

Detailed Syllabus of Practicals for B.Sc.Part-II (Zoology) Semester – III & IV
(Annual Pattern)

Practical-I (Based on Paper V & VI)

Unit I

A. Classification and morphological peculiarities of the following up to classes.

(Sketches/Photographs may be used)

- i. **Arthropoda** - Apus, Daphnia, Balanus, Prawn, Lobster, King crab, Grasshopper, Butterfly, Moth, Millipede, Centipede, Scorpion, Spider, Peripatus.
- ii. **Mollusca** - Chiton, Dentalium, Patella, Aplysia, Snail, Slug, Mytilus, Pearl Oyster, Sepia, Octopus.
- iii **Echinodermata** - Sea-lily, Brittle-star, Starfish, Sea-urchin. Sea cucumber
- iv. **Hemichordata** - Balanoglossus.

B. Amazing invertebrates - Fire fly, Mud wasp, Praying mantis, Sepia

Unit II

A. Crab :

- i. Systematic position and external characters
- ii. Study of appendages (Demonstration)
- iii. Study of nervous system (Demonstration)

B. Cockroach :

- i. Systematic position and external Characters.
- ii. Sexual dimorphism
- iii Dissection of
 - a) Digestive system
 - b) Nervous system
 - c) Male reproductive system
 - d)Female reproductive system
- iii. Temporary preparation of –
Trachea, mouth parts, cornea , walking leg, thoracic spiracles and gonapophysis.

Unit III

A. Pila:

- i. Systematic position and external Characters
- ii. Dissection of -(**Demonstration**)
 - a) Digestive system.
 - b) Nervous system
- iii. Temporary Preparation of - -(**Demonstration**)
Osphradium, Radula. and Statocyst.

B. Study of Mouth Parts of Insects. -

Honeybee, Mosquito, Housefly, Butterfly

Unit IV

A. Study of foot in Mollusca:

Chiton, Pila, Mytilus, Unio, Sepia.

- B. Examples in Genetics** (at least 10 examples)
Examples based on Crossing over, Linkage, Interaction of genes and Sex- determination.
- C. Detection of Carbohydrates**
(Glucose, Maltose, Lactose, starch), Proteins and Lipids.
- D. Demonstration of enzyme action:**
 - i. Urea-Urease reaction.
 - ii. Effect of temperature and pH on enzyme activity.
 - iii. Action of protease (papaine) on proteins.
- E. Study of enzyme action of salivary amylase.**

Practical-II (Based on Paper VII & VIII)

Unit I

- A . Classification and Morphological Peculiarities of the following up to orders:**
(Sketches/Photographs may be used)
 - i. **Reptilia** - Chameleon, Gecko, Cobra, Crocodile.
 - ii. **Aves** - Duck, Kite, Woodpecker, Sparrow, Sunbird, Vulture, Kingfisher, Fowl.
 - iii. **Mammals**- Platypus, Bat, Scaly ant eater, Loris, Rabbit, Tiger, Whale
- B. Rat : (Demonstration Practical)**
Study of the following Systems:
 - i. Digestive System.
 - ii. Respiratory System.
 - iii. Arterial System.
 - iv. Venous System.
 - v. Excretory System.
 - vi. Reproductive System.
 - vii. Brain

Unit II

- A . Dissection of –**
 - i. Brain of Rat/fowl
- B.. Temporary Preparation of :**
 - i. Blood of mammal.
 - ii. Pecten , Sclerotic Plate , Collumella and Hyoid Apparatus of fowl.

Unit III

- A . Identification of the following Poisonous and Non-Poisonous snakes.**
Cobra, Pit viper, Russell's viper, Saw Scaled viper, Krait, Sea snake, Rat snake, Water snake.
- B . Beak and Leg modifications with reference to :**
Parrakit, Woodpecker, Kingfisher, Heron, Duck, Sparrow/Pigeon, Hawk/Kite , Owl.
- C. Dentition in Mammals with reference to:**
Rabbit, Sheep, Rat, Dog, Man.

