical classes.

#### Theory Paper 1: Course Outcomes (COs)

- CO1. Describe the salient features and outline classification (up to Classes) of various Lower Non-chordate Phyla
- CO2. Describe Protozoa with particular reference to locomotion, nutrition.
- CO3. Describe Porifera with reference to classification and canal system
- CO4. Describe Coelenterata with reference to classification, polymorphism, including brief account of Corals and Coral reefs.
- CO5. Describe general characters of Aschelminthes
- CO6. Describe parasitic adaptations in Helminths.
- CO7. Describe Annelida with reference to general features, larval form/s, and metamerism.
- CO8. Describe Arthropoda with reference to general features.
- CO9. Describe Mollusca with reference to features and torsion.
- CO10. Describe Echinodermata with reference to general features, water vascular system.

#### Theory Paper 1; Program Outcomes (POs)

- PO1. A basic understanding of Paramecium with particular reference to locomotion, nutrition
- PO2. A basic understanding of canal system in sponges
- PO3. A basic understanding of Polymorphism in Coelenterata, of corals and coral reefs
- PO4. A basic understanding of characters and Life History of Helminthes and parasitic adaptations
- PO5. A basic understanding of salient features and outline classification of various Higher Non-chordate Phyla

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PO6. A basic understanding of Annelida characters up to classes

PO7. A basic understanding of metamerism in Annelida (its origin and significance); of trochophore larva and its significance.

PO8. A basic understanding Arthropods general characters and zoological importance of Peripatus and limulus.

PO9. A brief account of torsion in Gastropoda.

### **Theory Paper 1: Programme Specific Outcomes (PSOs)**

PSO1. A basic understanding of Paramecium with particular reference to locomotion, nutrition,

PSO2. A basic understanding of Canal system, and affinities of Porifera.

PSO3. A basic understanding of Polymorphism in Coelenterata, of corals and coral reefs

PSO4. A basic understanding of morphology, life cycle, Fasciola, Ascaris,

PSO5. A basic understanding of parasitic adaptations in Helminths

PSO6. A basic understanding of salient features and outline classification of various Higher Non-chordate Phyla

PSO7. A basic understanding of metamerism in Annelida (its origin and significance); of trochophore larva and its significance.

PSO8. A basic understanding External features of Peripatus- Its distribution and Zoological importance.

PSO9. A brief account of torsion in Gastropoda.

## **B.Sc. First Year: Theory Paper 2: Cell Biology and Genetics**

### **Theory Paper 2: Course Outcomes (COs)**

CO1. Introduction to cell biology and cell theory

CO2. Give comparative knowledge of prokaryotic and eukaryotic cells

CO3. Elementary knowledge of the structure & functions of plasma membrane;

CO4. Introduction to the organelles constituting endomembrane system (Endoplasmic reticulum, Golgi complex, Lysosome & Peroxisome).

CO5. Elementary knowledge of the structure & functions of Nucleus & nucleolus; Ribosome; Mitochondria.

CO6. Elementary knowledge of the structure & functions of cytoskeleton.

CO7. Elementary knowledge of Cell Division-Mitosis & Meiosis

CO8. Basic features of Cell cycle:

CO9. Elementary idea of cell transformation and cancer

CO10. Elementary knowledge of Mende's 1 law-II, II, and III,

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CO11. Elementary knowledge of Incomplete dominance and Co -dominance, Epistasis. Sex-linked inheritance, Multiple alleles, lethal alleles.

CO12. Elementary knowledge of chromosomal inheritance

CO13. Elementary knowledge of Linkage & crossing over

CO14. Elementary knowledge of Sex-determination

CO15. Elementary knowledge of Chromosome structure. Euchromatin, Heterochromatin. Histone, Polytene & lampbrush chromosomes.

CO16. Elementary knowledge of Eugenesis,

### **Theory Paper 2; Program Outcomes (PO)**

PO1. Outline study of the prokaryotic and Eukaryotic cells, including ultrastructure of the eukaryotic cell

PO2. A basic understanding of ultrastructure, chemical composition, models, specialisations and functions of plasma membrane.

PO3. A basic understanding of structure and functions of mitochondria, ribosomes, Lysosomes, centrioles, Golgi Complex, Endoplasmic reticulum, Nucleus and nucleolus.

PO4. A basic understanding of Cell division. mitotic poisons and significance of mitosis, structure and Functions, Synaptonemal complex, significance of meiosis.

