

**SCHEME OF EXAMINATION FOR B.SC. SEMESTER SYSTEM**

*Scheme of B.Sc. I*

<i>Semester-I</i>					
Sr. No.		Paper	Marks		Exam. Duration
			Internal Assessment*	External Marks	
1.	Paper-I	Life and Diversity from Protozoa to Porifera and Cell Biology-I	10	40	3 hrs.
2.	Paper-II	Life and Diversity from Coelentrata to Helminthes and Cell Biology-II	10	40	3 hrs.
<i>Semester-II</i>					
3.	Paper-I	Life and Diversity from Annelida to Arthropoda and Genetics-I	10	40	3 hrs.
4.	Paper-II	Life and Diversity from Molluaska to Hemichordata and Genetics-II	10	40	3 hrs.
5.	Paper-III	Practical	--	100	6 hrs. (Two session) Morning & Evening
<b>Total Semester I &amp; II</b>			40	260	

*Scheme of B.Sc. II*

<i>Semester-III</i>					
Sr. No.		Paper	Marks		Exam. Duration
			Internal Assessment*	External Marks	
1.	Paper-I	Life and Diversity of Chordates-I	10	40	3 hrs.
2.	Paper-II	Mammalian Physiology-I	10	40	3 hrs.
<i>Semester-IV</i>					
3.	Paper-I	Life and Diversity of Chordates-II	10	40	3 hrs.
4.	Paper-II	Mammalian Physiology-II	10	40	3 hrs.
5.	Paper-III	Practical	--	100	6 hrs. (Two session)

					Morning & Evening
<b>Total Semester III &amp; IV</b>			40	260	

***Scheme of B.Sc. III***

<b><i>Semester-V</i></b>					
<b>Sr. No.</b>		<b>Paper</b>	<b>Marks</b>		<b>Exam. Duration</b>
			Internal Assessment*	External Marks	
1.	Paper-I	Environmental Biology	10	40	3 hrs.
2.	Paper-II	Evolution and Developmental Biology	10	40	3 hrs.
<b><i>Semester-VI</i></b>					
3.	Paper-I	Aquaculture and Pest Management-I	10	40	3 hrs.
4.	Paper-II	Aquaculture and Pest Management-II	10	40	3 hrs.
5.	Paper-III	Practical	--	100	6 hrs. (Two session) Morning & Evening
<b>Total Semester V &amp; VI</b>	40	260			
<b>Grand Total Semester I – VI</b>			<b>900</b>		

**\* 10 Percent on the basis of two hand written assignments, 5 percent on the basis of one class test and 5 percent on the basis of attendance of the student.**

**Scheme of B.Sc. I**

<b>Semester-I</b>					
<b>Sr. No.</b>		<b>Paper</b>	<b>Marks</b>		<b>Exam. Duration</b>
			Internal Assessment*	External Marks	
1.	Paper-I	Life and Diversity from Protozoa to Porifera and Cell Biology-I	10	40	3 hrs.
2.	Paper-II	Life and Diversity from Coelentrata to Helminthes and Cell Biology-II	10	40	3 hrs.
<b>Semester-II</b>					
3.	Paper-I	Life and Diversity from Annelida to Arthropoda and Genetics-I	10	40	3 hrs.
4.	Paper-II	Life and Diversity from Molluaska to Hemichordata and Genetics-II	10	40	3 hrs.
5.	Paper-III	Practical	--	100	6 hrs. (Two session) Morning & Evening
<b>Total Semester I &amp; II</b>			40	260	

\* 10 Percent on the basis of two hand written assignments, 5 percent on the basis of one class test and 5 percent on the basis of attendance of the student.

# SYLLABUS

## Life and Diversity from Protozoa to Porifera & Cell Biology – I

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**External Marks: 40**

**Internal Assessment : 10**

**Time allotted : 3 Hours**

**Note :** *Nine questions are to be set in all and the candidate are required to attempt five questions including compulsory question.*

1. Question 1 is compulsory consisting of 10 parts (1.0 marks each) converting the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidate is required to attempt four questions, two from each section

1. **Protozoa:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- iii) Type study of *Plasmodium*;
- iv) Parasitic protozoans: Life history, mode of infection and pathogenicity of *Entamoeba*, *Trypanosoma*, *Leishmania* and *Giardia*.