Unit IV

A . Study of histology of following mammalian organs :

- i. Tooth (V.S.) ii. Tongue iii. Salivary gland iv. Stomach v Duodenum.
vi. Ileum vii. Liver viii. Pancreas ix. Kidney x. Testis xi. Ovary
xii Pituitary gland xiii. Uterus.

B . Preparation of Haemin crystals.

C. Study of vaginal smear of Rat.

D . Study of abnormal constituents of urine.

E . Study of blood groups.

F . Visit to sea-shore/any suitable place to study animal diversity.

Nature of theory question paper

Semester III

Paper – V Animal Diversity III

Q.1	Eight Multiple choice questions (one mark each)	8
Q.2	Attempt any two (Eight marks each)	16
	i.	
	ii.	
	iii.	
Q. 3	Attempt any four (Four marks each)	16
	I.	
	II.	
	III.	
	IV.	
	V.	
	VI.	

Total - 40

Paper – VI Genetics And Biological Chemistry

Q.1	Eight multiple choice questions (one mark each)	8
Q.2	Attempt any two (Eight marks each)	16
	i.	
	ii.	
	iii.	
Q. 3	Attempt any four (Four marks each)	16
marks		
	I.	
	II.	
	III.	

- IV.
- V.
- VI.

Total - 40

Semester IV

Paper – VII - Animal diversity IV

- | | | |
|-----|---|----|
| Q.1 | Eight Multiple choice questions (one mark each) | 8 |
| Q.2 | Attempt any two (Eight marks each) | 16 |
| | i. | |
| | ii. | |
| | iii. | |

- | | | |
|------|------------------------------------|----|
| Q. 3 | Attempt any four (Four marks each) | 16 |
| | I. | |
| | II. | |
| | III. | |
| | IV. | |
| | V. | |
| | VI | |

Total - 40

Paper – VIII – Histology & Physiology

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|-----|---|----|
| Q.1 | Eight Multiple choice questions (one mark each) | 8 |
| Q.2 | Attempt any two (Eight marks each) | 16 |
| | i. | |
| | ii. | |
| | iii. | |

- | | | |
|------|------------------------------------|----|
| Q. 3 | Attempt any four (Four marks each) | 16 |
| | I. | |
| | II. | |
| | III. | |
| | IV. | |
| | V. | |
| | VI | |

Total – 40

Distribution of Marks for Practical Examination: (Annual Pattern)

Practical- I

1. Dissection.....	13
2. Temporary Preparation/Mounting.....	07
3. Biochemical Tests/ Enzyme Action.....	07
4. Genetics Example.....	08
5. Identification.....	10
6. Journal.....	05
Total 50	

Practical- II

1. Dissection.....	13
2. Temporary Preparation/Mounting.....	07
3. Physiological Experiment.....	07
4. Submission of Excursion Report and Viva-voce based on it.	08
5. Identification.....	10
6. Journal.....	05
Total 50	

B.Sc. II: Zoology Equivalence to old Syllabus:

Old : Paper III – Animal Diversity III, Genetics & Biological Chemistry.

New : Semester III Paper –V Animal Diversity III

New : Semester III Paper – VI Genetics & Biological Chemistry.

Old : Paper IV – Animal Diversity IV, Histology & Physiology.

New : Semester IV Paper – VII Animal Diversity IV

New : Semester IV Paper – VIII Histology & Physiology

Semester IV

Paper III - Inland Fisheries

UNIT- I	
1. Freshwater Habitat :	5
1.1 Introduction.	
1.2 Characters and classification of :	
Ponds, Lakes, Streams, Rivers and Reservoirs.	
2. Freshwater Ecosystems in Ponds, Lakes, Rivers and Reservoirs.	8
With respect to:	
2.1 Food chain.	
2.2 Food web.	
2.3 Primary productivity.	
UNIT- II	
3. Inland Capture Fisheries:	10
3.1 Riverine capture fisheries.	
3.2 Reservoir capture fisheries.	
3.3 Lacustrine capture fisheries.	
UNIT- III	
4. Fishing Craft and Gear Technology:	12
4.1 Fishing Crafts:	
Rafts, Catamaron, Canoes, Machwa, Trawler.	
4.2 Fishing Gears :	
Hooks and Lines, Cast net, Gill net, Trap net,	
Rampani net and Trawl net.	
UNIT- IV	
4.3 Maintenance of Fishing Crafts and Gears.	3
5. Water Pollution:	7
5.1 Types of water pollutants.	
5.2 Effects of pollutants on fishes.	
5.3 Preventive measures.	
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Paper IV (Aquaculture)

