**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA: VIJAYAWADA-10.**
(An autonomous college in the jurisdiction of Krishna University, Machilipatnam)
**DEPARTMENT OF ZOOLOGY**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | | | | | | | |
| **Title of the Course** | | | | ANIMAL DIVERISTY-II BIOLOGY OF CHORDATES | | | |
| **Offered to: (Programme/s)** | | | | **I B.Sc. Hons Aquaculture** | | | |
| **L** | **4** | **T** | **0** | **P** | **0** | **C** | **3** |
| **Year of Introduction:** | **2024-25** | | | **Semester:** | | | **3** |
| **Course Category:** | **MINOR** | | | **Course Relates to:** | | **GLOBAL** | |
| **Year of Introduction:** | **2024** | | | **Percentage:** | | **NA** | |
| **Type of the Course:** | | | | **SKILL DEVELOMENT** | | | |
| **Crosscutting Issues of the Course :** | | | | | | | |
| **Pre-requisites, if any** | | | | Basic knowledge in Vertebrates in intermediate level | | | |

**Course Description:**

This course explores the evolutionary and functional biology of the phylum Chordata, which includes vertebrates and their relatives. The course covers key concepts such as chordate anatomy, developmental biology, and evolutionary adaptations. Students will examine the structure and function of chordate systems, including the notochord, pharyngeal slits, and post-anal tail.

Comparative analysis across various chordate groups, from primitive lancelets to complex mammals, will illustrate evolutionary trends and functional diversity. Hands-on activities and laboratory sessions will enhance understanding of chordate morphology and physiology, highlighting their ecological roles and evolutionary significance

**Course Aims and Objectives:**

| S. No | COURSE OBJECTIVES |
|---|---|
| **1** | To understand the animal kingdom |
| **2** | To understand the taxonomic position of Protochordata to Mammalia. |
| **3** | To understand the general characteristics of animals belonging to Fishes to Reptilians |
| **4** | To understand the body organization of Chordata. |
| **5** | To understand the taxonomic position of Protherian mammals |

**Course Outcomes**

At the end of the course, the student will / will be…

| NO | COURSE OUTCOME | BTL | PO | PSO |
|---|---|---|---|---|
| **CO1** | Describe general taxonomic rules on animal classification of Chordates. | **K1** | **5** | **1** |
| **CO2** | Classify Protochordata to Mammalia with taxonomic keys. | **K2** | **5** | **1** |
| **CO3** | Understand Mammals with specific structural adaptations. | **K2** | **5** | **1** |
| **CO4** | Understand the significance of dentition and evolutionary Significance. | **K1** | **5** | **1** |
| **CO5** | Understand the origin and evolutionary relationship of different Phyla from Protochordata to Mammalia. | **K2** | **6** | **1** |

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate;K6: Create

| CO-PO-PSO MATRIX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CO NO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** |
| **CO1** | | | | | **1** | **2** | **3** | **1** | |
| **CO2** | | | | | **1** | **2** | **3** | **1** | |
| **CO3** | | | | | **1** | **2** | **3** | **1** | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CO4** | | | | | **1** | **2** | **3** | **1** | |
| **CO5** | | | | | **1** | **2** | **3** | **1** | |

**Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSOrespectively**

**Course Structure:**

**UNIT - I** **9 hours**

1.1 General characters and classification of Chordata up to classes 2hrs

1.2 Salient features of Cephalochordata, Salient features of Urochordata **2hrs**

1.3 Structure and life history of Herdmania, Retrogressive metamorphosis **3hrs** –Process and Significance

1.4 Cyclostomata, General characters, Comparison of Petromyzon and Myxine **2hrs**

**Activity**: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

https://youtu.be/2iwOPEGVHVY?si=dZ8Z55pgze6XmvyU

https://youtu.be/gWsmAxbdutI?si=3rVh5PXZNqyDssaa

https://youtu.be/_CBA7_Kosh4?si=mCcfBXfojvnu66gs

https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/cyclostome

**Applications:**

**Assignment 1**: Prepare a Cladogram on Chordates

**Assignment 2**: Preparation of chart on Retrogressive Metamorphosis

Compare and contrast Retrogressive metamorphosis with progressive metamorphosis for **advanced learners**

**Activity 1**

**Case Study Analysis**

- **Activity**: Assign different organisms that exhibit retrogressive metamorphosis (like certain insects or amphibians) to small groups of students.
- **Research**: Each group researches their assigned organism's life cycle and presents their findings, highlighting how retrogressive metamorphosis is displayed.