2. **Porifera:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- iii) Type study – *Sycon*
- iv) Canal system in sponges
- v) Spicules in sponges

1. Ultrastructure of different cell organelles of animal cell.
2. **Plasma Membrane:** Fluid mosaic model, various modes of transport across the membrane, mechanism of active and passive transport, endocytosis and exocytosis.
3. **Endoplasmic reticulum (ER) :** types, role of ER in protein synthesis and transportation in animal cell.
4. **Golgi complex:** Structure, Associated enzymes and role of golgi-complex in animal cell.
5. **Ribosomes:** Types, biogenesis and role in protein synthesis.
6. **Lysosomes:** Structure, enzyme and their role; polymorphism
7. **Mitochondria:** Mitochondrial DNA; as semiautonomous body, biogenesis, mitochondrial enzymes (only names), role of mitochondria.
8. **Cytoskeleton:** Microtubules, microfilaments, centriole and basal body.
9. Cilia and Flagella

# SYLLABUS

## Life and Diversity from Coelentrata to Helminths & Cell Biology – II

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**External Marks: 40**

**Internal Assessment : 10**

**Time allotted : 3 Hours**

Note :

1. Nine questions are to be set in all and the candidate are required to attempt five questions including compulsory question.
2. Question 1 is compulsory consisting of 10 parts (1.0 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
3. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidate is required to attempt four questions, two from each section

1. **Phylum – Coelentrata :**

- i) General characters and classification up to order level
- ii) Biodiversity, economic importance
- iii) Type Study - *Obelia*
- iv) Corals and coral reefs
- v) Polymorphism in Siphonophores

2. **Phylum – Helminths :**

- i) General characters and classification up to order level
- ii) Biodiversity, economic importance
- iii) Type study – *Fasciola hepatica*;
- iv) Helminths parasites : Brief account of life history, mode of infection and pathogenesis of *Schistosoma*, *Ancylostoma*, *Trichinella*, *Wuchereria* and *Oxyuris*.

1. Ultrastructure and functions of Nucleus : Nuclear membrane, nuclear lamina, nucleolus, fine structure of chromosomes, nucleosome concept and role of histones, euchromatin and heterochromatin, lampbrush chromosomes and polytene chromosomes.
2. Mitosis and Meiosis (Cell reproduction)
3. Brief account of causes of cancer.
4. An elementary idea of cellular basis of Immunity.

# SYLLABUS

## Life and Diversity from Annelida to Arthropoda & Genetics - I

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**External Marks: 40**

**Internal Assessment : 10**

**Time allotted : 3 Hours**

**Note : Nine questions are to be set in all and the candidate are required to attempt five questions including compulsory question.**

1. Question 1 is compulsory consisting of 10 parts (1.0 marks each) converting the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates is required to attempt four questions, two from each section

1. **Phylum – Annelida :**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance of Annelida
- iii) Type study – *Pheretima* (Earthworm)
- vi) Metamerism in Annelida
- v) Trochophore larva

2. **Phylum – Arthropoda :**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance of insects
- vi) Type study – *Grasshopper*

3. Elements of **Heredity and variations.**

4. The varieties of **gene interactions**

5. **Linkage and recombination :** Coupling and repulsion hypothesis, crossing-over and chiasma formation; gene mapping.

6. **Sex determination and its mechanism :** male and female heterozygous systems, genetic balance system; role of Y-chromosome, male haploidy, cytoplasmic and environmental factors, role of hormones in sex determination.

7. **Sex linked inheritance :** Haemophilia and colour blindness in man, eye colour in *Drosophila*, Non-disjunction of sex-chromosome in *Drosophila*; Sex-linked and sex-influenced inheritance

8. **Extra chromosomal and cytoplasmic inheritance:**

- i) Kappa particles in *Paramecium*
- ii) Shell coiling in snails.
- iii) Milk factor in mice.

# SYLLABUS

## Life and Diversity from Mollusca to Hemichordata & Genetics – II

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**External Marks: 40**

**Internal Assessment : 10**

**Time allotted : 3 Hours**

**Note : Nine questions are to be set in all and the candidate are required to attempt five questions including compulsory question.**

1. Question 1 is compulsory consisting of 10 parts (1.0 marks each) converting the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates is required to attempt four questions, two from each section

**1. Phylum - Mollusca:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- iii) Type study of - *Pila*
- iv) Torsion and detorsion in gastropoda
- v) Respiration and foot

**2. Phylum – Echinodermata :**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- vii) Type study – *Asteries* (Sea Star)
- viii) Echinoderm larvae
- ix) Aristotle's Lantern

