

8. Edward E. Ruppert, Robert D. Barnes (1994)·Invertebrate Zoology; Saunders College Pub.

**250/ZOO/CC201**

**ZOOLOGY:SEMESTER-2**

Course Type	Course Code	Name of the Course	Credit	Contact Hours/Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
CC-A4 4 credit		Basics of Diversity of Chordates-I	3	3	25	50	75	2hrs.
		Practical	1	2	5	20	25	2hrs.

Level of the course:100-199

Pre-requisite for the course (if any): Biology as a Subject at 4.0Level (ClassXII)

**Course Learning Outcomes (CLO)**

1. Student will be able to describe unique character and recognize life functions of Urochordates
2. Student will be able to describe unique characters and recognize life functions of Cephalochordates
3. Student will be able to describe unique characters and recognize life functions of Cyclostomes
4. Student will be able to describe unique characters and recognize life functions of Pisces
5. Students will be capable of identifying the characters and classification of Chordates

**Instructions for Paper-Setter**

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No.1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	<b>Chordates:</b> Principles of classification; Origin and Evolutionary tree; Role of amnion in evolution; Salient features of chordates; Functional morphology of the types with examples emphasizing their biodiversity, economic importance and conservation measures where required.	12
II	General characters and classification of phyla upto orders with examples emphasizing their Biodiversity, economic importance and conservation measures where required. <b>Protochordates:</b> Systematic position, distribution, ecology, morphology and affinities Urochordata: <i>Herdmania</i> – type study Cephalochordata; <i>Amphioxus</i> – type study	11
III	General characters and classification of phyla upto orders with examples emphasizing their biodiversity, economic importance and conservation measures where required. <b>Cyclostomes:</b> Classification and ecological significance Type study of <i>Petromyzon</i> .	11
	General characters and classification of all phyla upto orders with examples emphasizing their biodiversity, economic importance and conservation measures where required.	

IV	<p><b>Pisces:</b> Scales &amp; Fins, Parental care in fishes, fish migration. Type study of Labeo</p>	11
V Practical	<p>1. Classification upto orders, habit, habitats, external characters and economic importance (if any):  <b>Protochordata</b> : <i>Molqula, Hetryllus, Pyrosoma, Doliolum, Olikopleura, and Amphioxus.</i>  <b>Cyclostomata</b> : <i>Myxine, Petromyzon and Ammocoetus larva.</i>  <b>Chondrichthyes</b>: <i>Zygaena, Pristis, Narcine</i>(electric ray), <i>Trygon, Rhinobatus, Raja</i> and <i>Chimaera.</i>  <b>Osteichthyes</b> : <i>Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Ostraczion, Tetradon, Echinus, Lophius, Solea and Polypterus.</i> Any of the Lung Fishes.  <b>2. Preparation of models of the different systems of the following animals:</b>  <i>Herdmania</i>: General anatomy  <i>Labeo</i>(locally available fish): Digestive and reproductive systems: cranial nerves  <b>3. Study of the skeleton of <i>Scoliodon, Labeo</i></b>  <b>4. Study of the following prepared slides:</b> <i>Tornaria larva, T.S. Amphioxus</i> (through different regions). <i>Oikopleura</i>, different types of scales.  <b>5. Make permanent stained preparations of the following:</b> <i>Salpa</i>, Spicules, and Cycloid scales  <b>1. Make permanent stained preparation of the following:</b> <i>Salpa</i>, Spicules, and Pharynx of <i>Herdmania, Amphioxus</i>, Cycloid scales  2. Report on Animal Biodiversity of Sultanpur National Park, Gurugram.  <b>6. Project Report:</b>  1. Migration in fishes  2. Ornamental fishes</p>	30
<b>Learning Resources</b>		
<ol style="list-style-type: none"> <li>1. R.L.Kotpal.Modern Text book of Zoology</li> <li>2. E.L.Jordan and Verma.Chordate Zoology.</li> <li>3. Barrington,E.J.W.The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinbrough.</li> <li>4. Walters,H.E.and Sayles,L.D.Biology of vertebrates.MacMillan &amp;Co.,NewYork.</li> <li>5. Kent, C.G. Comparative anatomy of vertebrates.</li> <li>6. S.S. Lal.Practical Zoology Vertebrate</li> </ol>		

## ZOOLOGY:SEMESTER-2

Course Type	Course Code	Name of the Course	Credit	Contact Hours/Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
CC-A5 4 credit		Basics of Diversity of Chordates-II	3	3	25	50	75	2hrs.
		Practical	1	2	5	20	25	2hrs.

