

(As per New Education Policy 2020)

B.Sc. I Semester Examination, 2024

ZOOLOGY

ZOO5001T : Animal Diversity and Evolution

THEORY :	Max. Marks: 100
PRACTICALS :	Max. Marks: 100

Discipline Centric Core Course (DCC Course)

ZOO5001T - Animal Diversity & Evolution

Learning objective of the course

The course for the Animal Diversity & Evolution is dealing with the diversity, principles of systematics and categorization of invertebrate organisms.

Functional morphology of the types included with special emphasis on the adaptations to their modes of life and environment. General characters and classifications of all invertebrate phyla up to class with examples emphasizing their biodiversity, economic importance and conservation measures where required.

Unit 1: General principles of taxonomy, concept of the five-kingdom, Concept of Protozoa, Metazoa and Levels of organization. Basis of classification of non-chordata: Symmetry, coelom, segmentation and embryogeny, Characters and Classification of Protozoa and Porifera upto classes with examples.

Unit 2: Salient features and classification of Coelenterata, Ctenophora, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca and Echinodermata with their suitable examples.

Unit 3: Origin of Life, Miller's experiment, Lamarckism and Darwinism, Natural Selection, genetic basis of evolution, speciation, Evidences of organic evolution.

Unit 4: Variations, Isolation and Adaptations, Geological time scale and animal distribution in different era.

Unit 5: Principal zoogeographical regions of the world with special reference to their mammalian fauna, Factors affecting the large scale animal distribution, Origin and evolution of man.

ZOO5001P PRACTICALS

1. Demonstration of dissection:

Palaemon: Study of appendages, general anatomy, digestive and nervous systems

Pila: General anatomy and nervous system

Lamellidens / Unio: General anatomy and nervous system

2. Permanent preparations of the following: Protozoa: *Paramecium*

Porifera: Sponge spicules, fibres and gemmules Coelenterata: *Obelia* colony, *Obelia*, medusa

Annelida: *Nereis* parapodia

Arthropoda: *Palaemon*: Statocyst and hastate plate along with comb plates, *Cyclops* and *Daphnia*

Mollusca: *Pila*: Gill lamella, radula and L. S. Osphradium, *Lamellidens*: Gill-lamella

3. Identification, systematic position up to order and general study of the following animal forms, microscopic slides / museum specimens:

Protozoa: *Amoeba*, *Entamoeba*, *Euglena*, *Noctiluca*, *Trypanosoma*, *Trichomonas*, *Foraminifera* (Oozes), *Opalina*, *Balantidium*, *Nyctotherus*, *Paramecium*, *Paramecium* binary fission and conjugation and, *Vorticella* [Whole mounts].

Porifera: *Leucosolenia*, *Grantia*, *Scypha*, *Hyalonema*, *Euplectella*, *Spongilla* and *Euspongia*

Coelenterata: *Obelia* (colony and medusa), *Physalia*, *Porpita*, *Aurelia*, *Rhizostoma*, *Alcyonium*, *Corallium*, *Gorgonia*, *Tubipora*, *Pennatulla* and *Madrepora*

Ctenophora: *Beroe*

Platyhelminthes: *Dugesia*, *Fasciola* and *Taenia*

Nematoda: *Ascaris*, *Ancylostoma*, *Dracunculus*, *Wuchereria*, *Trichinella*, *Schistosoma* and *Enterobius*

Annelida: *Nereis*, Phase Heteronereis, *Aphrodite*, *Arenicola*, *Pheretima*, *Pontobdella*, *Branchellion* and *Hirudinaria*

Onychophora: *Peripatus*

Arthropoda : *Limulus*, *Araneus*, *Palamnaeus*, *Apus*, *Lepas*, *Balanus*, *Sacculina*, *Palaemon*, *Lobster*, *Eupagurus*, *Carcinus*, *Lepisma*, *Odontotermes*, *Pediculus*, *Schistocerca*, *Papilio*, *Bombyx*, *Xenopsylla*, *Apis*, *Julus* and *Scolopendra*

Mollusca: *Chiton*, *Dentalium*, *Patella*, *Pila*, *Turbinella*, *Aplysia*, Slug, Snail, *Mytilus*, *Ostrea* (pearl oyster), *Lamellidens*, *Teredo*, *Nautilus*, *Sepia*, *Octopus* Enchinodermata: *Pentaceros*, *Asterias*, *Ophiothrix*, *Echinus*, *Holothuria* and *Antedon*