**3. Phylum Hemichordate : General Character; Type Study of Ballanglosus**

3. **Multiple allelism :** Eye colour in *Drosophila*; A, B, O blood group in man.
4. **Human genetics :** Human karyotype, Chromosomal abnormalities involving autosomes and sex chromosomes, monozygotic and dizygotic twins.
5. **Inborn errors of metabolism** (Alcaptonuria, Phenylketonuria, Albinism, sickle-cell anaemia).
6. **Nature and function of genetic material :** Structure and type of nucleic acids; Protein synthesis.
7. Eugenics, eugenics and euphenics; spontaneous and induced (chemical and radiations) mutations; gene mutations; chemical basis of mutations; transition, transversion, structural chromosomal aberrations (deletion, duplication, inversion and translocation); Numerical aberrations (autopolyploidy, euploidy and polyploidy in animals)
8. **Applied genetics :** genetic counseling, pre-natal diagnostics, DNA-finger printing, transgenic animals.

## B.SC. (SEMESTER I & II) PAPER –III (PRACTICAL)

Max. Marks: 100

Time allowed: 6 Hours  
(2 Sessions M&E)

### (A) Classification up to orders with ecological note and economic importance of the following animals:

1. Protozoa Lamination of cultures of *Amoeba*, *Euglena* and *Paramecium*; permanent prepared slides: *Amoeba*, *Euglena*, *Trypanosoma*, *Noctiluca*, *Eimeria*, *Paramecium* (binary fission and conjugation), *Opalina*, *Verticella*, *Balantidium*, *Nyctotherus*, radiolarian and foraminiferan ooze.
2. Parazoa (Porifera) Specimens: *Sycon*, *Grantia*, *Euplectela*, *Hyalonema*, *Spongilla*, *Euspongia*
3. Coelenterata Specimens: *Porpita*, *Valella*, *Physalia*, *Aurelia*, *Rhyzostoma*, *Metridium*, *Millipora*, *Alcyonium*, *Tubipora*, *Zoanthus*, *Madrepora*, *Favia*, *Fungia*, and *Astrea*. Permanent prepared slides: *Hydra* (W.M.), *Hydra* with buds, *Obelia* (colony and medusa), *Sertularia*, *Plumularia*, *Tubularia*, *Bougainvillea*, *Aurelia* (sense organs and stages of life history).
4. Platyhelminthes Specimens: *Dugesia*, *Fasciola*, *Taenia*, *Echinococcus*. Permanent prepared slides: *Miracidium*, *sporocyst*, *redia*, *cercaria*, *scolex* and *proglottids of Taenia* (mature and gravid).
5. Aschelminthes *Ascaris* (male and female), *Trichinella*, *Ancylostoma*, *Meloidogyne*
6. Annelida Specimens : *Pheretima*, *Heteronereis*, *Polynoe*, *Aphrodite*, *Chaetopterus*, *Arenicola*, *Tubifex* and *Pontobdella*
7. Arthropoda Specimens : *Peripatus*, *Palaemon* (Prawn), *Lobster*, *Cancer* (crab), *Sacculina*, *Eupagurus* (hermit crab), *Lepas*, *Balanus*, *Cyclops*, *Daphnia*, *Lepisma*, *Periplaneta* (cockroach), *Schistocerca* (locust), *Poecilocerus* (ak-hopper), *Gryllus* (cricket), *Mantis* (praying mantis), *Cicada*, *Forticula* (earwig), Dragon fly, termite queen, bug, moth, beetle, *Polistes* (wasp), *Apis* (honey bee), *Bombyx* (silk moth), *Cimex* (bed bug), *Pediculus* (body louse), *Millipedes*, *Scolopendra* (centipedes), *Palamnaeus* (scorpion), *Aranea* (spider), *Limulus* (king crab)
8. Mollusca Specimens: *Mytilus*, *Ostrea*, *Cardium*, *Pholas*, *Solen* (razor Fish), *Pecten*, *Haliotis*, *Patella*, *Aplysia*, *Doris*, *Limax*, *Loligo*, *Sepia*, *Octopus*, *Nautilus* (complete and T.S.), *Chiton* and *Dentalium*
9. Echinodermata Specimens: *Asterias*, *Echinus*, *Cucumara*, *Ophiothrix*, *Antedon* and *Asterophyton*
10. Hemichordata *Balanglossus*

### (B) Study of the following permanent stained preparations:

1. L.S. and T.S. *Sycon*; gemmules, spicules and sponging fibres of *Sycon*, canal system of sponges
2. T.S. *Hydra* (testis and ovary region)
3. T.S. *Fasciola* (different regions)
4. T.S. *Ascaris* (male and female)
5. T.S. *Pheretima* (pharyngeal and typhlosolar regions), Setae, septal nephridia and spermathecae of *Pheretima*.
6. Trachea and mouthparts of cockroach.
7. Statocyst of *Palaemon*.
8. Glochidium larva of *Anodonta*; radula and osphradium of *Pila*.
9. T.S. Star fish (arm).