**Activity 2**

**Cyclostome Life Cycle Exploration**

**Objective:** Explore the life cycle of cyclostomes.

**Materials:** Lifecycle diagrams or videos of lampreys and hagfish.

**Instructions:**

- Present a diagram or video showing the life cycle of lampreys and hagfish, from egg to adult.
- Discuss the different stages of development, including larval stages such as ammocoetes in lampreys.
- Have students create their own life cycle diagrams or timelines to illustrate and label each stage

**Unit – II:** **9 hours**

- 2.1 General characters of Fishes, Salient features Dipnoi **2hrs**
- 2.2 Scoliodon: External features, Digestive system, Respiratory system **3hrs**
- 2.3 Scoliodon Structure and function of Heart, Structure and functions of the Brain. **2hrs**
- 2.4 Migration in Fishes, Types of Scales **2hrs**

Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity.

https://www.notesonzoology.com/phylum-chordata/dogfish/external-features-of-dogfish-scoliodon-with-diagram-chordata-zoology/7558

https://asccollegekolhar.in/wp-content/themes/kolhar/essentials/pdf/elearning/Zoology/S.Y.B.SC._Zoology/SYBSC_Scoliodon_Heart_ppt.pdf

https://youtu.be/aMGjmSOAXj8?si=KE0Zh8BCAzplmX_4

https://youtu.be/ye6Nlf_tNw4?si=jPYWKOO8qLWMv5xf

**Applications:**

**Assignment 1**: Develop a conservation plan for Scoliodon, considering current threats and protection strategies.
**Assignment 2**: Select a fish species known for its migration patterns (e.g., salmon, eels, tuna)
**Advanced students**
**Scoliodon Adaptation Analysis**
**Objective:** Analyze how Scoliodon's anatomical features are adapted to its environment.
**Instructions:**
- Choose 3-4 specific adaptations of Scoliodon (e.g., its cartilaginous skeleton, electroreception, or dentition).
- Write an analysis of how each adaptation enhances Scoliodon's ability to survive and thrive in its marine environment.
- Use scientific research and examples to support your analysis.

**Submission Requirements:** 2-3 pages, with evidence
**Activity 1**
**Interactive Fish Quiz**
**Objective:** Test and reinforce knowledge about fish characteristics.
**Materials:** Quiz questions, interactive quiz platforms (e.g., Kahoot!, Quizlet).
**Instructions:**
- Create a quiz with questions related to fish anatomy, classification, and behaviour.
- Use an interactive quiz platform to make the activity engaging.
- Encourage students to answer questions individually or in teams.

Review the answers and discuss any misconceptions
**Activity 2**
**Scoliodon Function Chart**
**Objective:** Develop a chart linking structures to their functions.
**Materials:** Large paper or digital tools for chart creation.
**Instructions:**
- Create a large chart with two columns: one for Scoliodon's structures and one for their functions.
- Have students list structures (e.g., gills, pectoral fins) and match them with their functions.
- Discuss how each structure supports the shark's lifestyle and survival

**Unit – III: 9 hrs**
3.1 General characters of Amphibia, General characters of Reptilia **2hrs**
3.2 Rana hexadactyla: External features, Respiratory system, Structure and function of Heart **3hrs**
3.3 Rana hexadactyla structure and functions of the Brain **1hr**
3.4 Calotes: External features, Digestive system, structure and function of Brain **2hrs**
3.5 Identification of Poisonous snakes **1hr**

Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity
**https://youtu.be/NhtX016DbuQ?si=DIqo_YdKUDcUHrkj**
**https://youtu.be/Nr58AVtpLEQ?si=39fUmsSuq3ULvL7V**
**https://youtu.be/RTHAhn7O524?si=RLrzbN0WGLFudV7E**
**https://youtu.be/xgMzNW0Scug?si=gTIqkNItzP6uo-uh**
**https://youtu.be/1xmCCVuRy9U?si=U9G3x2HmRqB9KLtY**
**Applications:**
**Assignment 1:**
Objective: To raise awareness about amphibian conservation issues and propose solutions.
Develop a conservation plan or awareness campaign to address these issues. This could be a written report, a video presentation, or a public awareness campaign
**Assignment 2:** Compare and contrast reptiles with amphibians.
Create a poster or digital presentation summarizing your findings
**Advanced students**: Observe and record the behaviour of any reptile in its natural habitat, focusing on aspects such as feeding, mating, and social interactions.
**Activity 1**

**Snake and Lizard Identification**
**Activity:** Use field guides or apps to identify local snake and lizard species.
**Materials:** Field guidebook or identification app, notebook.
**Outcome:** Improve skills in identifying reptiles in your area and learn more about their characteristics
**Activity 2**
Frog-Themed Creative Writing
**Objective:** To use creative writing to explore frog behaviours and systems and environments.
**Instructions:**

- **Activity:** Write a short story or diary entry from the perspective of a frog.
- **Steps:**

Research frog behaviours, systems and environments to create a realistic portrayal.
Write a narrative or paragraph or short story that reflects the life of a frog, including its challenges and experiences.
Share your writing with the class or in a group discussion.
**Materials Needed:**

- Writing materials (paper, pen, or computer)

**UNIT – IV** **9 hrs**

- 4.1 General characters of Aves **1hr**
- 4.2 Columba livia: External features, Digestive system, Respiratory system **3hrs**
- 4.3 Columba livia: Structure and function of Heart, structure and function of Brain **3hrs**
- 4.4 Migration in Birds, Flight adaptation in birds **2hrs**
- Activity: Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

https://youtu.be/2vt2wRTE0N0?si=K-ze07m7_ikDz3KV
https://youtu.be/EquY-Ww4-As?si=yW0P-TkMKxdVyH1_
https://youtu.be/HjXG33Hmqm0?si=BXRe-sMS9zJvGIQX
https://youtu.be/yEdgSMF8U18?si=0mi2ol8OEbtW8HhH

**Applications:**
**Assignment 1:** Select a few migratory bird species and track their migration patterns.
**Assignment 2:** Create a detailed report or presentation explaining flight adaptation in birds
**Advanced students** studying migration routes, timing, and the factors influencing migratory behaviour of any migratory bird of their choice
**Activity 1**
**Respiratory System Investigation**
**Objective:** To understand the unique respiratory system of birds and its adaptations for flight
Create a diagram or model illustrating the flow of air through the bird's respiratory system.
**Activity 2**
**Bird Feeder Construction:** Students build simple bird feeders from recycled materials. They can observe which bird species come to the feeders and record their observations.
**Unit – V:** **9 Hr**
5.1 General characters of Mammalia **1hr**
5.2 Classification of Mammalia up to sub - classes with examples **1hr**
5.3 Comparison of Prototherians, Metatherians and Eutherians **3hrs**
5.4 Dentition in mammals, Aquatic mammals Adaptations **4hrs**
Activity: Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity
https://youtu.be/jhXqIy49YEw?si=nqcywb7aqcoW9TtB
https://youtu.be/CBcKovnEFZY?si=HbNSe-X8Pe0bkNwh
https://youtu.be/r4ZK0kexdOk?si=0CeYLX3u_0JbtoIt
https://dpbck.ac.in/wp-content/uploads/2022/03/Classification-of-mammals.pdf
**Applications:**

**Assignment 1:** Students write a diary entry from the perspective of a mammal of their choice. They should describe a day in the life of the mammal, including its challenges and interactions

**Assignment 2: Mystery Mammal:** Provide students with clues about a mystery mammal and have them guess what mammal it is based on its adaptations, diet, and habitat

**Advanced students** Assign advanced students to compare and contrast two different mammals. They could examine aspects such as adaptations, behaviour, and ecological roles

**Activity 1**

**Mammal Profiles:** Have students select a mammal to research and create a detailed profile, including habitat, diet, physical characteristics, and any interesting facts. They can present their findings in a report or a multimedia presentation.