UNIT- I

- 1. Introduction to Aquaculture:** 5
- 1.1 Basic Aquaculture- Definition and scope.
 - 1.2 History of Aquaculture- Origin and growth.
 - 1.3 Present national and global scenario.
 - 1.4 Comparison of aquaculture and agriculture.
- 2. Types of aquaculture:** 7
- 2.1 Semi Intensive, Intensive and Extensive aquaculture.
 - 2.2 Pond culture.
 - 2.3 Pen and cage culture.
 - 2.4 Running water culture.

UNIT- II

- 3. Criteria for selection of candidate species of aquaculture.** 3
- 4. Major candidate species for freshwater aquaculture.** 3
- 5. Prerequisites of site selection:** 4
- 5.1 Topography
 - 5.2 Soil type.
 - 5.3 Water supply.

UNIT- III

- 6. Layout Fish farm:** 4
- 6.1 Construction of pond.
 - 6.2 Types of ponds.
- 7. Physico- chemical conditions of fish pond:** 7
- 7.1 Physical conditions: Depth, Temperature, Turbidity , Light.
 - 7.2 Chemical conditions: Oxygen, Carbon dioxide, P^H, Organic and inorganic contents.

UNIT– IV

- 8. Freshwater Plankton:** 6
- 8.1 Definition and classification
 - 8.2 Importance of plankton
 - 8.3 Morphological study of :
 - a) Phyto- plankton
 - b) Zoo-plankton
- 9. Aquarium Fishery:** 6
- 9.1 Setting of an aquarium.
 - 9.2 Common aquarium fishes:
 - a) Angel fish.
 - b) Gold fish.

- c) Guppy fish.
- d) Gourami.
- e) Swordtail Fish.
- f) Molly.

List of Recommended Books :

- 1) Fish and Fisheries of India : V. G. Jhingran. Hindustan Publication Corp. (India), Delhi.
- 2) Tropical Fish Farming : D. K. Belsare. Environmental Publi. Karad, Maharashtra.
- 3) Aquaculture : J. E. Bardach. J. H. Ryther and W. O. McLarney.
- 4) Textbook of Fish Culture : Breeding and Cultivation of Fish. Mare. Huet.
- 5) Freshwater Fish Pond Culture and Management. M. Chakrof.9
- 6) Text Book of Aquaculture. M. S. Reddy.
- 7) Encyclopaedia of Fishes and Fisheries of India. A. K. Pandey. G. S. Sandhu Vol. IV. Anmol Publi. New Delhi.
- 8) A Handbook of Fish Farming : S. C. Agarwal, Narendra Publication House, Delhi.
- 9) A Textbook of Fishery Science and Indian Fisheries : C. B. Shrivastav. Kitab Mahal, New Delhi.
- 10) A Manual of Freshwater Acquaculture : R. Santhanam. N. Sukumaran and P. Natrajan.
- 11) Methods of Physical and Chemical Analysis of Water : Gotterman et.al.
- 12) An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad.
- 13) Manual of Methods in Fish Biology : S. P. Biswas.
- 14) Manual in Fishery Science : K. R. Reddy and M. G. Babare.
- 15) Aquarium System : 1981 : A. D. Hawkins. Academic Press.
- 16) Aquarium Fishes and Plants : K. Bajaj and R. Zukal Himalayan Publication.
- 17) Freshwater Aquarium : J. A. Dawas. Robort Royce. Ltd.