PO5. A basic understanding of cell transformation and cancer

PO6. A basic understanding of Eukaryotic chromosomes uninemic and multinemic concept of chromosome structure and giant chromosomes

### **Theory Paper 2: Programme Specific Outcomes(PSOs)**

PSO1. Outline study of the prokaryotic and eukaryotic cells, including ultrastructure of the eukaryotic cell

PSO2. A basic understanding of ultrastructure. chemical composition. models. specialisations and functions of plasma membrane.

PSO3. A basic understanding of structure and functions of mitochondria, ribosomes. Lysosomes, centrioles, Golgi Complex. Endoplasmic reticulum. Nucleus and nucleolus.

PSO4. A basic understanding of Cell division, mitotic poisons and significance of mitosis, structure and functions of synaptonemal complex. significance of meiosis.

PSO5. A basic understanding of cell transformation and cancer

PSO6. A basic understanding of eukaryotic chromosomes, uninemic and multinemic concept of chromosome structure and giant chromosomes

## **B.Sc. First Year: Theory Paper 3: Taxonomy, Evolution and Computer**

### **Theory Paper 3: Course Outcomes (COs)**

CO1. Describe Taxonomy: Definition & scope; relationship with Systematic, Zoological nomenclature: Binominal & Trinomial; ICZN

CO2. Describe Components of classification: Linnaean hierarchy. Concepts of species: Typological,

## Nomenalistic & Biological

CO3. Describe Geological distribution of animals, period of evolution and extinction of major groups

CO4. Describe Direct Evidences of Evolution: Type of Fossils & fossilization. Dating of fossils. Significance of fossil record

CO5. Describe Evolutionary theories: Lamarckism, Darwinism, Neo-Darwinism CO6 Give an elementary knowledge of fossils

CO7. Describe Processes of Evolutionary Change: Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism)

CO8. Describe Types of natural selection (Directional, Stabilizing, Disruptive).

CO9. Describe Evolution of Horse

CO10. Describe Biostatistics as a tool in research. Data collection: Random & non-random sampling

CO11. Describe Data tabulation; Data presentation (Graph, Frequency Polygon, Histogram, Bar diagram, Scatter diagram).

CO12. Explain Measures of central tendency- Calculation of Mean, Mode, Median

CO13. Explain Introduction to computers types; Components of computer (Input unit, Memory, Central Processing Unit, Output unit).

CO14. Describe Problem solving with computers.

CO15. Describe Elementary idea of memory (RAM, ROM).

CO16. Describe Uses of computers in different fields. e.g., Biology, Medical, Environment etc.

## Theory Paper 3; Program Outcomes (PO)

PO1. A basic understanding of taxonomy and systematics, their relationship

PO2. A basic understanding of Classification and significance

PO3. A basic understanding of Geological distribution of animals, period of evolution

PO4. A basic understanding of Evidences of Evolution

PO5. A basic understanding of Evolutionary theories

PO6. A basic understanding of Evolutionary Change

PO7. A basic understanding of Types of natural selection

PO8. A basic understanding of Evolution of Horse

PO9. Brief background knowledge of Biostatistics as a tool in research

PO10. A basic understanding of Data tabulation and Data presentation

PO11. A basic understanding OF Measures of central tendency

PO12. A basic knowledge of Introduction of computers and its types

PO13. A basic knowledge of Problem solving with computers

PO14. An Elementary idea of memory

PO15. A basic knowledge of Uses of computers in different fields

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### **Theory Paper 3; Programme Specific Outcomes (PSO)**

- PSO1. A basic understanding of taxonomy and systematics, their relationship
- PSO2. A basic understanding of Classification and significance
- PSO3. A basic understanding of Geological distribution of animals, period of evolution
- PSO4. A basic understanding of Evidences of Evolution
- PSO5. A basic understanding of Evolutionary theories
- PSO6. A basic understanding of Evolutionary Change
- PSO7. A basic understanding of Types of natural selection
- PSO8. A basic understanding of Evolution of Horse
- PSO9. Brief background knowledge of Biostatistics as a tool in research
- PSO10. A basic understanding of Data tabulation and Data presentation
- PSO11. A basic understanding OF Measures of central tendency
- PSO12. A basic knowledge of Introduction of computers and its types
- PSO13. A basic knowledge of Problem solving with computers
- PSO14. An Elementary idea of memory
- PSO15. A basic knowledge of Uses of computers in different fields

