



**Gyanmanjari**  
Innovative University

Syllabus  
Gyanmanjari Science College  
Semester-2 (B.Sc)

**Subject:** Chordate Zoology-BSC1XX12307

**Type of course:** Minor

**Prerequisite:** Basic knowledge of Zoology.

**Rationale:** Here is the Rationale of the subject: Chordate Zoology in one clear paragraph Chordate Zoology is included in the curriculum to give students a comprehensive understanding of the structure, function, diversity, and evolutionary relationships of chordate ranging from primitive forms to advanced vertebrates. This subject helps learner explores key concepts such as comparative anatomy, physiology, embryology, and adaptations that have led to the success of chordates in diverse habitats. By studying chordate groups, students gain insights into human origins and biological systems, ecological roles of vertebrates, and issues related to wildlife conservation and biodiversity management. The course also develops essential skills in observation, dissection, taxonomic identification, and scientific analysis, forming a strong foundation for advanced studies in zoology, wildlife science, veterinary science, and biomedical fields.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P		SEE	CCE	
2	0	4	4	100	100	200

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.*



Course Content:

Unit No	Course content	Hrs	% Weightage																												
1	<p><b>Module:1</b>  <b>Introduction to Chordates</b></p> <ul style="list-style-type: none"> <li>• General characteristics of Phylum Chordata</li> <li>• Classification of Chordates up to classes</li> <li>• Concept of <b>Protochordates</b></li> <li>• Comparison: Non-chordates vs Chordates</li> <li>• Evolutionary significance of chordate characters</li> </ul> <p><b>Practical:</b></p> <p>1) Study of General Characteristics of Phylum Chordata                      Observation of chordate features through models/slides:</p> <ul style="list-style-type: none"> <li>• Notochord structure (diagrammatic slide/model)</li> <li>• Dorsal tubular nerve cord</li> <li>• Gill slits (permanent slide)</li> <li>• Post-anal tail (specimen/model)</li> </ul> <p>2) Evolutionary Significance of Chordate Characters</p> <ul style="list-style-type: none"> <li>• Study of connecting links (e.g., <i>Amphioxus</i>, <i>Archaeopteryx</i>).</li> </ul> <p>3) Diagram Labeling Practical                      General characters of Chordate.</p> <p>4) Preparation of a student chart on: Chordate classification</p> <p><b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Evolution Methods</th> <th>SEE Marks</th> <th>CCE Marks</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Spot the Difference (Reason Based)</td> <td>05</td> <td></td> </tr> <tr> <td>2.</td> <td>Journal:</td> <td>05</td> <td></td> </tr> <tr> <td>3.</td> <td>Label &amp; justify.</td> <td>10</td> <td></td> </tr> <tr> <td>4.</td> <td>ALA -1 Mini Case Study</td> <td></td> <td>10</td> </tr> <tr> <td>5.</td> <td>Chart/Model Preparation</td> <td></td> <td>10</td> </tr> <tr> <td colspan="2"><b>Total Marks</b></td> <td><b>20</b></td> <td><b>20</b></td> </tr> </tbody> </table> <p>1. <b>Spot the Difference (Reason Based)</b>                      List five differences between:                      Chordates and non-chordate</p> <p>2. <b>Journal:</b>                      Prepare and submit a journal of the practical given of the unit.</p> <p>3. <b>Label &amp; Justify</b></p>	Sr. No.	Evolution Methods	SEE Marks	CCE Marks	1.	Spot the Difference (Reason Based)	05		2.	Journal:	05		3.	Label & justify.	10		4.	ALA -1 Mini Case Study		10	5.	Chart/Model Preparation		10	<b>Total Marks</b>		<b>20</b>	<b>20</b>	T: P 6:12	20%
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	<p>Provide a diagram/image (e.g., Amphioxus) Write why each feature is important evolutionarily.</p> <p><b>4. ALA -1 Mini Case Study (Real-Life Connection)</b> Activity Example: Amphioxus shows chordate characters only in larval stage. Students explain, Why it is called a connecting Its evolutionary importance.</p> <p><b>5. Chart/Model Preparation</b> Preparation of a student chart on: Chordate classification</p>																										
2	<p><b>Module: 2 Protochordata</b></p> <p><b>Hemichordate</b></p> <ul style="list-style-type: none"> <li>• General characteristics and classification up to class.</li> <li>• Affinities with chordates.</li> </ul> <p><b>Urochordata</b></p> <ul style="list-style-type: none"> <li>• General characteristics and classification up to class.</li> </ul> <p><b>Cephalochordate</b></p> <ul style="list-style-type: none"> <li>• General characteristics and classification up to class.</li> </ul> <p><b>Practical:</b></p> <p>1) To study the general characteristics and body organization of <i>Balanoglossus</i>.</p> <p>2) To compare and analyze the affinities of Hemichordata with Chordates and Echinoderms.</p> <p>3) Classification of Sub phylum Urochordata and Cephalochordata with examples <i>Salpa</i>, <i>Ascidia</i>, <i>Herdmania</i>, <i>Doliolum</i>.</p> <p>4) To study the general characteristics and external morphology of <i>Herdmania</i>.</p> <p>5) To study the general features and external morphology of <i>Branchiostoma</i> (Amphioxus), including body shape, myotomes, fins, and atriopore.</p> <p><b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Evolution Methods</th> <th>SEE Marks</th> <th>CCE Marks</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Identify &amp; classify specimen</td> <td>15</td> <td></td> </tr> <tr> <td>2</td> <td>Journal:</td> <td>5</td> <td></td> </tr> <tr> <td>3.</td> <td>(ALA-2) System Diagram Activity</td> <td></td> <td>10</td> </tr> <tr> <td>4.</td> <td>Mini Review Article</td> <td></td> <td>10</td> </tr> <tr> <td colspan="2">Total Marks</td> <td>20</td> <td>20</td> </tr> </tbody> </table>	Sr. No.	Evolution Methods	SEE Marks	CCE Marks	1.	Identify & classify specimen	15		2	Journal:	5		3.	(ALA-2) System Diagram Activity		10	4.	Mini Review Article		10	Total Marks		20	20	T: P 6:12	20%
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	<p><b>1. Identify &amp; classify specimen:</b> <i>Salpa, Ascidia, Herdmania, Doliolum.</i></p> <p><b>2. Journal:</b> Prepare and submit a journal of the practical given of the unit.</p> <p><b>3.(ALA-2) System Diagram Activity</b> <b>Topic:</b> <i>Life history of Branchiostoma (Amphioxus)</i> <b>Student Task:</b></p> <ul style="list-style-type: none"> <li>• Draw a neatly labeled life history diagram showing:</li> <li>• Fertilization</li> <li>• Larval stage</li> <li>• Metamorphosis</li> <li>• Adult form</li> <li>• Write 2–3 explanatory points</li> <li>• Mention evolutionary importance</li> </ul> <p><b>Learning Outcome:</b> Understanding chordate development and protochordate evolution.</p> <p><b>4. Mini Review Article</b> <b>Topic Options:</b></p> <ul style="list-style-type: none"> <li>• Amphioxus as a connecting link</li> <li>• Evolutionary importance of protochordates</li> <li>• Significance of tadpole larva in Urochordata</li> <li>• Etc.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Key observations</li> <li>• Conclusion</li> <li>• References (2–3)</li> </ul>		
3	<p><b>MODULE :3</b> <b>Vertebrata</b> Introduction to Sub-Phylum Vertebrata, General Characteristics of Vertebrates, Classification of Vertebrata, Superclass Agnatha (Jawless Vertebrates), Classification and Types of Agnatha (A. Class Ostracodermi (Extinct Forms) B. Class Cyclostomata (Living Agnathans). <b>Division Gnathostomata</b> Introduction to Gnathostomata, General Characteristics of Gnathostomes, Classification of Gnathostomata (Up to Amphibia)</p>	T: P 6:12	20%



