

S.K.S.D. MAHILA KALASALA, UG & PG (A), TANUKU
(Affiliated to Adikavi Nannaya University)
Re-Accredited by NAAC WITH 'B++' Grade
B.Sc.,(CBZ,BZCs)
Subject: ZOOLOGY
Paper : ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES
Syllabus
Semester - I
(w.e.f. 2020-2021 A.B)

UNIT I

Phylum Protozoa

General Characters and classification of protozoa up to classes with suitable examples
Locomotion, nutrition and reproduction in Protozoans
Elphidium (type study)

Phylum Porifera

General characters and classification up to classes with suitable examples
Skeleton in Sponges
Canal system in sponges

Unit - II

Phylum Coelenterata

General characters and classification up to classes with suitable examples
Metagenesis in *Obelia*
Polymorphism in coelenterates
Corals and coral reefs

Phylum Ctenophora :

General Characters and Evolutionary significance (affinities)

Phylum Platyhelminthes

General characters and classification up to classes with suitable examples
Life cycle and pathogenicity of *Fasciola hepatica*
Parasitic Adaptations in helminthes

Phylum Nematelminthes

General characters and classification up to classes with suitable examples
Life cycle and pathogenicity of *Ascaris lumbricoides*

Unit - III

Phylum Annelida

General characters and classification up to classes with suitable examples
Evolution of Coelom and Coelomoducts

Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Phylum Arthropoda

General characters and classification up to classes with suitable examples

Vision and respiration in Arthropoda

Metamorphosis in Insects

Peripatus - Structure and affinities

Social Life in Bees and Termites

Unit - IV

Phylum Mollusca

General characters and classification up to classes with suitable examples

Pearl formation in Pelecypoda

Sense organs in Mollusca

Phylum Echinodermata

General characters and classification up to classes with suitable examples

Water vascular system in starfish

Larval forms of Echinodermata

Phylum Hemichordata

General characters and classification up to classes with suitable examples

Balanoglossus - Structure and affinities

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Paper : ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES
Practical Syllabus
Semester - I
(w.e.f. 2020-2021 A.B)

Study of museum slides / specimens / models (Classification of animals up to orders)

Protozoa: Amoeba, *Paramecium*, *Paramecium* Binary fission and Conjugation, *Vorticella*, *Entamoeba histolytica*, *Plasmodium vivax*

Porifera: *Sycon*, *Spongilla*, *Euspongia*, *Sycon*- T.S & L.S, Spicules, Gemmule
Coelenterata: *Obelia* – Colony & Medusa, *Aurelia*, *Physalia*, *Velella*, *Corallium*, *Gorgonia*, *Pennatulav.*

Platyhelminthes: *Planaria*, *Fasciola hepatica*, Fasciolalarval forms – Miracidium, Redia, Cercaria, *Echinococcus granulosus*, *Taenia solium*, *Schistosoma haematobium*.

Nemathelminthes: *Ascaris*(Male & Female), *Dracunculus*, *Ancylostoma*, *Wuchereria*

Annelida: *Nereis*, *Aphrodite*, *Chaetopterus*, *Hirudinaria*, Trochophore larva
Arthropoda: *Cancer*, *Palaemon*, *Scorpion*, *Scolopendra*, *Sacculina*, *Limulus*, *Peripatus*, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female *Anopheles* and *Culex*, Mouthparts of Housefly and Butterfly. xiii.

Mollusca: *Chiton*, *Pila*, *Unio*, *Pteredo*, *Murex*, *Sepia*, *Loligo*, *Octopus*, *Nautilus*, Glochidium larva

Echinodermata: *Asterias*, *Ophiothrix*, *Echinus*, *Clypeaster*, *Cucumaria*, *Antedon*, Bipinnaria larva

Hemichordata: *Balanoglossus*, Tornaria larva

Dissections:

• **Prawn:** Appendages, Digestive system, Nervous system, Mounting of Statocyst

• **Insect** MouthParts

• **Laboratory Record work shall be submitted at the time of practical examination**

• An “**Animal album**” containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose

• **Computer - aided techniques should be adopted or show virtual dissections**



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B.Sc.,(CBZ,BZCs)

Subject: ZOOLOGY

Paper : ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Syllabus

Semester - II

(w.e.f. 2020-2021 A.B)

Unit - I

General characters and classification of Chordata upto classes
Protochordata- Salient features of Cephalochordata , Affinities
of Cephalochordata.
Salient features of Urochordata
Structure and life history of *Herdmania*
Retrogressive metamorphosis –Process and Significance

Unit -II

Cyclostomata, General characters, Comparison of *Petromyzon* and *Myxine*
Pisces : General characters of Fishes
Scoliodon: External features, Digestive system, Respiratory system,
Structure and function of Heart, Structure and functions of the Brain.
Migration in Fishes
Types of Scales
Dipnoi

Unit - III

General characters of Amphibia
Classification of Amphibia up to orders with examples.
Rana hexadactyla: External features, Digestive system, Respiratory
system, Structure and function of Heart, structure and functions of
the Brain
Reptilia: General characters of Reptilia, Classification of Reptilia up to orders
with examples
Calotes: External features, Digestive system, Respiratory system,
Structure and function of Heart, structure and function of Brain
Identification of Poisonous snakes and Skull in reptiles

Unit - IV

Aves General characters of Aves

Columba livia: External features, Digestive system, Respiratory system,
Structure and function of Heart, structure and function of Brain
Migration in Birds
Flight adaptation in birds

Unit - V

General characters of Mammalia
Classification of Mammalia upto sub - classes with examples
Comparison of Prototherians, Metatherians and Eutherians
Dentition in mammals

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Paper : ANIMAL DIVERSITY – BIOLOGY OF CHORDATES
Practical Syllabus
Semester - II
(w.e.f. 2020-2021 A.B)

Learning Outcomes:

- To understand the taxidermic and other methods of preservation of chordates
- To identify chordates based on special identifying characters
- To understand internal anatomy of animals through demo or virtual dissections, thus directing the student for “empathy towards the fellow living beings”
- To maintain a neat, labeled record of identified museum specimens

OBSERVATION OF THE FOLLOWING SLIDES / SPOTTERS / MODELS

1. Protochordata : *Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomata : *Petromyzon and Myxine*.
3. Pisces : *Pristis, Torpedo, Hippocoampus, Exocoetus, Echeneis, Labeo, Catla, Clarius, Channa, Anguilla*.
4. Amphibia : *Ichthyophis, Amblystoma, Axolotl larva, Hyla*,
5. Reptilia: *Draco, Chamaeleon, Uromastix, Testudo, Trionyx, Russels viper, Naja, Krait, Hydrophis, Crocodile*.
6. Aves : *Psittacula, Eudynamis, Bubo, Alcedo*.
7. Mammalia: *Ornithorhynchus, Pteropus, Funambulus*.

Dissections-

1. *Scoliodon* IX and X, Cranial nerves
2. *Scoliodon* Brain
3. Mounting of fish scales

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II B.Sc. ZOOLOGY SYLLABUS
SEMESTER – III
Subject : ZOOLOGY
Paper III: Cell Biology, Genetics, Molecular Biology and Evolution
(w.e.f.2020-2021 Academic Batch)

UNIT I:

Cell Biology: Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma Electron microscopic structure of animal cell. Plasma membrane –Models and transport functions of plasma membrane. Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

Additional Input : Cell theory.

(Note: 1. **General pattern of study of each cell organelle** – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)

2. Need not study cellular respiration under mitochondrial functions)

UNITII:

Molecular Biology: Central Dogma of Molecular Biology Basic concepts of-

1. DNA replication – Overview (Semi-conservative mechanism, Semi- discontinuous mode, Origin & Propagation of replication fork)
2. Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications(basics)
3. Translation – Initiation, Elongation and Termination Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

UNIT : III

Genetics-I: Mendel's work on transmission of traits Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes Polygene's (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination) Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance) -Chromosomal Disorders (Autosomal and Allosomal)

UNIT IV :

Origin of life Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory Neo- Darwinism: Modern Synthetic, Theory of Evolution, Hardy-Weinberg Equilibrium Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