Level of the course:100-199

Pre-requisite for the course (if any): Biology as a Subject at 4.0Level(ClassXII)

**Course Learning Outcomes (CLO)**

1. Student will be able to describe unique characters and recognize life functions of Urochordates
2. Student will be able to describe unique characters and recognize life functions of Pisces
3. Student will be able to describe unique characters and recognize life functions of Amphibians & Reptiles
4. Student will be able to describe unique characters and recognize life functions of Birds & Mammals
5. Students will be capable of identifying the characters and classification of Chordates

**Instructions for Paper-Setter**

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No.1and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	<b>Chordates:</b> <b>Amphibia:</b> Origin, Evolutionary tree. Type study of frog ( <i>Rana tigrina</i> ), Parental Care in Amphibia	12
II	<b>Reptilia:</b> Type study of Lizard ( <i>Hemidactylus</i> ), Origin, Evolutionary tree. Extinct reptiles; Poisonous and non-poisonous snakes; Poison apparatus in snakes.	11
III	<b>Aves:</b> Type study of Pigeon ( <i>Columba livia</i> ); Flight adaptation, Principles of aerodynamics in Bird flight, migration in birds.	11
IV	<b>Mammals:</b> Classification, type study of Rat; Adaptive radiations of mammals and dentition. <b>Note: Type study includes detailed study of various systems of the animal.</b>	11

<p style="text-align: center;"><b>V Practical</b></p>	<p><b>1. Classification up to orders, habit, habitats, external characters and economic importance (if any) of the following animals:-</b></p> <p><b>Amphibia</b> :<i>Necturus, Proteus, Amphiuma, Salamandra, Amblystoma, Axolotie larva, Alytes, Bufo, Rana.</i></p> <p><b>Reptilia</b> :<i>Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhops, Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Viper, Crocodilus, Gavialis, Chelone</i> (Turtle) and <i>Testudo</i> (Tortoise).</p> <p><b>Aves</b> :<i>Casuarius, Arden, Anas, Milvus, Pavo, Eudynamis, Tyto and Alcedo, Halcyon</i></p> <p><b>Mammalia</b> :<i>Ornithorhynchus, Echidna, Didelphis, Macropus, Loris, Macaque, Hystrix, Funambulus, Felis, Panthera, Canis, Herpestes, Capra, Pteropus</i></p> <p><b>2. Preparation of models of the different systems of the following animals:</b></p> <p><b>Hemidactylus</b> : Digestive, arterial, venous and urinogenital systems.</p> <p><b>Rat</b> : Digestive, arterial, venous and urinogenital systems.</p> <p><b>3. Study of the skeleton</b> of <i>Rana</i> (Frog), <i>Varanus</i>, Pigeon or Gallus and <i>Orcyctolagus</i>/rat</p> <p><b>4. Study of the following prepared slides:</b> Histology of rat (compound tissues).</p> <p><b>5. Study and collection of Quill, Contour, Filoplume and Down feathers</b></p> <p><b>6. Project Report:</b></p> <ol style="list-style-type: none"> <li>1. Survey of diversity</li> <li>2. Parental care</li> <li>3. Dentition in mammals</li> <li>4. Migration in birds</li> </ol>	<p style="text-align: center;"><b>30</b></p>
<b>Learning Resources</b>		
<ol style="list-style-type: none"> <li>1. R.L.Kotpal.ModernText book of Zoology</li> <li>2. E.L.Jordan and Verma.Chordate Zoology.</li> <li>3. Barrington,E.J.W.The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinborough.</li> <li>4. Walters,H.E.and Sayles,L.D.Biology of vertebrates.MacMillan &amp;Co.,New York.</li> <li>5. Kent, C.G. Comparative anatomy of vertebrates.</li> <li>6. S.S. Lal.Practical Zoology Vertebrate</li> </ol>		