Marks Distribution

SN	Exercise	Marks
1	Demonstration of Dissection/Study	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

Note: Each regular student is required to keep a record of practical work done by him/her duly checked by the teacher which will be submitted at the time of practical examination

B.Sc. II Semester (ZOOLOGY) Examination, 2023

ZOO5002T: Biology of Non chordates

THEORY :	Max. Marks: 100
PRACTICALS :	Max. Marks: 100

Discipline Centric Core Course (DCC Course)

ZOO5002T: Biology of Non chordates

Learning objective of the course

The course for the biology of non-chordates is dealing with the categorization of non-chordates organisms from unicellular to multicellular with different grading of body forms.

Unit 1: *Euglena*: Ultrastructure of flagellum and flagellar movement, osmoregulation and behaviour, reproduction.

Paramecium: Locomotion, nutrition, osmoregulation and reproduction. *Sycon*: Cellular organization, canal system, reproduction and development.

Unit 2: *Obelia*: Structure of polyp and medusa, sense organs and reproductive systems, life cycle.

Fasciola: Digestive, excretory and reproductive systems, developmental stages and life cycle.

Taenia: Structure of body wall, excretory and nervous systems, reproduction and developmental stages in life cycle.

Unit 3: *Nereis*: Parapodial locomotion, digestive, blood vascular, excretory, nervous and reproductive systems, development and metamorphosis.

Hirudinaria: Digestive, haemocoelomic, excretory, nervous and reproductive systems, sense organs.

Unit 4: *Palaemon*: Appendages, Digestive, respiratory, blood – vascular, excretory, nervous, sense organs and reproductive systems.

Pila: Digestive, respiratory, blood vascular, nervous and reproductive systems, sense organs

Unit 5: *Lamellidens*: Digestive, respiratory, blood–vascular, excretory and nervous systems, sense organs, reproduction and development.

Asterias: Water – vascular system, digestive, circulating and nervous systems, sense organs, reproduction, life history and regeneration.

ZOO5002P: Practical

1. Study of sections, developmental stages and isolated structures from microscopic slides

Porifera: L. S. and T. S. of *Scypha* / *Grantia*

Coelenterata: *Hydra*, Sections of *Hydra*, Developmental stages of *Aurelia* Platyhelminthes: Transverse sections of *Dugesia*, *Fasciola* and *Taenia*, mature and gravid proglottids of *Taenia*, developmental stages of *Fasciola* and *Taenia* Annelida: Transverse sections of *Nereis* and *Hirudinaria*, Trochophore

larva of Nereis, Parapodium of *Nereis* and *Heteronereis*

Arthropoda: Crustacean larvae (*Nauplius*, *Zoea*, *Megalopa* and *Mysis*), mosquitolarva & pupa

Mollusca: Transverse sections of *Lamellidens* and Glochidium larva Echinodermata: Pedicellariae of

Star fish

2. Experimental Zoology:

- a. Test for Protein : Biuret
- b. Test for Lipids : Sudan IV
- c. Test for Carbohydrates : Benedict's

3. Living study of *Paramecium*

Marks Distribution

SN	Exercise	Marks
1	Demonstration of Dissection/Study	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

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B.Sc. III Semester (ZOOLOGY) Examination, 2025

ZOO6001T : Biology of Non chordates

THEORY : Max. Marks: 100

PRACTICALS : Max. Marks: 100

Discipline Centric Core Course (DCC Course)

ZOO6001T : Chordate Structure and Function

Learning objective of the course

The course for the Taxonomy of chordates is exchanging the knowledge about with the principles of systematic and categorization of vertebrate organisms including their structure and function.

Unit 1: Classification and characters of phylum Chordata (excluding extinct forms) up to orders, Comparisons of habit, habitat, external features and anatomy of *Balanoglossus*, *Herdmania* and *Branchiostoma* (excluding development).

Unit 2: Ascidian tadpole larva and its Metamorphosis, Affinities of Hemichordate, Urochordate and Cephalochordates, Habit, Habitat and salient features of *Petromyzon*, Ammocoete larva.

Unit 3: Integument including structure and development of placoid scales, feathers and hairs, Jaw suspensorium, limbs and girdles of *Rana*, *Uromastix*, *Columba* and *Oryctolagus*.