**Activity 2**

**Adaptations and Evolution of Dentition**

**Objective:** To explore how mammalian dentition has evolved in response to environmental changes.

**Instructions:**

- **Activity:** Research and present on the adaptations and evolutionary changes in mammalian dentition.
- **Steps:**
  - Study the evolutionary history of mammals and the changes in dental adaptations over time.
  - Identify key adaptations such as tooth size, shape, and number that have evolved in response to environmental pressures.
  - Create a timeline or evolutionary tree illustrating the development of different types of teeth in mammals.

**Co-curricular activities (suggested)**

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes Maintaining of aquarium by students
- Model of fish heart and brain
- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons
- Additional input on types of snake poisons and their antidotes (student activity). Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology Museum
- Map pointing of prototherian and metatherian mammals
- Chart preparation for dentition in mammals

**REFERENCE BOOKS**


- J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages. Reprinted
- Arumugam, N. Chordate Zoology, Vol. 2. Saras Publication. 278 pages. 200 figs. A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages. (Revised edition of Parker &Haswell, 1961).
- M. Ekambaranatha Ayyar, 1973. A manual of zoology. Part II. (S. Viswanathan Pvt. Ltd., Madras).
- P.S. Dhami & J.K. Dhami, 1981. Chordate zoology. (R. Chand & Co.). 550 pages. Gurdarshan Singh & H. Bhaskar, 2002. Advanced Chordate Zoology. Campus Books, 6 Vols., 1573 pp., tables, figs.
- A.K. Sinha, S. Adhikari& B.B. Ganguly, 1978. Biology of animals. Vol. II. Chordates. (New Central Book Agency, Calcutta). 560 pages.
- R.L. Kotpal, 2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.

E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages. G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii, 169 pp.

Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx, 964 p., figs.
Veena, 2008. Lower Chordata. (Sonali Publ.), 374 p., tables, 117 figs.

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**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA.**

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SEMESTER -END MODEL QUESTION PAPER

| | |
|---|---|
| Course Code | |
| Title: | ANIMAL DIVERISTY-II BIOLOGY OF CHORDATES |
| Offered to: | B.Sc Honours Aquaculture |
| Category: MINOR | SEMESTER: 3 |
| Max. Marks | 70 |
| Max.Time | 3 Hrs |

**Section A: Short Answer Questions. . . Answer all questions.**

Each question carries 4 Marks. Marks: 20

1 (a) Describe the general characters of Chordata. K1

OR

(b) Describe the salient features of Urochordata K1

2 (a) Explain the Salient features Dipnoi . K2

OR

(b) Distinguish the types of scales in fishes K2

3 (a) Illustrate the identification of Poisonous snakes K3

OR

(b) Distinguish between the general characters of Amphibia and Reptilia K3

4 (a) Explain the structure of heart in Columbia livia K2

OR

(b) Write about the general characters of Aves K2

5 (a) Write about the adaptations of aquatic mammals. K2

OR

(b) Distinguish between Prototherians and Metatherians. K2

**Section B: Long Answer Questions Answer All questions.**

Each question carries 10 Marks. Marks: 50

6 (a) Describe the process and significance of Retrogressive metamorphosis in Herdmania K1

OR

(b) Give a detailed description on the comparison between Petromyzon and Myxine K1

7 (a) Describe the process of Digestive system in Scoliodon. K2

OR

(b) Explain in detail about the structure and functions of brain in Scoliodon. K2

8 (a) Describe in detail about the digestive system in Calotes K1

OR

(b) Describe the structure and functions of Heart in Rana hexadactyla. K1

9 (a) Review the respiratory system and flight adaptation in birds K2

OR

(b) Elaborate about Migration in Birds K2

10 (a) Describe dentition in mammals. K1

OR

(b) Explain about the classification of Mammalia up to sub - classes with examples K1

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|---|---|---|---|---|---|---|---|
| Course Code | | | | | | | |
| Title of the Course | | | | ANIMAL DIVERISTY-II BIOLOGY OF CHORDATES | | | |
| Offered to: (Programme/s) | | | | BSc Hons Aquaculture | | | |
| L | | T | 0 | P | 2 | C | 1 |
| Year of Introduction: | 2024-25 | | | Semester: | | | 3 |
| Course Category: | MINOR | | | Course Relates to: | GLOBAL | | |
| Year of Introduction: | 2024 | | | Percentage: | NA | | |
| Type of the Course: | | | | SKILL DEVELOMENT | | | |
| Crosscutting Issues of the Course: | | | | GENDER | | | |
| Pre-requisites, if any | | | | Basic knowledge on Vertebrates in intermediate | | | |

**Course Description:**

This practical course provides an immersive experience into the study of chordate organisms, focusing on their anatomical structures, physiological processes, and evolutionary significance.