### **B.Sc. First Year: Practical's**

#### **Practical: Course Outcomes(COs)**

##### **A. Non-Chordata**

- CO1. Students will be able to Give a brief description Kingdom Protista: Amoeba, paramecium, Euglena and plasmodium.
- CO2. Students will be able to Describe of Phylum Porifera including T.S. and L.S. of Sycon.
- CO3. Students will be able to Describe of Phylum Platyhelminthes: Liver fluke, Teaniasolium, and their life history and stages.
- CO4. Students will be able to Describe of Phylum Nematelminthes: Male and Female Ascaris.
- CO5. Students will be able to Describe of Phylum Annelida: Aphrodite, Nereis, Pheretima, Hirudinaria.
- CO6. Students will be able to Describe of Phylum Arthropoda: Plaemon, Cancer, Limilus, Palamnaeus, Julus, Apis, Peripaltus.
- CO7. Students will be able to Describe of Phylum Mollusca: Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus.
- CO8. Students will be able to Describe of Phylum Echinodermata: Pentaceros, Ophiura, Echinus, Cucumaria and Antedon.
- CO9. Animal Album needs to be made: with photographs, cut-outs and writeup about collection.

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## **B. Cell Biology and Genetics**

CO10. Students will be able to make Slide of tissues/Photographs of cell/tissues

CO11. through Giant chromosomes preparation Students will be able to comprehend its Importance in cell biology

CO12. Students will be able to understand the process of cell division by making slide of meiosis and mitosis using onion root-tip.

CO13. Students will be able to comprehend the importance of mendelian inheritance using various example and hypothesis testing using chi-square test

CO14. Study of human karyotype will make student to differentiate normal and abnormal chromosomes

## **C. Evolution**

CO15. Study of fossil evidences from plaster cast models and pictures

CO16. Study of homology and analogy from suitable specimens/ pictures and charts:

CO17. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors

CO18. Darwin's Finches with diagrams/ cut outs of beaks of different species

CO19. Visit to Museums, National parks and sanctuaries and submission of report.

## **D. Biostatistics**

CO20. Practical application of statistics- Data presentation (Bar diagram, Histogram, Frequency distribution curve and scattered diagram).

CO21. Measures of central tendency (Calculation of Mean, Mode, and Median).

## **E. Computer application**

CO22. Practical demonstration -preparation of Power Point presentation, Spread sheet, Chart and Design etc:

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## B.Sc. Second Year

### Theory Paper 1: Chordata

#### Time Allotted for B.Sc.-2 Year

1. Theory Class period of duration 45 minutes for 6 days a week while 2.30 hours for 2 days a week for practical classes.

#### Theory Paper 1: Course Outcomes(COs)

CO1. Describe the salient features and Phylogeny of Protochordats.

CO2. Describe body organization of Protochordats in reference to Balanoglossus, Herdmania & Amphioxus.

CO3. Describe the salient features & classification of Agnatha Up to classes.

CO4. Describe general characteristics of Lampreys and Hagfish and compare them.

CO5. Give an account of class Pisces.

CO6. Describe scales and fins of fishes.

CO7. Give an account of Hill stream adaptation in fishes.

CO8. Describe general features and classification of class Amphibia up to orders.

CO9. Give an account of parental care and neoteny in Amphibia.

CO10. Describe general features and classification of class Reptiles up to orders.

CO11. Give an account of Poisonous and non-poisonous snakes.

CO12. Give an account of venom and antivenom and describe the biting mechanism in snakes.

CO13. Describe general features and classification of class Aves up to orders.

CO14. Give a description of feathers in Birds.

CO15. Give an account of adaptations for aerial mode of life in Aves.

CO16. Describe general features of Class Mammalia.

CO17. Give an account of origin of mammals.

CO18. Give an account of distribution and affinities of Prototheria, Metatheria and Eutheria.

CO19. Describe aerial and aquatic adaptations in mammals

#### Time Allotted

1. Theory period of duration of 45 minutes for 6 days a week theory classes and 2.30 hours for 2 days a week for practical classes.

#### Theory Paper 1; Program Outcomes (POs)

PO1. A basic understanding of salient features and Phylogeny of Protochordats.

PO2. A basic understanding body organization of Protochordats in reference Amphioxus.

PO3. A basic understanding of salient features & classification of Agnatha Up to classes.