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II B.Sc. ZOOLOGY PRACTICAL SYLLABUS

SEMESTER – III

Subject : ZOOLOGY

Paper III: Cell Biology, Genetics, Molecular Biology and Evolution
(w.e.f.2020-2021 Academic Batch)

I. Cell Biology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chironomus*

II. Genetics

1. Study of Mendelian inheritance using suitable examples and problems.
2. Problems on blood group inheritance and sex linked inheritance.
3. Study of human Karyo types (Down's syndrome, Edwards, syndrome, Patau syndrome, Turner's syndrome and Klinefelter syndrome).

III. Evolution

1. Study of fossil evidences.
2. Study of homology and analogy from suitable specimens and pictures.
3. Phylogeny of horse with pictures.
4. Study of Genetic Drift by using examples of Darwin's finches (pictures).
5. Visit to Natural History Museum and submission of report.

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II B.Sc. ZOOLOGY SYLLABUS
SEMESTER – IV
Subject : ZOOLOGY
Paper IV: Animal Physiology, Cellular Metabolism and Embryology
(w.e.f.2020-2021 Academic Batch)

UNIT I:

Animal Physiology -I: Process of digestion and assimilation, Respiration - Pulmonary ventilation, transport of oxygen and CO₂, (Note: Need not study cellular respiration here), Circulation - Structure and functioning of heart, Cardiac cycle, Excretion - Structure and functions of kidney urine formation, counter current Mechanism

Additional Input : Vitamins

UNIT II:

Animal Physiology -II: Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers. Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction. Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas, Hormonal control of reproduction in mammal

UNIT III:

Cellular Metabolism – I(Biomolecules) Carbohydrates - Classification of carbohydrates. Structure of glucose Proteins - Classification of proteins. General properties of amino acids Lipids - Classification of lipids. Enzymes: Classification and Mechanism of Action

Cellular Metabolism –II: Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis, Lipid Metabolism – Synthesis of fatty acids, β -oxidation of palmitic acid Protein metabolism - Transamination, Deamination and Urea Cycle

UNIT IV:

Embryology:

- i) Gametogenesis
- ii) Fertilization,
- iii) Types of eggs
- iv) Types of cleavages,
- v) Development of Frog upto formation of primary germ layers

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SEMESTER – IV
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Paper IV: Animal Physiology, Cellular Metabolism and Embryology
(w.e.f.2020-2021 Academic Batch)

I. Animal physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Study of activity of salivary amylase under optimum conditions
3. T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
4. Differential count of human blood

II. Cellular metabolism

1. Estimation of total protein in given solutions by Lowry's method.
2. Estimation of total carbohydrate by Anthrone method.
3. Qualitative tests for identification of ammonia, urea and uric acid
4. Protocol for Isolation of DNA in animal cells

III. Embryology

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Construction of fate map of frog blastula

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II B.Sc. ZOOLOGY SYLLABUS
SEMESTER – IV
Subject : ZOOLOGY
Paper V: Immunology and Animal Biotechnology
(w.e.f.2020-2021 Academic Batch)

UNIT I:

Immunology – I (Overview of Immune system): Introduction to basic concepts in Immunology, Innate and adaptive immunity, Vaccines and Immunization programme, Cells of immune system, Organs of immune system, Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)

Antigens: Basic properties of antigens, B and T cell epitopes, adjuvants and factors influencing immunogenicity

Antibodies: Structure of antibody, Classes and functions of antibodies Structure and functions of major histocompatibility complexes, Exogenous and Endogenous pathways of antigen presentation and processing Hypersensitivity – Classification and Types

UNIT II:

Techniques: Animal Cell, Tissue and Organ culture media: Natural and Synthetic media, Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures

Stem cells: Types of stem cells and applications, Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb).

UNIT III:

Applications of Animal Biotechnology: Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology

Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery

Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, fish; applications Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

UNIT IV:

PCR: Basics of PCR.

DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2hrs) **Hybridization techniques:** Southern, Northern and Western blotting DNA fingerprinting: Procedure and applications

Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing;

Agriculture: Monoculture in fishes, polyploidy in fishes.