The course is designed for students with a foundational understanding of biology and aims to enhance hands-on skills through dissections, microscopy, and experimental investigations.

**Course Aims and Objectives:**

| S. No | COURSE OBJECTIVES |
|---|---|
| 1 | To understand the importance of preservation of museum specimens |
| 2 | To identify animals based on special identifying characters |
| 3 | To understand different organ systems through demo or virtual dissections |
| 4 | Facilitate an in-depth understanding of the anatomical features and physiological systems of chordates |
| 5 | To maintain a neat, labelled record of identified museum specimens |

Course Outcomes

At the end of the course, the student will / will be…

| NO | COURSE OUTCOME | BTL | PO | PSO |
|---|---|---|---|---|
| CO1 | Understanding the overview of chordate diversity and classification | K1 | 5 | 1 |
| CO2 | Understanding evolutionary history and key characteristics of Chordates. | K2 | 5 | 1 |
| CO3 | Using of microscopes to study tissue and organ structures in Chordates. | K2 | 5 | 1 |
| CO4 | Analysing and Identifying distinguishing features across different chordate subgroups | K4 | 5 | 1 |
| CO5 | Analysing the locomotion, feeding mechanisms, and reproductive strategies | K4 | 6 | 1 |

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyse; K5: Evaluate; K6: Create

| CO-PO-PSO MATRIX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CO NO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
| CO1 | | | | | 1 | 2 | 3 | 1 | |
| CO2 | | | | | 1 | 2 | 3 | 1 | |
| CO3 | | | | | 1 | 2 | 3 | 1 | |
| CO4 | | | | | 1 | 2 | 3 | 1 | |
| CO5 | | | | | 1 | 2 | 3 | 1 | |

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively
Course Structure:
Practical 1
Protochordata: Herdmania, Amphioxus, Amphioxus T.S through pharynx.

Common Characteristics of Protochordates:

- Presence of a Notochord: A flexible, rod-like structure present at some stage of development (larval or adult).
- Pharyngeal Slits: Openings in the pharynx that serve in filter-feeding or respiration.
- Dorsal Nerve Cord: A nerve cord running along the dorsal side of the body.
- Post-anal Tail: An extension of the body beyond the anus, present in the larval stage or throughout life in some groups.

These characteristics distinguish protochordates from other chordates and highlight their evolutionary significance as a bridge between invertebrates and more complex vertebrates.

Practical 2
Cyclostomes: Petromyzon and Myxine.
Cyclostomes are characterized by their jawless condition, cartilaginous skeleton, presence of a notochord throughout life and lack of paired fins.
Their skeleton is composed mainly of cartilage rather than bone, making it flexible and less mineralized.
Cyclostomes have multiple gill pouches or openings that allow for respiration. Their simple body structure and primitive features offer valuable insights into early vertebrate evolution.

Practical 3
Pisces: Pristis, Torpedo, Hippocampus, Exocoetus, Echeneis, Labeo, Catla, Clarius, Channa, Anguilla.
Pisces generally have a streamlined body shape that reduces water resistance and facilitates efficient swimming.
Pisces are characterized by their aquatic habitat, gill respiration, scales or skin, fins for locomotion, streamlined body, lateral line system, and various reproductive strategies.
These features are adapted to their life in the water and help them thrive in diverse aquatic environments.

Practical 4
Amphibia: Ichthyophis, Amblystoma, Axolotl larva, Hyla
Amphibians are tetrapods (four-limbed vertebrates) with typically four limbs (two pairs of legs). They use their limbs for locomotion on land and in water.
Webbed Feet: Many amphibians have webbed feet to aid swimming
Amphibians generally have a slender, elongated body that aids in their movement through both aquatic and terrestrial environments.