- PO4. A basic understanding of general characteristics of Lampreys and Hagfish and compare them.
- PO5. A basic understanding of class pisces.
- PO6. A basic understanding of scales and fins of fishes.
- PO7. A basic understanding of Hill stream adaptation in fishes.
- PO8. A basic understanding of characteristics and classification of class Amphibia up to orders.
- PO9. A basic understanding of parental care and neoteny in Amphibia.
- PO10. A basic understanding of general features and classification of class Reptiles up to orders.
- PO11. A basic understanding of Poisonous and non-poisonous snakes.
- PO12. A basic understanding of venom and antivenom and to understand the biting mechanism in snakes,
- PO13. A basic understanding of characteristics and classification of class Aves up to orders
- PO14. A basic understanding of feathers in Birds.
- PO15. A basic understanding of adaptations for aerial mode of life in Aves.
- PO16. A basic understanding of Class Mammalia.
- PO17. A basic understanding of origin of mammals.
- PO18. A basic understanding of distribution and affinities of Prototheria, Metatheria and Eutheria
- PO19. A basic understanding of aerial and aquatic adaptations in mammals

### **Theory Paper 1: Programme Specific Outcomes(PSOs)**

- PSO1. A basic understanding of Balanoglossus, Herdmania and Amphioxus.
- PSO2. A basic understanding of Lampreys and Hagfish.
- PSO3. A basic understanding of Fishes, types of scales and fins in fishes.
- PSO4. A basic understanding of hill stream adaptation in hill stream fishes.
- PSO5. A basic understanding of Class Amphibia.
- PSO6. A background knowledge of Parental care and Neoteny in Amphibia.
- PSO7. A basic understanding of biting mechanism in snakes.
- PSO8. A brief knowledge of venom and antivenom.
- PSO9. A brief understanding of Aves and types of feathers in birds.
- PSO10. A brief knowledge of adaptations in birds for aerial mode of life.
- PSO11. Background knowledge of origin, distribution and affinities of mammals.
- PSO12. A brief knowledge of aerial and aquatic adaptations in mammals.

## **Second Year: Theory Paper 2: Physiology and Biochemistry**

### **Theory Paper 2: Course Outcomes(CO)**

- CO1. Give an account of digestive system.
- CO2. Describe digestion and absorption of carbohydrates, Lipids and Proteins.
- CO3. Describe physiology of respiration.



- CO4. Give an account of blood components and blood coagulation.
- CO5. Describe physiology of heart.
- CO6. Describe structure and function of excretory system.
- CO7. Describe nervous system
- CO8. Describe the process of initiation, conduction and transmission of nerve impulse.
- CO9. Describe the structure and physiology of muscles.
- CO10. Describe carbohydrate metabolism
- CO11. Give an account of Lipids.
- CO12. Describe Proteins.
- CO13. Give an account of enzymes.

### **Theory Paper 2: Program Outcomes (POs)**

- PO1. A basic understanding of the process of digestion and absorption.
- PO2. A basic understanding of pulmonary ventilation, respiratory volumes and capacities.
- PO3. A basic understanding of Transportation of oxygen and carbondioxide.
- PO4. A basic knowledge of of mechanism of blood coagulation.
- PO5. A basic understanding of Structure and function of heart.
- PO6. A basic understanding of Physiology of urine formation.
- PO7. A basic understanding of structure, types of neurons and function of neurons.
- PO8. A basic understanding of synapse and nerve impulse transmission.
- PO9. A basic understanding of structure and types of muscles.
- PO10. A basic understanding of molecular and chemical basis of muscle contraction.
- PO11. A basic understanding of carbohydrate, lipids and protein metabolism.
- PO12. A basic understanding of types, properties and functions of enzymes

### **Theory Paper 2: Programme Specific Outcomes (PSOs)**

- PSO1. A basic understanding of Intracellular and extracellular digestion.
- PSO2. A basic understanding of the process of digestion and absorption
- PSO2. A basic knowledge of pulmonary ventilation, respiratory volumes and Capa
- PSO3. A basic knowledge of Transportation of oxygen and carbondioxIde
- PSO4. A basic knowledge of mechanism of blood coagulation.
- PSO5. A basic understanding of Structure of heart and origin and conduction of nerve impui
- PSO6. A basic understanding of structure and physiology of nephron.
- PSO7. A basic understanding of physiology of muscle contraction.
- PSO8. A brief idea of tetanus and fatigue
- PSO9. A basic understanding of Glycolysis, Kerb's cycle. Gluconeogenesis, Glycogenesis and Glycogenolysis.