	<p><b>Superclass Pisces (Class Chondrichthyes Class Osteichthyes)</b>  <b>Superclass Tetrapoda (Class Amphibia)</b>  <b>Practical:</b>                  (1) To study and identify the defining features of vertebrates such as vertebral column, cranium, paired appendages, and advanced organ systems.                  (2) To study and describe the external morphology of jawless vertebrates such as <i>Petromyzon</i> (lamprey) and <i>Myxine</i> (hagfish).                  (3) Classification of Super class Pisces with examples. <i>Labeo rohita, Catla catla, Channa, Hilsa, Scoliodon, Pristis, Torpedo</i> (Electric Ray)                  (4) Classification of class Amphibia with examples. <i>Ichthyophis, Frogs, Toads, Salamanders.</i>  <b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Evolution Methods</th> <th>SEE Marks</th> <th>CCE Marks</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Identify &amp; classify specimen</td> <td>10</td> <td></td> </tr> <tr> <td>2.</td> <td>specimen to Answer</td> <td>10</td> <td></td> </tr> <tr> <td>3.</td> <td>Journal:</td> <td></td> <td>5</td> </tr> <tr> <td>4.</td> <td>Case-Based Question</td> <td></td> <td>15</td> </tr> <tr> <td colspan="2"><b>Total Marks</b></td> <td><b>20</b></td> <td><b>20</b></td> </tr> </tbody> </table> <p>1. Identify &amp; classify specimen: <i>Labeo rohita, Catla catla, Channa, Hilsa, Scoliodon, Pristis, Ichthyophis, Frogs, Toads, Salamanders Torpedo</i> (Electric Ray)                  2. specimen to Answer                  Topic: Vertebrate features (vertebrate animal)                  Activity: Given a diagram write 5 statements from it                  3. Journal:                  Prepare and submit a journal of the practical given of the unit.                  4. Case-Based Question                  "Amphibians are considered a connecting link between fishes and reptiles." Justify with Images.</p>	Sr. No.	Evolution Methods	SEE Marks	CCE Marks	1.	Identify & classify specimen	10		2.	specimen to Answer	10		3.	Journal:		5	4.	Case-Based Question		15	<b>Total Marks</b>		<b>20</b>	<b>20</b>		
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4	<p><b>MODULE 4. Reptilia &amp; Aves</b>  <b>Reptilia:</b> General characters &amp; classification, Terrestrial adaptations, Snakes: venomous vs non-venomous, Anti-venom, first aid, and reptile evolution</p>	T: P 6:12	20%																								