10. T.S. *Balanoglossus* (through various regions).

**(C) Preparation of the following slides:**

1. Temporary preparation of *Volvox*, *Paramecium*, Gemmules and spicules of *Sycon*; mouth parts and trachea of *Periplaneta* (cockroach).
2. Preparation of permanent stained whole mounts of *Hydra*, *Obelia*, *Sertularia*, *Plumularia* and *Bougainvillea*.
3. Preparation of mouth parts of Mosquito, House fly and cockroach.

**(D) Study of Internal Anatomy**

1. Computer, simulated study/ model of :
  - (i) *Earthworm* : Digestive, reproductive and nervous systems
  - (ii) *Pila* : Pallial complex, digestive and nervous system
2. Demonstration of internal anatomy of cockroach : Digestive, reproductive and nervous systems

**(E) Cell biology and Genetics:**

1. Cell division : Prepared slides of stages of mitosis and meiosis.
2. Salivary gland and polytene chromosomes of *Drosophila*/ *Chironomus*.
3. Temporary squash preparations of onion root tip / grasshopper testis for the study of mitosis using acetocarmine stain.

**B.SC. PART – I**  
**GUIDELINES / INSTRUCTIONS FOR PRACTICAL (PAPER – III)**

Max. Marks : 100

Time allowed : 6 Hours  
(2 Sessions M&E)

**Note : Following exercises will be set in the examination as per marks assigned for each.**

<b>Exercise</b>	<b>Marks allotted</b>
1. Internal Anatomy – One (Labeled diagram)	12
2. Permanent Slide Preparation - one (Staining, identification, sketch)	06
3. Museum specimens – eight (identification and classification)	24 (8x3)
4. Ecological note – One specimen	05
5. Permanent slides – Two (identification with reasons)	08 (2x4)
6. Preparation of chromosome slide (root tip / grasshopper testis)	10
7. Invertebrate survey and report	10 (5+5)
8. Practical record and slides	10
9. Viva-voce	15

***Scheme of B.Sc. II***

<b><i>Semester-III</i></b>					
<b>Sr. No.</b>		<b>Paper</b>	<b>Marks</b>	<b>Exam. Duration</b>	
			Internal Assessment*	External Marks	
1.	Paper-I	Life and Diversity of Chordates-I	10	40	3 hrs.
2.	Paper-II	Mammalian Physiology-I	10	40	3 hrs.
<b><i>Semester-IV</i></b>					
3.	Paper-I	Life and Diversity of Chordates-II	10	40	3 hrs.
4.	Paper-II	Mammalian Physiology-II	10	40	3 hrs.
5.	Paper-III	Practical	--	100	6 hrs. (Two session) Morning & Evening
<b>Total Semester III &amp; IV</b>			40	260	

**\* 10 Percent on the basis of two hand written assignments, 5 percent on the basis of one class test and 5 percent on the basis of attendance of the student.**

# SYLLABUS

## B.Sc. Part-II (Semester III & IV)

### SEMESTER III

#### Paper-I : Life and Diversity of Chordates - I

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

**Note:** *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question.*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

#### SECTION-A

Functional morphology of the types included with special emphasis on the adaptations to their modes of life and environment. General characters and classification of all phyla upto orders with examples emphasizing their biodiversity, economic importance and conservation measures where required.

1. **Chordates**: Origin and Evolutionary tree.
2. **Protochordates**: Systematic position, distribution, ecology, morphology and affinities  
Urochordata *Herdmania* - type study  
Cephalochordata, *Amphioxus* – type study

#### SECTION-B

3. **Cyclostomes**: Type study of *Petromyzon*.
4. **Pisces**: Scales & Fins, Parental care in fishes, fish migration.  
Types study of Labeo

## SEMESTER – III

### **Paper-II : Mammalian Physiology-I**

**External Marks : 40**

**Internal Assessment: 10**

**Time allowed : 3 Hours**

**Note:** *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

#### SECTION-A

1. Introduction, Classification, Structure, function and general properties of proteins, carbohydrates and lipids.
2. Nomenclature, Classification and mechanisms of enzyme action.
3. Transport through biomembranes (Active and Passive), buffers

#### SECTION-B

4. **Nutrition:** Nutritional components; Carbohydrates, fats, lipids, Vitamins and Minerals. Types of nutrition & feeding, Digestion of dietary constituents, viz. lipids, proteins, carbohydrates & nucleic acids; symbiotic digestion. Absorption of nutrients & assimilation; control of enzyme secretion.
5. **Muscles:** Types of muscles, ultra-structure of skeletal muscle. Bio-chemical and physical events during muscle contraction; single muscle twitch, tetanus, muscle fatigue muscle, tone, oxygen debt., Cori's cycle, single unit smooth muscles, their physical and functional properties.
6. **Bones:** Structure and types, classification, bone growth and resorption, effect of ageing on Skeletal system and bone disorders.