PSO10. A basic understanding of transamination and deamination.

PSO11. A brief Knowledge of enzymes and their mechanism of action

## **Second Year: Theory Paper 3: Molecular Biology, Biotechnology and Microbiology**

### **Theory Paper 3: Course Outcomes (COs)**

CO1. Describe structure of DNA.

CO2. Describe DNA double helix model of Watson and Crick.

CO3. Give an account of enzymes involved in prokaryotic and eukaryotic DNA replication.

CO4. Describe Causes and types of DNA damage and mechanism of DNA repair.

CO5. Describe Structure and types of RNA.

CO6. Give an elementary knowledge of transcription in prokaryotes.

CO7. Give a background knowledge of biotechnology and its scope.

CO8. Describe recombinant DNA technology

CO9. Describe DNA fingerprinting.

CO10. Describe PCR and its significance.

CO11. Give an account of innovations of biotechnology in different areas.

CO12. Give an account of Cynobacteria, fungi, yeast and viruses.

CO13. Give a detail account of Bacteria.

### **Theory Paper 3; Program Outcomes (POs)**

PO1. A basic understanding of DNA, nucleoside, nucleotide and polynucleotide chain.

PO2 .A basic understanding of DNA as genetic material, its packaging and types of DNA.

PO3. A basic understanding of DNA damage and mechanism of DNA repair.

PO4. A basic understanding of Clover leaf model of tRNA.

PO5. A basic understanding of transcription mechanism in prokaryotes.

PO6. A basic understanding of processing of pre-mRNA

PO7.A brief background knowledge of biotechnology.

PO8. A basic understanding of recombinant technology and DNA fingerprinting.

PO9. A basic understanding of PCR and its significance.

PO10. A brief knowledge of biotechnological innovations.

PO11. A basic understanding of Cynobacteria, fungi, yeast and viruses.

PO12. A basic understanding of structure, classification, nutrition and reproduction in Bacteria

### **Theory Paper 3: Programme Specific Outcomes(PSOs)**

PSO1. A basic understanding of DNA, nucleoside, nucleotide and polynucleotide chain.

PSO2. A basic understanding of DNA as genetic material, its packaging and types of DNA.

- PSO3. A basic understanding of DNA damage and mechanism of DNA repair.
- PSO4. A basic understanding of Clover leaf model of tRNA.
- PSO5. A basic understanding of transcription mechanism in prokaryotes
- PSO6. A basic understanding of processing of pre-mRNA
- PSO7. A brief background knowledge of biotechnology.
- PSO8. A basic understanding of recombinant technology and DNA fingerprinting.
- PSO9. A basic understanding of PCR and its significance.
- PSO10. A brief knowledge of biotechnological innovations.
- PSO11. A basic understanding of Cyanobacteria, fungi, yeast and viruses.
- PSO12. A basic understanding of structure, classification, nutrition and reproduction in Bacteria.

## **B.Sc. Second Year: Practical's**

### **Practical: Course Outcomes (Cos)**

#### **C. Chordata**

- CO1. Students will be able to Give a brief description Protochordats: Balanoglossus, Amphioxus
- CO2. Students will be able to identify and describe class Pisces Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Tor putitora, Hill stream fishes Amphibia: Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Axolotal larva, Reptilia: Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis Key for Identification of poisonous and non-poisonous snakes Aves: Study of six common birds from different orders, Mammalia: Sorex, Bat, Funambulus, Loris.
- CO3. Students will be able to identify poisonous and non-poisonous snakes.
- CO4. Students will be able to Describe different common birds from different orders. herdmania,

#### **D. Physiology and Biochemistry**

- CO5. Students will be able to make Slide of haemin crystal from human blood.
- CO6. Students will be able to estimate the haemoglobin percentage in human blood.
- CO7. Students will be able to identify the presence of carbohydrate, prolein and lipid in any solution.
- CO8. Students will be able to determine the blood group.
- CO9. Students will able to identify and differentiate different histological slides.

#### **C. Molecular Biology & Biotechnology**

- CO10. Study of Watson and Crick Model of DNA.
- CO11. Study of Clover leaf structure of tRNA.
- CO12. Study of gel electrophoresis and plasmids

#### **D. Microbiology**

- CO13. study of Media preparation and sterilization.
- CO14. Study of homology and analogy from suitable specimens/ pictures and charts:

CO15. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors

CO16. Darwin's Finches with diagrams/ cut outs of beaks of different species

CO17. Visit to Museums, National parks and sanctuaries and submission of report. B.