Additional Input: PCR applications

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SEMESTER – IV
Subject : ZOOLOGY
Paper V: Immunology and Animal Biotechnology
(w.e.f.2020-2021 Academic Batch)

I. Immunology

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of
 - a. ELISA
 - b. Immune electrophoresis

II. Animal biotechnology

1. DNA quantification using DPAMethod.
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Preparation of culture media.

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III B.Sc. ZOOLOGY SYLLABUS

SEMESTER – V

Paper –VI : SustainableAquacultureManagement

UNIT I:

PresentstatusofAquaculture–GlobalandNationalscenario
Majorcultivablespeciesforaquaculture:freshwater,brackishwaterandmarine.
Traditional,extensive,modifiedextensive,semi-
intensiveandintensiveculturesoffishandshrimp.
Designandconstructionoffishandshrimpfarms

UNITII:

Functionalclassificationofponds–headpond,hatchery,nurseryponds
Functionalclassificationofponds-
rearing,production,stockingandquarantineponds
Needoffertilizer andmanureapplicationincultureponds
Physio-chemical conditions of soil and water optimum for culture
(Temperature, depth, turbidity, light,water, PH, BOD, CO2 and nutrients)

UNIT III:

Inducedbreedinginfishes
CultureofIndianmajorcarps:Pre-
stockingmanagement(Dewatering,drying,ploughing/desilting;
redators, weeds and algal blooms and their control, Liming and
fertilization)
CultureofIndianmajor carps-Stocking management
CultureofIndianmajorcarps-post-stockingmanagement

UNIT IV:

Commercial importance of shrimp & prawn

Macrobrachium rosenbergii - biology, seed production.

Culture of *L. vannamei* - hatchery technology and culture practices

Mixed culture of fish and prawns

Viral diseases of fin fish & shellfish

Fungal diseases of fin & shellfish

Bacterial diseases of fin fish & shellfish

Prophylaxis in aquaculture

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III B.Sc. ZOOLOGY PRACTICAL SYLLABUS

SEMESTER – V

Paper –VI : SustainableAquacultureManagement

Practical(Laboratory)Syllabus:

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)-5
2. Brackishwater cultivablespecies (Fin&Shellfish- Specimens- Observationof MorphologicalCharacter by observing drawing) -5
3. Hands ontraining ontheuse of kits for determination of water qualityinaquaculture(DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard procedure can be demonstrated for the same)
4. Demonstration of Hypophysation(Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
5. Viral diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of viral pathogens in fin/ shell fish – one ediblespecimen can beused for observation of samein the laboratory)
6. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)
7. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

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III B.Sc. ZOOLOGY SYLLABUS

SEMESTER – V

Paper –VII : Postharvest Technology of Fish and Fisheries

UNIT I: Handling and Principles of fish Preservation

1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.2 Principles of preservation – cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

Methods of fish Preservation

2.1 Traditional methods – sun drying, salt curing, pickling and smoking.

2.2. Advanced methods – chilling, icing, refrigerated seawater, freezing, canning, irradiation and Accelerated Freeze drying (AFD).

UNIT II: Processing and preservation of fish and fish by-products

Fish products –
fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

Fish by-products –
fish glue, Using glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

UNIT III: Sanitation and Quality control

Sanitation in processing plants –
Environmental hygiene and Personal hygiene in processing plants.
Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

Additional Input : Seaweed culture

UNIT I V: Quality Assurance, Management and Certification

Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.2 National and International standards – ISO 9000:2000 Series of Quality Assurance System, Codex Alimentarius.

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SEMESTER – V

Paper –VII : Postharvest Technology of Fish and Fisheries

Practical(Laboratory)Syllabus:

1. Evaluation of fish / fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products For detailed procedure method visit sites:
3. Examination of salt, protein, moisture in dried / cured products
4. Examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
5. Preparation of fish gelatin, collagen and chitosan from shrimp and crab shell.
6. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet
7. Corrective action procedures in processing of fish - flowchart - worksheet preparation

(**Refer the following websites for complete procedure method and estimations of above listed practicals)