## SEMESTER – IV

### **Paper-I : Life and Diversity of Chordates - II**

**External Marks : 40**

**Internal Assessment: 10**

**Time allowed : 3 Hours**

**Note:** *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

#### SECTION-A

1. **Amphibia:** Origin, Evolutionary tree. Type study of frog (*Rana tigrina*), Parental Care in Amphibia
2. **Reptilia:** Type study of Lizard (*Hemidactylus*), Origin, Evolutionary tree. Extinct reptiles; Poisonous and non-poisonous snakes; Poison apparatus in snakes.

#### SECTION-B

3. **Aves:** Type study of Pigeon (*Columba livia*); Flight adaptation, Principles of aerodynamics in Bird flight, migration in birds.
4. **Mammals:** Classification, type study of Rat; Adaptive radiations of mammals dentition.

**Note:** Type study includes detailed study of various systems of the animal.

## SEMESTER – IV

### **Paper-II : Mammalian Physiology-II**

**External Marks : 40**

**Internal Assessment: 10**

**Time allowed : 3 Hours**

**Note:** *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

#### SECTION-A

1. **Circulation:** Origin, conduction and regulation of heart beat, cardiac cycle, electrocardiogram, cardiac output, fluid pressure and flow pressure in closed and open circulatory system; Composition and functions of blood & lymph; Mechanism of coagulation of blood, coagulation factors; anticoagulants, haemopoiesis.
2. **Respiration:** Exchange of respiratory gases, transport of gases, lung air volumes, oxygen dissociation curve of hemoglobin, Bohr's effect, Haburger's phenomenon (Chloride shift), control / regulation of respiration.
3. **Excretion:** Patterns of excretory products viz. Amonotelic, ureotelic uricotelic, ornithine cycle (Kreb's – Henseleit cycle) for urea formation in liver. Urine formation, counter-current mechanism of urine concentration, osmoregulation, micturition.

#### SECTION-B

4. **Neural Integration:** Nature, origin and propagation of nerve impulse alongwith meddullated & non-medullated nerve fibre, conduction of nerve impulse across synapse.
5. **Chemical integration of Endocrinology:** Structure and mechanism of hormone action; physiology of hypothalamus, pituitary, thyroid, parathyroid, adrenal, pancreas and gonads.
6. **Reproduction:** Spermatogenesis, Capacitation of spermatozoa, ovulation, formation of corpus luteum, oestrous-anoestrous cycle, Menstrual cycle in human; fertilization, implantation and gestation.

## B.Sc. Part-II

### Paper-III : PRACTICAL

Max. Marks : 100  
Time allowed : 6 Hours  
(2 Sessions M&E)

1. Classification upto orders, habit, habitats, external characters and economic importance (if any) of the following animals:-

Protochordata : *Molgula, Hetryllus, Pyrosoma, Doliolum, Olikopleura, and Amphioxus.*

Cyclostomata : *Myxine, Petromyzon and Ammocoetus larva.*

Chondrichthyes : *Zygaena, Pristis, Narcine (electric ray), Trygon, Rhinobatus, Raja and Chimaera.*

Osteichthyes : *Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus Exocoetus, Anabas, Diodon, Ostracion, Tetradon, Echinus, Lophius, Solea and Polypterus. Any of the Lung Fishes.*

Amphibia : *Necturus, Proteus, Amphiuma, Salamandra, Amblystoma, Axolotie larva, Alytes, Bufo, Rana.*

Reptilia : *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx, Ptyas, Bungarus, Naja, Hydruis, Viper, Crocodilus, Gavialis, Chelone (Turtle) and Testudo (Tortoise).*

Aves : *Casuarius, Arden, Anas, Milvus, Pavo, Eudynamis, Tyto and Alcedo, Halcyon*

Mammalia : *Ornithorhynchus, Echidna, Didelphis, Macropus, Loris, Macaque, Hystrix, Funambulus, Telix, Panthera, Canis, Herpestes, Capra, Pteropus.*

2. Internal anatomy of the following animals:

- (i) Computer simulated model/study of :

(a) *Herdmania* : General anatomy

(b) *Rat* : Digestive, arterial, venous and urinogenital systems.