#### **D. Conservation Biology**

CO18. Practical application of statistics- Data presentation (Bar diagram, Histogram, Frequency distribution curve and scattered diagram),

CO19. Measures of central tendency (Calculation of Mean, Mode, and Median).

#### **E. Developmental Biology**

CO20. Practical demonstration -preparation of Power Point presentation, Spread sheet, Chart and Design etc.

#### **F. Toxicology**

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# B.SC. Third Year

## Theory Paper: 1. Endocrinology and Applied Zoology

### Time Allotted for B.Sc-3 Year

1. Theory Class period of duration 45 minutes for 6 days a week while 2.30 hours for 2 days a week for practical classes.

### Theory Paper 1: Course Outcomes(COs)

CO1.To Describe the Basic idea of endocrine, paracrine & autocrine secretion.

CO2. To Describe Mechanism of action of hormones, Structure and function of Pituitary, Thyroid, Adrenal, Pancreas. Testes and ovary.

PO3. To Describe Hormonal control of menstrual cycle understand the Structure and function of Pituitary, Thyroid, Adrenal, Pancreas, Testes and ovary. Hormonal control of menstrual cycle.

CO4. To Describe the Sericulture: Types of silk worms (Mulberry & Non1mulberry), Rearing of Mulberry Silkworm

CO5. To Describe the Lac culture: cultivation practices of host plants, extraction and uses of lac

CO6. To Describe the Medicinal Pests: Identification, Characteristics of Mosquitoes, Housefly, Bedbug, Sand Medicinal Pests fly, Human lice, Tse Tse fly, Rat flea

CO7. To Describe the Aquaculture (Fish Culture): Monoculture and composite culture.

CO8. To Describe the Hatchery management development of fish hatcheries, types of hatcheries, production or spawn, fry and fingerlings.

CO9. To Describe the techniques of Pond management and fertilization pre and post stocking management Indian major carps

### Time Allotted

1. Theory period of duration of 45 minutes for 6 days a week theory classes and 2.30 hours for 2 days a week for practical classes.

### B.SC. Third Year: Theory Paper: Endocrinology and Applied Zoology

### Theory Paper 1: Program Outcomes (POs)

PO1.To understand the Basic idea of endocrine, paracrine & autocrine secretion.

PO2. To understand the Mechanism of action of hormones, Structure and function of Pituitary, Thyroid, Adrenal, Pancreas. Testes and ovary.

PO3. To Understand the Hormonal control of menstrual cycle understand the Structure and function of Pituitary, Thyroid, Adrenal, Pancreas, Testes and ovary. Hormonal control of menstrual cycle.

PO4. understand the Sericulture: Types of silk worms (Mulberry & Non1mulberry), Rearing of Mulberry Silkworm

PO5. To describe the Lac culture: cultivation practices of host plants, extraction and uses of lac

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PO6. To describe the Medicinal Pests: Identification, Characteristics of Mosquitoes, Housefly, Bedbug, Sand Medicinal Pests fly, Human lice, Tse-Tse fly, Rat flea

PO7. To describe the Aquaculture (Fish Culture): Monoculture and composite culture.

PO8. To describe the Hatchery management development of fish hatcheries, types of hatcheries, production or spawn, fry and fingerlings.

PO9. To describe the techniques of Pond management and fertilization pre and post stocking management Indian major carps

### **B.Sc. Third Year: Theory Paper: Endocrinology and Applied Zoology**

#### **Theory Paper 1: Programme Specific Outcomes (PSOs)**

PSO1 Students have basic understanding of endocrine, paracrine & autocrine secretion.

PSO2. A basic understanding of Mechanism of action of hormones, Structure and function of Pituitary, Thyroid, Adrenal, Pancreas. Testes and ovary.

PSO3. A basic understanding of Hormonal control of menstrual cycle understand the Structure and function of Pituitary, Thyroid, Adrenal, Pancreas, Testes and ovary. Hormonal control of menstrual cycle.

PSO4. A basic understanding of Sericulture: Types of silk worms (Mulberry & Non mulberry), Rearing of Mulberry Silkworm

PSO5. A basic understanding of Lac culture: cultivation practices of host plants, extraction and uses of lac

PSO6. A basic understanding of Medicinal Pests: Identification, Characteristics of Mosquitoes, Housefly, Bedbug, Sand Medicinal Pests fly, Human lice, Tse-Tse fly, Rat flea

PSO7. A basic understanding of Aquaculture (Fish Culture): Monoculture and composite culture.