Practical 5
Reptilia: Draco, Chamaeleon, Uromastix, Testudo, Trionyx, Russels viper, Naja, Bungarus, Hydrophis, Crocodilus.
Reptiles are characterized by their scaly skin, reliance on lungs for respiration, ectothermic temperature regulation, internal fertilization and amniotic eggs, and a three-chambered heart (except for crocodiles).
They occupy a wide range of terrestrial and aquatic habitats and exhibit diverse adaptations that allow them to thrive in various environments.
Most reptiles have four limbs with toes or claws, although snakes have evolved a limbless body form. Reptiles have a well-developed bony skeleton

Practical 6
Aves: Psittacula, Eudynamis, Bubo, Alcedo.
Feathers are a defining characteristic of birds. They provide insulation, enable flight, and play roles in mating displays and camouflage.
Birds have beaks or bills instead of teeth. The shape and size of the beak are adapted to their feeding habits and diet

Birds lay amniotic eggs with hard shells made of calcium carbonate, providing protection and a stable environment for the developing embryo

Practical 7

Mammalia: Ornithorhynchus, Pteropus, Funambulus.

Mammals are characterized by their hair or fur, mammary glands, warm-blooded metabolism, and the presence of three middle ear bones. They have differentiated teeth, typically give birth to live young, and possess a highly developed brain. They also have specialized skin structures like sweat glands and a variety of reproductive adaptations depending on their subclass (monotremes, marsupials, or placental mammals). These features collectively define mammals and contribute to their adaptability and diverse lifestyles.

Practical 8

Scoliodon IX and X, Cranial nerves

Note: 1. Dissections are to be demonstrated only by the faculty or virtual.

The dissection of cranial nerves IX (Glossopharyngeal nerve) and X (Vagus nerve) in a Scoliodon (a type of shark) is an advanced anatomical procedure that requires precision and care. Here's a step-by-step guide to help with the dissection process:

Materials and Tools Needed:

- Dissection kit (scalpel, forceps, scissors, probes)
- Dissection tray
- Scoliodon specimen (preserved)
- Anatomical diagrams of Scoliodon (optional but helpful)
- Gloves and safety goggles

Dissection Procedure:

Preparation:

1. Safety First:

   Wear gloves and safety goggles to protect yourself.

   Ensure that your dissection area is clean and well-organized.

2. Position the Specimen:

   Place the Scoliodon on the dissection tray in a ventral (belly-up) position for better access to the head and neck area.

Step-by-Step Dissection:

Initial Incision:

Make a longitudinal incision along the midline of the head, starting from the snout and extending to the base of the skull. This will expose the internal structures of the head.

Expose the Cranial Cavity:

Carefully lift and reflect the skin and underlying muscles away from the head to expose the cranial cavity.

Identify Key Structures:

Locate the brain and spinal cord. Cranial nerves IX and X emerge from the brainstem and travel to various regions.

Identify Cranial Nerves IX and X:

Glossopharyngeal Nerve (IX): Look for this nerve emerging from the medulla oblongata. It generally appears as a smaller nerve traveling towards the pharynx.

Vagus Nerve (X): Locate this nerve near the glossopharyngeal nerve. It is usually larger and travels down towards the gills and other organs.

Dissection of Nerve IX:

Gently use a probe or forceps to separate the glossopharyngeal nerve from surrounding tissues.

Trace the nerve’s path to identify its branches and connections. Be cautious not to damage the nerve or surrounding structures.

Dissection of Nerve X:

Similarly, use the probe or forceps to carefully isolate the vagus nerve from the surrounding tissues.

Follow the path of the vagus nerve to observe its branches, especially as it travels to the gills and other parts of the body.

Remove and Observe:
Once isolated, carefully remove the nerves for closer observation if needed. This step may involve gently cutting the nerve at its base of attachment.
Compare the isolated nerves with anatomical diagrams to verify their identification and structure.
Documentation:
Take notes or make sketches of the nerves' positions and branches for reference.
Document any observations related to the anatomy and variations in nerve structure.
Post-Dissection Care:
Clean Up:
Dispose of or properly clean all used materials and specimens.
Wash your hands and dissection area thoroughly.
Review Findings:
Review the anatomical features observed during the dissection to reinforce learning and understanding.