(c) *Hemidactylus* : Digestive, arterial, venous and urinogenital systems

- (ii) Demonstration & Study of Internal Anatomy of locally available fish (*Labeo*). Digestive and reproductive systems: cranial nerves, Ear ossicle

3. Study of the skeleton of *Scoliodon, Labeo, Rana* (Frog), *Varanus*, Pigeon or Gallus and *Orcyctolagus*/rat, Palates of birds, skulls of dog & rabbit.

4. Study of the following prepared slides:

Tornaria larva, T.S. *Amphioxus* (through different regions). *Oikopleura*, Histology of rat (compound tissues), different types of scales.



5. Make permanent stained preparations of the following:  
*Salpa*, Spicules, and Pharynx of *Herdmania*, *Amphioxus*, Cycloid scales, Zoological excursion  
and its report is compulsory in the practical examination.

#### **PHYSIOLOGY PRACTICALS:**

1. Qualitative tests for identification of simple sugars, disaccharides and polysaccharides.
2. Study of human salivary amylase activity: Effect of temperature, pH, Concentration.
3. Estimation of abnormal constituents of urine (Albumin, sugar, ketonebodies).
4. Use of Kymograph unit & respirometer.
5. Haematein crystal preparation.
6. Estimation of Hb.
7. DLC of Man/RBC count/WBC count.

## B.Sc. Part-II

### Paper-III :

#### Guidelines/instructions for practical

Max. Marks : 100

Time allowed : 6 Hours  
(2 Sessions M&E)

Note : Following exercises will be set in the examination as per marks assigned for each.

- |     |  |   |    |
|-----|--|---|----|
| 1.  | Internal Anatomy – One<br>(exposition, labeled diagram)        | : | 12 |
| 2.  | Temporary Mountign – One<br>(staining, identification, sketch) | : | 06 |
| 3.  | Museum specimens – five<br>(identification, classification)    | : | 15 |
| 4.  | Ecological note – one specimen                                 | : | 05 |
| 5.  | Permanent slides – Three<br>(identification with reasons)      | : | 09 |
| 6.  | Bone – Two pieces<br>(Identification & sketch)                 | : | 10 |
| 7.  | Physiology (Two exercises)                                     | : | 10 |
| 8.  | Field excursion and report                                     | : | 08 |
| 9.  | Practical record & slides                                      | : | 10 |
| 10. | Viva-voce  | : | 15 |

**Scheme of B.Sc. III (Zoology)**

<b>Semester-V</b>					
<b>Sr. No.</b>		<b>Paper</b>	<b>Marks</b>		<b>Exam. Duration</b>
			Internal Assessment*	External Marks	
1.	Paper-I	Environmental Biology	10	40	3 hrs.
2.	Paper-II	Evolution and Developmental Biology	10	40	3 hrs.
<b>Semester-VI</b>					
3.	Paper-I	Aquaculture and Pest Management-I	10	40	3 hrs.
4.	Paper-II	Aquaculture and Pest Management-II	10	40	3 hrs.
5.	Paper-III	Practical	--	100	6 hrs. (Two session) Morning & Evening
<b>Total Semester V &amp; VI</b>			40	260	

**\* 10 Percent on the basis of two hand written assignments, 5 percent on the basis of one class test and 5 percent on the basis of attendance of the student.**

**SYLLABUS**  
**B.Sc. Part-III (Semester V & VI)**  
**SEMESTER - V**

**Paper-I : Environmental Biology**

**External Marks : 40**

**Internal Assessment: 10**

**Time allowed : 3 Hours**

*Note: Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question.*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

**SECTION-A**

1. **Basic concepts of ecology:** Definition, signification. Concepts of habitat and ecological niche.
2. **Factors affecting environment:** Abiotic factors (light-intensity, quality and duration), temperature, humidity, topography; edaphic factors; Biotic factors.
3. Introduction to major ecosystem of the world.
4. **Ecosystem:** Concept, components, properties and functions; Ecological energetics and energy flow-food chain, food web, trophic structure; ecological pyramids concept of productivity.
5. **Biogeochemical cycles:** Concept, reservoir pool, gaseous cycles and sedimentary cycles.

**SECTION-B**

6. **Population:** Growth and regulation.
7. Concept of biodiversity and conservation of natural resources.
8. Migration in fishes and birds.
9. Parental care in animals.
10. **Population interactions:** Competition, predation, parasitism, commensalisms and mutualism.
11. **Environmental Pollution:** Air, water, soil and management strategies.