PSO8. A basic understanding of Hatchery management development of fish hatcheries, types of hatcheries, production or spawn, fry and fingerlings.

PSO9. A basic understanding of techniques of Pond management and fertilization pre and post stocking management Indian major carps

### **B.Sc. Third Year:**

#### **Theory Paper 2: Ecology. Conservation Biology and Animal Behaviour**

#### **Theory Paper 2: Course Outcomes (COs)**

CO1. To Explain the concept of Ecology: Definition, scope and importance, Introduction to laws of Limiting factors: Liebig's law of the minimum, Shelford's law of tolerance. Factor interaction

CO2. To Explain the concept Biogeochemical cycles: Concept and types of biogeochemical cycle (Water, Carbon, Nitrogen and Phosphorus cycle

CO3. To Explain the concept Ecosystem concept: Component & types (Grassland, Forest, Pond, River); Abiotic, biotic & edaphic factors and their interdependence, Energy flow in ecosystem. Primary and secondary productivity. Food chains, food web and ecological pyramids.

CO4. To Explain the concept of Conservation Biology: Definition & scope. Concept of biodiversity;

Biodiversity as a resource; Biodiversity loss and its Causes. Conservation & Management of Biodiversity.  
CO5. To Explain the concept of Protected Areas: Ex- situ & In-situ Conservation. Biodiversity hot spots.  
India's wildlife: Habitats & Distribution; Protected areas: National Parks & Sanctuaries.  
CO6. To Explain the concept of science of behaviour: History, scope and terminology.  
CO7. To Explain the concept of Biological rhythms. Biological Clock. Circadian rhythms and their synchronisation seasonal rhythms. Photoperiodism

### **B.Sc. Third Year:**

#### **Theory Paper 2: Ecology. Conservation Biology and Animal Behaviour**

##### **Theory Paper 2: Program Outcomes (POs)**

- PO1. To describe the concept of Ecology: Definition, scope and importance, Introduction to laws of Limiting factors: Liebig's law of the minimum, Shelford's law of tolerance. Factor interaction
- PO2. To describe the Biogeochemical cycles: Concept and types of biogeochemical cycle (Water, Carbon, Nitrogen and Phosphorus cycle)
- PO3. To describe the Ecosystem concept: Component & types (Grassland, Forest, Pond, River); Abiotic, biotic & edaphic factors and their interdependence, Energy flow in ecosystem. Primary and secondary productivity. Food chains, food web and ecological pyramids
- PO4. To describe the Conservation Biology: Definition & scope. Concept of biodiversity; Biodiversity as a resource; Biodiversity loss and its Causes. Conservation & Management of Biodiversity.
- PO5. To describe the Concept of Protected Areas: Ex- situ & In-situ Conservation. Biodiversity hot spots. India's wildlife: Habitats & Distribution; Protected areas: National Parks & Sanctuaries.
- PO6. To describe the science of behaviour: History, scope and terminology.
- PO7. To describe the Biological rhythms. Biological Clock. Circadian rhythms and their synchronisation seasonal rhythms. Photoperiodism

### **B.Sc. Third Year:**

#### **Theory Paper 2: Ecology. Conservation Biology and Animal Behaviour**

##### **Theory Paper 2: Program Specific Outcomes (PSOs)**

- PSO1. The students understand the concept of Ecology: Definition, scope and importance, Introduction to laws of Limiting factors: Liebig's law of the minimum, Shelford's law of tolerance. Factor interaction
- PSO2. The students understand the concept of Biogeochemical cycles: Concept and types of biogeochemical cycle (Water, Carbon, Nitrogen and Phosphorus cycle)
- PSO3. The students understand the concept of Ecosystem concept: Component & types (Grassland, Forest, Pond, River); Abiotic, biotic & edaphic factors and their interdependence, Energy flow in ecosystem. Primary and secondary productivity. Food chains, food web and ecological pyramids
- PSO4. The students understand the concept of Conservation Biology: Definition & scope. Concept of biodiversity; Biodiversity as a resource; Biodiversity loss and its Causes. Conservation & Management of Biodiversity.

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PSO5. The students understand the concept of Protected Areas: Ex- situ & In-situ Conservation. Biodiversity hot spots. India's wildlife: Habitats & Distribution; Protected areas: National Parks & Sanctuaries.

PSO6. The students understand the concept of science of behaviour: History, scope and terminology.