Practical 9
Mounting fish scales for observation involves a series of steps to prepare and preserve them so that they can be examined under a microscope or used for other educational purposes. Here's a detailed procedure for mounting fish scales:
Materials and Tools Needed:
Fish scales (from a fish specimen)
Dissection kit (scalpel, forceps)
Microscope slides and coverslips
Clear mounting medium (e.g., Canada balsam or glycerin jelly)
Tweezers
Scalpel or fine scissors
Staining solutions (optional, for enhancing visibility)
Deionized water (for cleaning)
Paper towels or filter paper
Labeling materials (for slide labels)

Procedure:
Preparation:
Safety First:
Wear gloves and safety goggles to ensure protection during the dissection process.
Prepare Work Area:
Set up your dissection tray and organize your tools. Ensure your work area is clean and well-lit.
Collecting Fish Scales:
Obtain Scales:
Using forceps or a scalpel, carefully remove a few scales from the fish. Typically, scales from the sides of the fish are used, as they are usually larger and easier to handle.
Clean Scales:
Rinse the scales in deionized water to remove any mucus or debris. Gently pat them dry with a paper towel or filter paper.

Mounting the Scales:
Prepare the Microscope Slide:
Place a small drop of the mounting medium (e.g., Canada balsam or glycerin jelly) onto the center of a clean microscope slide.
Place the Scale:
Using tweezers, carefully place the fish scale onto the drop of mounting medium. Ensure the scale is flat and spread out. If needed, use a scalpel or fine scissors to trim the edges of the scale to fit the slide.
Add Mounting Medium:
Add a small amount of mounting medium on top of the scale, ensuring it covers the entire surface of the scale.

Apply the Coverslip:
Gently place a coverslip over the scale. Avoid trapping air bubbles between the scale and coverslip by lowering the coverslip at an angle or using a slide holder.

Final Touches:
Seal the Slide:
If using a permanent mounting medium like Canada balsam, allow the slide to dry completely. This may take several hours to overnight, depending on the medium used. For temporary mounts, the slide can be used immediately.
Label the Slide:
Use a labeling material to mark the slide with relevant information, such as the species of fish, type of scale, and date of preparation.

Observing the Mounted Scale:
Microscopic Examination:
Place the mounted slide under a microscope. Adjust the light source and focus to observe the scale's structure, including its pattern, ridges, and any unique features.
Documentation:
Take notes or photographs of your observations for documentation and analysis.

Additional Tips:
Handling Scales: Handle the scales gently to avoid damaging their delicate structures.
Clean Tools: Ensure that all tools and slides are clean to avoid contamination or damage to the scales.
Staining (Optional): For better visualization, consider staining the scales with appropriate dyes or stains before mounting. Ensure that the stain is compatible with your mounting medium.
Laboratory Record work shall be submitted at the time of practical examination.
RFERENCE WEB LINKS:
https://nt7-mhe-complex-assets.mheducation.com/nt7-mhe-complex-assets/Upload-20190715/InspireScience6-8CA/LS15/index.html
https://themammallab.com/ http://abacus.bates.edu/acad/depts/biobook/LabConCh.htm
https://virtualzoology.wordpress.com/scoliodon/
http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45. pdf

PSO1: Biology of Chordates practical course aim to equip students with the ability to identify and classify chordates, perform dissections, understand developmental stages, apply taxonomic and evolutionary concepts, analyse adaptations, use microscopy, conduct comparative analyses, communicate findings, develop laboratory techniques, and engage in critical thinking.
PSO2: This course ensures that students gain a comprehensive understanding of chordates and their biological significance.

**SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA, VIJAYAWADA-10.**

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**SEMESTER END LAB EXAMINATION**

**Course Code:**

**Title of the Course: animal diversity – Biology of Non chordates**

**Semester: III** **Max.Marks: 35M** **Time: 3 Hrs**

Answer all the questions

1. Dissect, display and draw neat labelled diagram of 'A' 10M

2. Identify the given spotter and write about the phylum to which it belongs mentioning the general characters of that phylum 'B or C '(roll number wise) 1x5=5M

3. Identify and write comments upon the given spotters 2x21/2=5M

d.

e.

4. Identify and write comments upon the given spotters 2x21/2=5M

f.

g.