Unit 4: Heart and aortic arches, respiratory system and alimentary canal of *Scoliodon*, *Rana*, *Uromastix*, *Columba* and *Oryctolagus*.

Unit 5: Brain, urinogenital system (*Scoliodon*, *Rana*, *Uromastix*, *Columba* and *Oryctolagus*), Identification of poisonous and non poisonous snakes. Biting mechanism in snakes, flight adaptations in birds. Adaptations in aquatic mammals.

ZOO5002P Practical

1. Demonstration of dissection:

Scoliodon : General anatomy, alimentary canal, afferent and efferent blood vessels, urinogenital system, brain and cranial nerves – V, VII, IX and X only and internal ear *Labeo* / *Wallago*, Brain V, VII, IX and X Cranial nerves, afferent and efferent blood vessels, air sacs, and internal ear.

Rattus: General anatomy, digestive, blood vascular and urinogenital systems

2. OSTEOLOGY

Articulated and disarticulated skeleton of *Rana*, *Varanus*, *Gallus* and *Oryctolagus*

3. PERMANENT PREPARATIONS

Scoliodon: Placoid scales, Ampulla of Lorenzini.

4. Identification, systematic position and comments of the following animals:

Cephalochordata: *Amphioxus*, Hemichordata: *Balanoglossus*

Urochordata: *Salpa, Doliolum* and *Herdmania*

Cyclostomata: *Petromyzon* and *Myxine*

Pisces: *Zygaena, Scoliodon, Pristis, Torpedo, Trygon, Protopterus, Labeo, Heteropneustis*

(*Saccobranhus*), *Belone, Exocoetus, Anabas* and *Echeneis* Amphibia: *Necturus, Amphiuma,*

Amblystoma, Axolotal larva, Hyla, Uraeotyphlus Reptilia: *Trionyx, Chelone, Varanus, Uromastix,*

Ophiosaurus, Naja, Bungarus, Echis, Hydrophis, Eryx, Ptyas, Crocodilus and *Gavialis*

Aves: *Columba, Pavo, Choriotis, Francolinus, Streptopelia*

Mammalia: *Meriones, Funambulus, Rattus, Hemiechinus, Suncus, Ptecopus, Presbytis*
and *Macaca*

5. Microscopic Study

Hemichordata: Section through proboscis and branchiogenital region *Branch stoma*: T.S. oral hood,
pharynx, gonads, intestine and caudal region *Scoliodon*: T.S. gill and scroll valve

Rana: T.S. through various organs, T.S. and L.S. of developmental stages

Reptilia: V.S. skin of lizard

Aves: V.S. skin, different types of feathers

Mammalia: T.S. through various organs

Marks Distribution

SN	Exercise	Marks
1	Demonstration of Dissection/Study	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

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B.Sc. IV Semester (ZOOLOGY) Examination, 2025

ZOO6002T: Developmental Biology

THEORY : Max. Marks: 100
PRACTICALS : Max. Marks: 100

Discipline Centric Core Course (DCC Course)

ZOO6002T : Developmental Biology

Learning objective of the course

The course for the developmental biology of vertebrates is exchanging the knowledge about with the developmental processes and various events of development.

Unit 1: Formation of egg and sperm, vitellogenesis and fertilization. Types of eggs and sperms, parthenogenesis, regeneration.

Unit 2: Planes and patterns of cleavage in chordates, significance of cleavage and blastulation, Morphogenetic cell movement, Fate maps and significance of gastrulation.

Unit 3: Development of Branchiostoma (Amphioxus) up to gastrulation; chick egg and its development up to the formation of primitive streak, Extra embryonic membranes of chick, development of placenta in rabbit, types and functions of placenta in mammals.

Unit 4: Various types of stem cells and their applications (with special reference to embryonic stem cells), Cloning of animals: nuclear embryonic transfer technique, nuclear transfer technique; Identical, Siemese and fraternal twins and Artificial insemination.

Unit 5: Organogenesis of alimentary canal, eye, kidney, gonads and brain in Frog.

ZOO6002P : Developmental Biology

1. Chick embryology: Whole mounts of embryos of 18, 24, 28, 33, 36, 48 and 72 hours.
2. Microscopic studies of Testis and Ovary of Frog, Uromastrix, Columba and Rat.
3. Preparation of different development stages of Chick.