PSO7. The students understand the concept of Biological rhythms. Biological Clock. Circadian rhythms and their synchronisation seasonal rhythms. Photoperiodism

### **B.Sc. Third Year:**

#### **Theory Paper 3: Developmental Biology and Toxicology**

##### **Theory Paper 3: Course Outcomes (COs)**

CO1. To describe the Gametogenesis: spermatogenesis in mammals, Morphology of mature mammalian spermatozoon: Oogenesis in mammals, Vitellogenesis in birds.

CO2. To describe the Fertilization: external (amphibian), Internal (mammals), Block to polyspermy

CO3. To describe the Early Development of Frog and Human: types of cleavage; Morphogenetic movements; frog and Human: types of egg; patterns of cleavage; role of yolk

CO4. To describe the Development up to formation of gastrula. Neurulation.

CO5. To describe the Implantation of embryo in human: Types of placenta on the basis of histology; Formation of human placenta and its functions.

CO6. To describe the Elementary concept of Primary organizer: Induction. Differentiation and organogenesis or vertebrate eye.

CO7. To describe the Definition, history, scope of toxicology, Classification of toxic agents, natural food toxins, and chemical toxins Environmental toxicology of heavy metal (lead)

CO8. To describe the Air pollution-types of air pollutants, their effects and remedial measures.

CO9. To describe the Water pollution- types of water pollutants, their effects and remedial measures.

CO10. General introduction to pesticides, herbicides, fungicides, and insecticides

#### **Theory Paper 3: Developmental Biology and Toxicology**

##### **Theory Paper 3: Program Outcomes (POs)**

PO1. To describe the Gametogenesis: spermatogenesis in mammals, Morphology of mature mammalian spermatozoon: Oogenesis in mammals, Vitellogenesis in birds.

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### **Theory Paper 3: Developmental Biology and Toxicology**

#### **Theory Paper 3: Program Specific Outcomes (POs)**

PSO1. Students know process of Gametogenesis: spermatogenesis in mammals, Morphology of mature mammalian spermatozoon: Oogenesis in mammals, Vitellogenesis in birds.

PSO2. Students understand the Fertilization: external (amphibian), Internal (mammals), Block to polyspermy

PSO3. Students understand the Early Development of Frog and Human: types of cleavage; Morphogenetic movements; frog and Human: types of egg; patterns of cleavage; role of yolk

PSO4. Students understand the Development up to formation of gastrula. Neurulation.

PSO5. Students understand the Implantation of embryo in human: Types of placenta on the basis of histology; Formation of human placenta and its functions.

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#### **Practicals: Course Outcomes (COs)**

##### **A. Endocrinology**

CO1. To identify and describe the slides; pituitary, adrenal gland, thymus, testes, ovary

##### **B. Ecology**

CO2. To describe the Models based on different aspects of ecology.

CO3. To describe the Population study of available terrestrial and aquatic animals.

CO4. To describe and analyze the Physico-chemical study of soil and water (pH, DO, Free CO<sub>2</sub>, Turbidity etc)

CO5. To describe the ecosystem, its biotic components and food chains

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थलीसैण (पीछी गढ़वाल)

### **C. Animal Behaviour &**

CO6. To describe the Models Based on different aspects of animal behavior.

CO7. To describe the Birds Nest showing Nesting Behaviour

CO8. To describe the Experiments related to learning behavior/conditional learning.

CO9. To describe the Concept of biodiversity; Biodiversity as a resource; Biodiversity loss and its Causes.

### **D. Conservation Biology**

CO10. To identify Biodiversity hot spots with the help of maps.

CO11. To identify and describe the Protected areas: National Parks & Sanctuaries with the help of maps.

### **E. Developmental Biology**

CO12. To describe the developmental stages of frog- whole mounts and sections through permanent slides cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole-external and internal gill stages.

CO13. To identify and describe the different types of placentae- histological sections through permanent slides or photomicrographs.

### **F. Toxicology**

CO14. To describe the concept of Toxicology

### **Practical: Program Outcomes (COs)**

#### **A. Endocrinology**

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#### **B. Ecology**

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### **Practical: Program Specific Outcomes (CSOs)**

#### **A. Endocrinology**

PSO1. Students can be identify and describe the slides; pituitary, adrenal gland, thymus, testes, ovary

#### **B. Ecology**

PSO2. Students can be describe the Models based on different aspects of ecology.

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## **F. Toxicology**

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