## SEMESTER – V

### **Paper-II : Evolution and Developmental Biology**

**External Marks : 40**

**Internal Assessment: 10**

**Time allowed : 3 Hours**

**Note:** *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

#### SECTION-A

1. Origin of life.
2. Concept and evidences of organic evolution.
3. Theories of organic evolution.
4. Concept of micro, macro-and mega-evolution.
5. Concept of species
6. Phylogeny of horse.
7. Evolution of man.

#### SECTION-B

8. Historical perspectives, aims and scope of developmental biology.
9. Generalized structure of mammalian ovum & sperm, spermatogenesis and Oogenesis, fertilization, parthenogenesis, different types of eggs and patterns of cleavage.
10. Process of blastulation and fate-map construction in frog and chick.
11. Gastrulation in frog and chick upto the formation of three germinal layers.
12. Elementary knowledge of primary organizers.
13. Elementary knowledge of extra embryonic membranes.
14. Concepts of competence, determination and differentiation.
15. Concept of regeneration.

## SEMESTER – VI

### **Paper-I : Aquaculture and Pest Management-I**

**External Marks : 40**

**Internal Assessment: 10**

**Time allowed : 3 Hours**

**Note:** *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

#### SECTION-A

1. **Introduction to world fisheries:** Production, utilization and demand.
2. **Fresh Water fishes of India:** River system, reservoir, pond, tank fisheries; captive and culture fisheries, cold water fisheries.
3. Fishing crafts and gears.
4. Fin fishes, Crustaceans, Molluscs and their culture.

#### SECTION-B

Study of important insect pests of crops and vegetables:

5. **Sugercane:**
  - (a) Sugercane leaf-hopper (*Pyrilla perpusilla*)
  - (b) Sugercane Whitefly (*Aleurolobus barodensis*)
  - (c) Sugercane top borer (*Sciropophaga nivella*)
  - (d) Sugercane root borer (*Emmalocera depresella*)
  - (e) Gurdaspur borer (*Bissetia steniellus*)

With their systematic position, habits and nature of damage cause. Life cycle and control of *Pyrilla perpusilla* only.

6. **Cotton:**
  - (a) Pink bollworm (*Pestiphora gossypifolia*)
  - (b) Red cotton bug (*Dysdercus Cingulatus*)
  - (c) Cotton grey weevil (*Mylocerus undecimpustulatus*)
  - (d) Cotton Jassid (*Amrasca devastans*)

With their systematic position, habits and nature of damage caused. Life cycle and control of *Pectinophora gossypiella*.

7. **Wheat:**

Wheat stem borer (*Sesamia inferens*) with its systematics position, habits, nature of damage caused. Life cycle and control.

8. **Paddy:**

- (a) Gundhi bug (*Leptocorisa acuta*)
- (b) Rice grasshopper (*Hieroglyphus banian*)
- (c) Rice stem borer (*Scirpophaga incertullus*)
- (d) Rice Hispa (*Diceladispera armigera*)

With their systematic position, habits and nature of damage caused. Life cycle and control of *Leptocorisa acuta*.

9. **Vegetables:**

- (a) *Raphidopalpa faveicollis* – The Red pumpkin beetle.
- (b) *Dacus cucurbitas* – The pumpkin fruit fly.
- (c) *Tetranychus tecarius* – The vegetable mite.
- (d) *Epilachna* – The Hadda beetle

Their systematics position, habits and nature of damage caused. Life cycle and control of *Aulacophora faveicollis*.

## SEMESTER – VI

### Paper-II : Aquaculture and Pest Management-II

**External Marks : 40**

**Internal Assessment: 10**

**Time allowed : 3 Hours**

**Note:** *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

#### SECTION-A

1. **Seed production:** Natural seed resources – its assessment, collection, Hatchery production
2. **Nutrition:** Sources of food (Natural, Artificial) and feed composition (Calorie and Chemical ingredients).
3. **Field Culture:** Ponds-running water, recycled water, cage, culture; poly culture.
4. **Culture technology:** Biotechnology, gene manipulation and cryopreservation of gametes.

#### SECTION-B

5. **Stored grains:**
  - (a) Pulse beetle (*Callosobruchus maculatus*)
  - (b) Rice weevil (*Sitophilus oryzae*)
  - (c) Wheat weevil (*Trogoderma granarium*)
  - (d) Rust Red Flour beetles (*Tribolium castaneum*)
  - (e) Lesser grain borer (*Rhizopertha dominica*)
  - (f) Grain & Flour moth (*Sitotroga cerealella*)

Their systematic position, habits and nature of damage caused. Life cycle and control of *Trogoderma granarium*.