	<p>Aves (Birds) Origin of birds (Archaeopteryx), Classification up to orders, Feathers: types &amp; functions, Migration: types, causes, navigation mechanisms</p> <p><b>Practical</b> (1) To prepare and understand the classification of reptiles up to the order level with representative examples. <b>Gharial (<i>Gavialis gangeticus</i>), Mugger Crocodile (<i>Crocodylus palustris</i>), Indian Star Tortoise (<i>Geochelone elegans</i>), Indian Chameleon, Indian Cobra (<i>Naja naja</i>).</b> (2) To prepare and understand the classification of up to the order level with representative examples. Black drongo, <b>Common Myna, green bee-eater, Rose-ringed Parakeet, Spot-billed Duck, Red Vented Bulbul, House Crow, Asian Koel,</b> (3) <b>Anti-venom and First Aid</b> -To understand the preparation and administration of anti-venom serum. -To learn and describe first aid procedures to be followed in case of snake bites.</p> <p><b>Examination Style:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Sr. No.</th> <th style="width: 45%;">Evolution Methods</th> <th style="width: 20%;">SEE Marks</th> <th style="width: 30%;">CCE Marks</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Identify &amp; classify specimen</td> <td>10</td> <td></td> </tr> <tr> <td></td> <td>Identify &amp; describe</td> <td>10</td> <td></td> </tr> <tr> <td>2.</td> <td>Migration Map Activity</td> <td></td> <td>15</td> </tr> <tr> <td>3.</td> <td>Journal</td> <td></td> <td>5</td> </tr> <tr> <td colspan="2"><b>Total Marks</b></td> <td><b>20</b></td> <td><b>20</b></td> </tr> </tbody> </table> <p><b>1. Identify &amp; classify specimen:</b> <b>Gharial (<i>Gavialis gangeticus</i>), Mugger Crocodile (<i>Crocodylus palustris</i>), Indian Star Tortoise (<i>Geochelone elegans</i>), Indian Chameleon, Indian Cobra (<i>Naja naja</i>).</b> Black drongo, Common Myna, green bee-eater, Rose-ringed Parakeet, Spot-billed Duck, Red Vented Bulbul, House Crow, Asian Koel</p> <p><b>2. Identify &amp; Describe</b> (Snakes and Types of feathers)</p> <p><b>3. Migration Map Activity</b> Topic: Bird Migration Students: -Mark migration routes on an outline map</p>	Sr. No.	Evolution Methods	SEE Marks	CCE Marks	1.	Identify & classify specimen	10			Identify & describe	10		2.	Migration Map Activity		15	3.	Journal		5	<b>Total Marks</b>		<b>20</b>	<b>20</b>	
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	<p>-Write types &amp; causes (eg. Flamingo, Crain, pelican, etc.)</p> <p><b>4. Journal:</b> Prepare and submit a journal of the practical given of the unit.</p>																						
5	<p><b>MODULE 5.</b> <b>Mammalia &amp; Wild life of India</b> General characters &amp; classification, Dentition in mammals, Adaptive radiation: aquatic, aerial, fossorial, arboreal, cursorial.</p> <p><b>Wild life of India</b> Defining Wild life, Brief history of Indian wild life, Biodiversity, Importance of (values) of wild life, Vanishing Wild Life, Importance of wild life (Great Indian Bustard, Common Peafowl, Indian Elephant, Indian lion, Indian tiger), Wild life Sanctuaries and nation Park, Methods of wild life conservation, Problems of wild life and management in India</p> <p><b>Practical</b> (1) To prepare and understand the classification of mammals up to orders with examples. (<b>Bengal tiger, Asiatic elephant, Indian leopard, Asiatic lion, Gaur, Nilgai, Sloth bear, Indian rhinoceros and Indian wolf</b>) (2) To identify and classify teeth types: incisors, canines, premolars, and molars. (3) To identify major biodiversity hotspots and their significance. (4) To identify major wildlife sanctuaries and national parks in India. (5) To learn different methods of wildlife conservation including in situ and ex situ conservation strategies.</p> <p><b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Evolution Methods</th> <th>SEE Marks</th> <th>CCE Marks</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Identify &amp; classify specimen.</td> <td>5</td> <td></td> </tr> <tr> <td>2.</td> <td>Identify &amp; describe</td> <td>5</td> <td></td> </tr> <tr> <td>3.</td> <td>Biodiversity Hotspot Mapping</td> <td>5</td> <td></td> </tr> <tr> <td>4.</td> <td>Journal</td> <td>5</td> <td></td> </tr> </tbody> </table>	Sr. No.	Evolution Methods	SEE Marks	CCE Marks	1.	Identify & classify specimen.	5		2.	Identify & describe	5		3.	Biodiversity Hotspot Mapping	5		4.	Journal	5		T: P 6:12	20%
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4.	Journal	5																					