Practical course in Fisheries for B.Sc. II (Annual)

Practical- I

UNIT -I

1. Taxonomy of fin fishes;

Classification of the following fishes up to families:

Scoliodon, Prisdts, Torpedo, Chimaera, Polypterus, Acipenser, Amia, Lepidosteus,

Harpodon, Eel, Labeo, Clarias, Exocoetus, Hippocampus, Ophiocephalus, Anabas, Pleuronectes, Echeinis, Tetradon and Antennarius.

2. Taxonomy of shell fishes:

- i. **Crustacea:** Prawn, lobster and crab.
- ii. **Mollusca:** Unio, Pearl oyster and Sepia.

UNIT-II

3. Morphology of Scoliodon and Labeo.

4. Dissection of Catla/ Mrigal/ Cyprinus

- 4.1 Digestive system.-Major
- 4.2 Heart and major blood vessels.-Minor
- 4.3 Respiratory system.- Minor
- 4.4 Reproductive system.-Minor
- 4.5 Brain.- Major
- 4.6 Weberian ossicles. -Major
- 4.7 Mountings- Cycloid scale and swim bladder.

5. Dissection of accessory respiratory organs in(Demonstration)

- 5.1 Anabas.
- 5.2 Clarias.
- 5.3 Saccobranchus.

UNIT-III

6. Study of Fin:

- 6.1 Paired fins: Pectoral and pelvic fins.
- 6.2 Unpaired fins: Dorsal, ventral and different types of caudal fins.

7. Mounting of the following scales:

Placoid, cycloid and ctenoid scales.

8. Study of different types of swim bladders.

UNIT –IV

9. Economic importance of the following:

Sponges, Prawn, Oyster, Bivalve, Scoliodon, Pomphret, Harpadon, Sardine, Labeo.

10. Estimation of total glycogen, protein and lipid in fish organs.

[Note: Sketches, photographs may be used]

Practical II

UNIT-I

1. Estimation of the following chemical factors from water sample.

- 1.1 Dissolved oxygen.
- 1.2 Free carbon dioxide.
- 1.3 Alkalinity
- 1.4 Hardness

2. Determination of primary productivity

UNIT-II

3. Study of Crafts and Gears:

- 3.1 Crafts - i. Raft. ii. Catamaran. iii. Dugout canoe iv. Trawler
- 3.2 Gears - i. Drag net. ii. Cast net. iii. Gill net. iv. Rampani net. v. Trawl net.

UNIT-III

4. Study of planktons:

- 4.1 Quantitative estimation of planktons.
- 4.2 Quantitative study of zoo-planktons.

5. Study of life cycle in Labeo.

UNIT-IV

6. Aquarium fishery:

- 6.1 Demonstration of tank fabrication.
- 6.2 Setting of an aquarium.
- 6.3 Aquarium fishes: i) Angel. ii) Gold fish. iii) Guppy.
iv) Gouramy. v) Molly. vi) Swordtail fish.

7. Visit to fish seed production center and local fish market and submission of the report.

Distribution of Marks for Theory Examination for Fisheries Paper I, II, III and IV

Q. 1) Objective – Multiple choice (Eight questions)	8 Marks
Q.2) Attempt any two out of three (8 marks each)	16 Marks
a) Long answer question	
b) Long answer question	
c) Long answer question	
Q. 3) Short answer questions (Any four out of six) (Four marks each)	16 Marks

Distribution of Marks for Practical Examination

Practical – I

1. Dissection – Major	12
2. Dissection – Minor	08

3. Temporary Mounting	05
4. Estimation of glycogen / protein / lipid	10
5. Identification	10
6. Journal	05
	50

Practical – II

1. Estimation of dissolved O ₂ / Free CO ₂ /Hardness	10
2. Estimation of Alkalinity/Primary Productivity	10
3. Mounting / Quantitative estimation of Planktonic Forms	05
4. Identification	10
5. Tour Report	10
6. Journal	05

50

B.Sc. II : Fisheries Equivalence to Old Syllabus

Old Paper – I : Fishery Biology I and Fish Physiology I

New Paper, Sem-I – Paper I : Fishery Biology I and Paper II Fish Physiology I

Old Paper – II : Inland Fisheries and Aquaculture

New Paper , Sem-II – Paper III : Inland Fisheries and Paper IV Aquaculture