5. Identify and write comments upon the given spotters 2x21/2=5M

h.

i.

4. Practical Record 2M

5. Viva voce

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**DEPARTMENT OF ZOOLOGY**

**(MULTI - DISCIPLINARY COURSE)**

# PRINCIPLES OF BIOLOGICAL SCIENCES

**COURSE CODE**

**Offered to:** II B.A. Hons

**Course Type:** THEORY

**Semester**: III 30 Hours **Credits:** 02

**Course Description:** This course will provide one with a basic and comprehensive understanding of diversity of life Enable the student with depth of topics and helps them to gain an appreciation in the biomolecules and etabolism On the other hand, importance of understanding principles of biology provides an extensive knowledge to the student.

**Learning Objectives:** By the end of this course the learner can:

1. Acquire logic to evaluate fundamental biological concepts at various levels of biological organisation including the molecular, cellular, and organismal and systems levels.
2. Communicate fundamental biological knowledge between tiers of biological organisation.
3. Apply common biological principles across all levels of biological organization.

**Course Outcomes:** On completion of this course students will be able to:

1. Understand the relationship between structure and function at all levels.
2. Recognise the mechanisms underlying biological evolution, its patterns, and its significance as biology's overarching unifying principle.
3. Understand the contributions of biology to the resolution of medical, ethical, social, and environmental concerns in human affairs.

## UNIT-I Diversity of Life

**1.1** Introduction to Biology, Branches of Biology, Basic Principles of Biology
**1.2** Biological Classification-Two kingdom and Five kingdom classification, Viruses, Viroid'sand Lichens
**1.3** Diversity in the living world, Taxonomic categories, Taxonomic aids
**1.4** Plant organization-The form, structure and function of plant vegetative and reproductiveorgans, Classification of Plant Kingdom,
**1.5** Basis of Animal Classification, Classification of Animal Kingdom

## UNIT-II Biomolecules and metabolism

**2.1** Ultra structure of cell and Cell organelles (Structure and Functions), Plant cell vs Animalcell
**2.2** Plant Physiology: Photosynthesis, Respiration, Transportation, Mechanisms of Nitrogenfixation.
**2.3** Plant growth and development, physiology of flowering.
**2.4** Human Physiology: Digestion, Respiration, Circulation
**2.5** Male and female reproductive organs, gametogenesis, fertilization.

## UNIT-III Principles of Biology

**3.1** Genetics: Mendel's laws of inheritance, Genetic disorders- Colour blindness, Sickle cell anaemia.

**3.2** Evolution: Geological time scale for evolution of plants and vertebrates, Origin and evolution of plants and man

**3.3** Common Human Diseases: causing organism, prevention and treatment- malaria, dengue,AIDS, cancer, corona.

**3.4** Common Plant Diseases: causing organism, prevention and treatment- Black spot, Leafspots, Powdery mildew, Blight, Canker.

**3.5** Biotechnology: Tools and process of recombinant DNA technology, Applications of biotechnology in agriculture, food industry, medicine and transgenic animals.

## Text Books


1. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi.
2. Kotpal, R.L.2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut).
3. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolutionand Ecology. S. Chand publishers, New Delhi, India.


## Reference Books


1. Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International Publ. New Delhi, India.
2. Rastogi, S.C., 2019. Essentials of animal physiology. 4$^{th}$ Edition. New Age International Publishers.

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**DEPARTMENT OF ZOOLOGY**

**PRINCIPLES OF BIOLOGICAL SCIENCES**

**Model Question Paper**

**Course Code:**
**Offered to:** II B.A Hons **Course Type:** THEORY
**Semester**: III
Max.Marks: 35 Max.Time: 3Hours
Pass Min: 14

**Section-A**

Answer any **THREE** from the following 3x5 =15Marks

1. Write a short note on viruses
2. Write the structure and functions of mitochondria
3. Explain the mendels law of inheritence
4. Differentiate between plant and animal cell
5. Describe the structure and functions of human heart

**Section-B**

Answer any **TWO** from the following 2 x10 = 20Marks

6. Explain in detail the plant organization
7. Describe the human reproductive system
8. Write an essay on geological time scale for evolution of plants and vertebrates