5.	Report writing		20
Total Marks		20	20
<p><b>1. Identify &amp; classify specimen:</b> Bengal tiger, Asiatic elephant, Indian leopard, Asiatic lion, Gaur, Nilgai, Sloth bear, Indian rhinoceros and Indian wolf)</p> <p><b>2. Identify &amp; Describe:</b> incisors, canines</p> <p><b>3. Biodiversity Hotspot Mapping</b> Activity: Identify &amp; mark on India map:</p> <ul style="list-style-type: none"> <li>• Western Ghats</li> <li>• Himalaya</li> <li>• Indo-Burma</li> </ul> <p><b>4. Journal</b> Prepare and submit a journal of the practical given of the unit</p> <p><b>5. Report writing</b></p> <ul style="list-style-type: none"> <li>• Make a report on wildlife wildlife sanctuary and national park visit and submit to the faculty.</li> </ul>			

**Suggested Specification table with Marks:**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	10%	30%	20%	20%	20%	0%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

After learning the course, the students should be able to:	
CO1	Analyze the evolutionary significance of chordate characters, emphasizing their role in the origin and diversification of vertebrates.
CO2	Compare the three Protochordate groups to understand their structural organization and chordate characters.
CO3	Evaluate the evolutionary trends in vertebrates, tracing the progression from jawless fishes to early tetrapods.
CO4	Classify Class Aves up to orders and describe the types, structure, and functions of feathers.
CO5	Define wildlife and discuss the history, biodiversity, and importance of wildlife in India.



**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Reference Books:**

- 1) MODERN TEXT BOOK OF ZOOLOGY-VERTEBRATES R.L. KOTPAL
- 2) Chordate Zoology – E.L. Jordan & P.S. Verma
- 3) Chordate Zoology – N. Arumugam, A. Thangamani, S. Prasanna Kumar & L. M. Narayanan
- 4) Animal Diversity (Chordates) – Dr. Imtiaz Khan
- 5) Textbook of Chordate Zoology – Dev Bhattacharya
- 6) Textbook of Chordate Zoology (2 Vols) – G. S. Sandhu & H. Bhaskar

**Suggested Rubrics:**

**Suggested Assessment guidelines**

**MODULE 1**

1. Spot the Difference (Reason-Based) – 10 Marks

Criteria	Marks
Correct identification of differences between Chordates and Non-Chordates with scientific accuracy	5 Marks
Logical reasoning and explanation for each difference using proper terminology	5 Marks
<b>Total</b>	<b>10 Marks</b>



2. Practical Journal Submission – 10 Marks

Criteria	Marks
Completeness of all prescribed practicals with regular entries	5 Marks
Neat diagrams, correct labeling & observations/results	4 Marks
Overall presentation, cleanliness & organization	1 Mark
<b>Total</b>	<b>10 Marks</b>

3. Label & Justify (Diagram-Based) – 10 Marks

Criteria	Marks
Accuracy of diagram, outline & proper labeling of important parts	5 Marks
Evolutionary justification and explanation of labeled features	5 Marks
<b>Total</b>	<b>10 Marks</b>