Marks Distribution

SN	Exercise	Marks
1	Exercise	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

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B.Sc. V Semester (ZOOLOGY) Examination, 2026

ZOO7001T : Cell Biology and Genetics

THEORY :

Max. Marks: 100

PRACTICALS :

Max. Marks: 100

Discipline Specific Elective Course (DSE Course)

ZOO7001T - Cell Biology and Genetics

Learning objective of the course

The course for the cell biology and genetics is exchanging the knowledge about structure of cell organelles and basic idea of genetics.

Unit 1: Characteristics of prokaryotic and eukaryotic cells, Characteristics of cell membrane molecules, fluid-mosaic models of Singer and Nicolson, passive and active transport, Structures and functions of endoplasmic reticulum, ribosome, Golgi complex, lysosome, mitochondria, centriole, microtubules and nucleus.

Unit 2: Structure of Chromatin and Chromosomes, semiconservative mechanism of replication, elementary idea about topoisomerases, replication forks, leading and lagging strands, RNA primers and Okazaki fragments, RNA structure and types, mechanism of transcription, Genetic Code and protein synthesis.

Unit 3: Interphase nucleus and cell-cycle including regulation.

Mitosis: Phases and process of mitosis, structure and function of spindle apparatus, Theories of cytokines.

Meiosis: Phases and process of meiosis, synaptonemal complex, formation and fate of chiasmata recombination and significance of crossing over.

Unit 4: Mendelism: Brief history of genetics and Mendel's work: Mendelian laws, their significance and current status, linked gene inheritance.

Chromosomal aberration: Structural - translocation, inversion, deletion and duplication; Numerical - haploidy, diploidy, polyploidy, aneuploidy, euploidy, polysomy and genetic implications.

Unit 5: Genetic interaction: supplementary genes, complementary genes, duplicate genes, multiple gene interaction, ABO blood groups and their genotypes, Multiple alleles.

ZOO7001P - Practical

- (i) Identifications of different stages of Mitosis.
- (ii) Identifications of different stages of Meiosis.
- (iii) Demonstration of Amylase enzyme activity in animal tissue.
- (iv) Temporary acetocarmine squash preparations and study of chromosomes.
- (v) Determination of blood groups and Rh-factor.
- (vi) Study of nucleus morphology of mammalian blood sample.

Marks Distribution

SN	Exercise	Marks
1	Exercise	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

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ZOO7002T : Animal Physiology and Biochemistry

THEORY :

Max. Marks: 100

PRACTICALS :

Max. Marks: 100

Discipline Specific Elective Course (DSE Course)

ZOO7002T - Animal Physiology and Biochemistry

Learning objective of the course

The course for the animal physiology is exchanging the knowledge about different systems and basic biochemistry.

Unit 1: Digestion; digestive enzymes, process of digestion, digestion of protein, carbohydrate and lipid

Blood: Composition and functions, Blood groups, Rh factor and their significance, blood clotting mechanism, blood pressure and cardiac cycle, respiratory pigments, cardiac muscle activity.

Unit 2: Muscle: Structure of various types of muscles and mechanism of muscle contraction

Excretion: Structure of kidney, types of nephron, mechanism of urine formation and its elimination and arginine, ornithin cycle.

Unit 3: Respiration: Structure of lung, mechanism of respiration, respiratory pigment, exchange and transport of oxygen and carbon dioxide.

Nervous System: Structure of neuron and its classification, Nerve impulse, impulse conduction and reflex action.

Unit 4: Endocrine glands: Structure and functions of various endocrine glands, diseases caused by hormonal deficiency; Mechanism of hormone action.

Unit 5: Structure of Protein and Carbohydrates; oxidation of glucose through glycolysis, Krebs cycle and oxidative phosphorylation, deamination, transamination and decarboxylation.

ZOO7002P Practical

1. Haemoglobin estimation of mammalian blood
2. Preparation of heamin crystals
3. Osmotic effect of R.B.C.
4. Preparation of mammalian blood film.
5. To determine the rate of oxygen consumption of rat
6. Analysis of urine for sugar, protein and pH
7. Estimation of E.S.R.
8. Estimation of packed cell volume [PCV]
9. Measurement of blood pressure
10. Demonstration of dissection of nervous system of cockroach

Marks Distribution

SN	Exercise	Marks
1	Exercise	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

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B.Sc. VI Semester (ZOOLOGY) Examination, 2026

ZOO7003T : Ecology and Behaviour

THEORY :

Max. Marks: 100

PRACTICALS :

Max. Marks: 100

Discipline Specific Elective Course (DSE Course)

ZOO7003T - Ecology and Behaviour

Learning objective of the course

The course for the Ecology and Animal behavior is exchanging the knowledge about animal habitat and various behavioral activities.