ZOOLOGY:SEMESTER-2								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
CC-A6 4 credit		Aquaculture	3	3	25	50	75	2hrs.
		Practical	1	2	5	20	25	2hrs.
Level of the course:200-299								
Pre-requisite for the course (if any): Biology as a Subject at 4.0 Level (Class XII)								
<b>Course Learning Outcomes (CLO)</b>								
<ol style="list-style-type: none"> <li>Students will understand about fresh water fishes of India</li> <li>Students will capable to undertake about fishing craft sand gears</li> <li>It will make the students understand about the seed production in fishes</li> <li>Students will be able to explain the culture technology in fishery</li> <li>Students will be able to identify fish specimens</li> </ol>								
<b>Instructions for Paper-Setter</b>								
<ol style="list-style-type: none"> <li>Nine questions will be set in all. All questions will carry equal marks.</li> <li>QuestionNo.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise Selecting two questions from each Unit I to IV. The candidate will be required to attempt question No.1 and four more questions selecting one question from each unit.</li> </ol>								
UNIT	TOPICS							CONTACT HOURS
I	<b>Introduction to world fisheries:</b> Production, utilization and demand, Major species cultured Fresh Water fishes of India: River system, reservoir, pond, tank fisheries; captive and culture fisheries, cold water fisheries.							12
II	Fishing crafts and gears. Fin fishes, Crustaceans, Mollusks and their culture. Traits of important cultivable fish and shell fish and their culture methods– Indian major carps, exotic carps, air breathing fishes, cold water fishes,fresh water prawns, mussels							11
III	Seed production: Natural seed resources –its assessment, collection, Hatchery production Nutrition: Sources of food(Natural, Artificial)and feed composition(Calorie and Chemical ingredients).							11
IV	<b>Field Culture:</b> Culture, Culture in Pond-running waters; recycled water culture, cage culture; polyculture. <b>Culture technology:</b> Induced breeding in fishes, techniques and hormones; Fish Biotechnology (Transgenesis and Cryopreservation of gametes).							11
V	1.Identification of <i>Catlacatla</i> , <i>Labeorohita</i> , <i>L. calbasu</i> , <i>Cirrhinusmrigala</i> , <i>Puntiussarana</i> , <i>Channa punctatus</i> , <i>C. marulius</i> , <i>C.stariatus</i> , <i>Trichogasterfasciata</i> , <i>Mystusseenghala</i> , <i>M.cavasius</i> , <i>M.tengra</i> , <i>Callichrouspabola</i> , <i>C.bimaculatus</i> , <i>Wallagoattu</i> , Prawns, Crabs,							

<b>Practical</b>	Lobsters, Clams, Mussels & Oysters. 2. A study of the slides of fish parasites. 3. A study of the different types of nets, e.g., cast net, gill net, drift net and drag net. 4. Project report on: Freshwater fishes in Haryana and Pearl culture	<b>30</b>
<b>Learning Resources</b>		
<ol style="list-style-type: none"> <li>1. Arumugam N.(2014).Aqua culture and Fisheries, Saras Publication</li> <li>2. Bardach,JE, Ryther &amp; Mc Larney,Wo(1972) Aquaculture,NewYork:Wiley-Interscience.896pp.</li> <li>3. Lagler,KF,Bardach,JE,Miller,RR&amp;Passino,DRM(1977)Ichthyology,21ndEdition,NewYork,Wiley,506pp.</li> <li>4. Khanna S S, &amp; Singh H R (2014).Text book of Fish Biology and Fisheries 3<sup>rd</sup> education. Narendra Publishing House</li> </ol>		