4. ALA-1 Mini Case Study (Real-Life Connection) – 10 Marks

Criteria	Marks
Understanding of the case and concept of larval chordate characters	4 Marks
Justification of Amphioxus as a connecting link with evolutionary significance	6 Marks
<b>Total</b>	<b>10 Marks</b>

5. Chart / Model Preparation – 10 Marks

Criteria	Marks
Scientific accuracy, correct classification flow & content coverage	5 Marks
Visual clarity, labeling, creativity & neat presentation	5 Marks
<b>Total</b>	<b>10 Marks</b>

**MODULE 2**

1. Identify & Classify Specimen – 10 Marks

Criteria	Marks
Correct identification and systematic classification up to class level	6 Marks
Diagnostic characters with proper justification	4 Marks
<b>Total</b>	<b>10 Marks</b>

2. Practical Journal Submission – 10 Marks

Criteria	Marks
Completion of all unit practicals with accuracy	5 Marks
Neat diagrams, labeling, observations & results	4 Marks



Criteria	Marks
Presentation, regularity & cleanliness	1 Mark
<b>Total</b>	<b>10 Marks</b>

**3. (ALA-2) System Diagram Activity – 10 Marks**

Criteria	Marks
Accuracy and completeness of life-history diagram with labeling	5 Marks
Explanation of stages and evolutionary importance	5 Marks
<b>Total</b>	<b>10 Marks</b>

**4. Mini Review Article – 10 Marks**

Criteria	Marks
Conceptual clarity, scientific content & key observations	6 Marks
Logical conclusion, references & academic presentation	4 Marks
<b>Total</b>	<b>10 Marks</b>

**MODULE 3**

**1. Identify & Classify Specimen – 10 Marks**

Criteria	Marks
Correct identification and systematic classification	6 Marks
Diagnostic characters with scientific explanation	4 Marks
<b>Total</b>	<b>10 Marks</b>

**2. Specimen to Answer (Diagram-Based) – 10 Marks**

Criteria	Marks
Correct identification of specimen and observation of features	4 Marks
Scientific explanation of vertebrate features using correct terminology	6 Marks
<b>Total</b>	<b>10 Marks</b>

**3. Practical Journal Submission – 10 Marks**

Criteria	Marks
Completion of practical records with accuracy	5 Marks
Diagrams, labeling, observations & presentation	5 Marks
<b>Total</b>	<b>10 Marks</b>

**4. Case-Based Question – 10 Marks**

Criteria	Marks
Understanding of amphibians as connecting link	4 Marks



Criteria	Marks
Justification using fish-like and reptile-like characters with diagrams	6 Marks
<b>Total</b>	<b>10 Marks</b>

**MODULE 4**

1. Identify & Classify Specimen – 10 Marks

Criteria	Marks
Correct identification and classification up to class/order level	6 Marks
Diagnostic characters with adaptive explanation	4 Marks
<b>Total</b>	<b>10 Marks</b>

2. Identify & Describe (Snakes / Feathers) – 10 Marks

Criteria	Marks
Correct identification and structural description	5 Marks
Functional and adaptive significance	5 Marks
<b>Total</b>	<b>10 Marks</b>

3. Migration Map Activity (ALA) – 10 Marks

Criteria	Marks
Accurate marking of migration routes with examples	5 Marks
Types, causes of migration & justification	5 Marks
<b>Total</b>	<b>10 Marks</b>

4. Practical Journal Submission – 10 Marks

Criteria	Marks
Completion of all practical records with accuracy	5 Marks
Diagrams, observations, conclusions & presentation	5 Marks
<b>Total</b>	<b>10 Marks</b>

**MODULE 5**

1. Identify & Classify Specimen (Mammalia) – 10 Marks

Criteria	Marks
Correct identification and classification up to order/family	6 Marks
Diagnostic characters with justification	4 Marks
<b>Total</b>	<b>10 Marks</b>

2. Identify & Describe (Incisors & Canines) – 10 Marks



Criteria	Marks
Structural identification and description	5 Marks
Functional and adaptive significance	5 Marks
Total	10 Marks

3. Biodiversity Hotspot Mapping (ALA) – 10 Marks

Criteria	Marks
Correct location, labeling & mapping accuracy	5 Marks
Description, significance & presentation	5 Marks
Total	10 Marks

4. Practical Journal Submission – 10 Marks

Criteria	Marks
Completion, diagrams, observations & regularity	10 Marks
Total	10 Marks

5. Report Writing (Field Visit) – 10 Marks

Criteria	Marks
Structure, observations & scientific content	6 Marks
Use of visuals/data & conservation awareness	4 Marks
Total	10 Marks