Unit 1: Introduction of ecology, definition, history, sub division and scope of ecology. Environmental factors; physical factors- soil, water, air and temperature. Biotic factors-interspecific and intraspecific relations, neutralism, mutualism, commensalism, antibiosis, parasitism, predation, competition. Concept of limiting factors, Liebig's law of minimum, Shelford's law of tolerance, combined concept of limiting factors.

Unit 2: Population and community ecology, measurement of population density. Factors affecting population growth, growth factors, dispersal, characteristic of community, concept of ecosystem and niches.

Food chain, food web, Ecological pyramid. Energy flow in an ecosystem, biogeochemical cycles of CO₂, N₂, O₂, S and P. Prospects and strategies of sustainable development.

Unit 3: Brief introduction to the major ecosystem of the world and ecological succession, conservation of natural resources; Ecology in relation to Thar desert.

Brief account of environmental pollution, global warming and its impact upon Human race.

Unit 4: General survey of various types of animal behaviour; Methods of studying animal behaviour, Role of hormones and pheromones in behaviour, Biological rhythms.

Unit 5: Learning and Memory – Conditioning, Habituation, Insight learning, Association learning, Reasoning and Communication; Wildlife of Rajasthan and its conservation.

ZOO7003T - Practical

1. Demonstration of working of pH meter.
2. Demonstration of working of colorimeter.
3. Estimation of pH of Soil and water samples.
4. Measurement of temperature and relative humidity.
5. Estimation of soil moisture.
6. Estimation of water holding capacity of different soils.
7. Ecosystem study : Aquarium.
8. Pond water study to identify zoo-planktons and their permanent preparations

Marks Distribution

SN	Exercise	Marks
1	Exercise	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

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ZOO7003T : Applied Zoology

THEORY : Max. Marks: 100

PRACTICALS : Max. Marks: 100

Discipline Specific Elective Course (DSE Course)

ZOO7003T - Applied Zoology

Learning objective of the course

The course for the Applied Zoology is exchanging the knowledge about application of Zoology in society and well being.

Unit 1: Poultry keeping – Types of poultry breeds, poultry housing, farm and farm management, system of poultry farming; Grading, handling and marketing of eggs. Poultry diseases and Vermiculture; Methodology and products.

Unit 2: Sericulture : Different kinds of silk producing insects in India and its potentialities. Host plants of silk insects. Grainage, rearing and life cycle. Breeding and various diseases of silkworm. Reeling and fibre technology. Economics of sericulture.

Unit 3: Apiculture : Different kinds of honey bees found in India and, their identification. Identification of Queen, worker and drone. Importance of keeping bees in artificial hives and different kinds of hives. Care and management of bee colonies. Bee enemies and their control. Extraction and processing of honey from the comb. Utility and economics of production of honey. Honey bees and pollination strategy in agricultural crops.

Unit 4: Pest Management : Insect pests of important crops (cotton, Rice, sugar cane& pulses), insect pest of veterinary and medical importance, pest outbreaks and assessment of losses caused by the insect pests on crops; population dynamics of insect pests; Principles of Biological, mechanical and cultural methods of pest control. Integrated Pest Management (IPM). Principles of pest control by pesticides.

Important vertebrate pests; birds and mammals with special reference to rodents and their management.

Unit 5: General principles of aquaculture; transportation of fish seed and brooders. Induced Breeding, Composite fish culture, Lay out of fish farm and its management, By-products of fishing industry; Prawn culture; Management of water bodies for aquaculture.

ZOO7003P – Practical

1. Study of different spraying and dusting equipment.
2. Use of pesticides and precautionary measures.
3. Permanent preparation of any two stored grain pests.
4. Permanent Preparation and Identification parasitic insects.
5. Honey bee : Permanent preparation of pollen basket and mouth parts
6. Permanent preparation of mouth parts of butterfly, moth, mosquito, termites and cockroach
7. Model/ Project report based upon study of Poultry keeping/ Sericulture/ Apiculture/ Pest Management

Marks Distribution

SN	Exercise	Marks
1	Exercise	15
2	Permanent Preparations	15
3	Spots (10 x 4)	40
4	Viva – voce	15
5	Practical Record	15
Total		100

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