6. **Insect control:** Biological control, its history, requirement and precautions and feasibility of biological agents for control.
7. **Chemical control:** History, Categories of pesticides. Important pesticides from each category to pests against which they can be used. Insect repellants and attractants.
8. Integrated pest management.
9. Important bird and rodent pests of agriculture & their management.

10.



## B.Sc. Part-III

### Paper-III : PRACTICAL

Max. Marks : 100  
Time allowed : 6 Hours  
(2 Session M&E)

1. External morphology, identification marks, nature of damage and host of the following pests:-
  - (i) **Sugarcane** : Sugarcane leaf-hopper, Sugarcane whitefly, Sugarcane top borer, Sugarcane root borer, Gurdaspur borer (any two).
  - (ii) **Cotton**: Red Cotton bug
  - (iii) **Wheat** : Wheat stem borer
  - (iv) **Paddy** : Gundhi bug, Rice grasshopper, Rice stem borer, Rice hispa (any one).
  - (v) **Vegetables**: *Aulocophora faveicollis*, *Dacus cucurbitas*, *Tetranychus tecarius*, *Epilachna* (any three).
  - (vi) **Pests of stored grains**: Pulse beetle, Rice weevil, Grain & Flour moth, Rust-red flour beetle, lessergrain borer (any three).
2. Stages of life history of silk moth and honey bee.
3. Identification of *Catle*, *Labeo rohita*, *L. calbasu*, *Cirrhius*, *mrigala* *Puntius sarana*, *Channa punctatus*, *C. marulius*, *C. stariatus*, *Trichogaster fasciata*, *Mystus seenghala*, *M. cavasius*, *M. tengra*, *Callichrous pabola*, *C. bimaculatus*, *Wallago attu*, *Prawns*, *Crabs*, *Lobsters*, *Calms*, *Mussels & Oysters*.
4. Chemical analysis of pond water and soil for pH, dissolved oxygen, free CO<sub>2</sub> nitrates, phosphates and chlorides.
5. A study of the slides of fish parasites.
6. A study of the different types of nets, e.g., cast net, gill net, drift net and drag net.
7. A visit to lake/reservoir/fish breeding centre.
8. Adaptative modifications in feet and breaks of birds.
9. Preparation of permanent/temporary slides of developmental stages of frog/mosquito.
10. Study of permanent slides of WM of chick embryo (13-18h, 24-36h, 36-48h, 48-72h).
11. Window preparation and identification of stages of development in chick egg.
12. **Histology**: Preparation of permanent histological slides of testis, ovary, kidney, intestine, live of rat (H and E staining).

## B.Sc. Part-III

### Guidelines/instructions for practical (Paper-III)

Max. Marks : 100  
Time allowed : 6 Hours  
(2 Sessions M&E)

1. Chemical analysis of water/soil : 10 marks
2. Identification and Classification of specimens (Eight) : 16 marks
3. Ecological note on economically important specimen (two) : 10 marks
4. Identification of histological and embryological slides with Reasons of identification (Two): feet and beaks of birds : 8 marks
5. Identification with reason feet/beaks of birds : 3 marks
6. Permanent preparation of histological slides : 18 marks (6,6)  
(a) Section cutting and stretching  
(b) Staining, mounting, (c) identification & sketch
7. Field Report : 10 marks
8. Practical note book : 10 marks
9. Viva-voce : 15 marks

Note: Field report to be submitted alongwith answer books.

Practical exams for the  
**PAPER – III PRACTICALS**

**B.Sc-1st year 2<sup>nd</sup> semester April-May 2021**

**Session 2020-21**

**Max. Marks -80+20\***

**Time- 6 Hrs. (2 Sessions)**

Serial Number	Roll No	Attendance
1	2010377701	Pass
2	2010377703	Pass
3	2010377706	Pass
4	2010377707	Pass
5	2010377711	Pass
6	2010377714	Pass
7	2010377715	Pass
8	2010377725	Pass
9	2010377729	Pass
10	2010377737	Pass
11	2010377738	Pass
12	2010377739	Absent

**PAPER – III PRACTICALS**

**B.Sc 4th semester April-May 2019**

**Session 2020-21**

**Max. Marks -80+20\***

**Time- 6 Hrs. (2 Sessions)**

Serial Number	Roll No	Attendance
1	180037737	Pass
2	191038312	Pass
3	191038314	Pass
4	191038316	Pass
5	191038318	Pass
6	191038323	Pass
7	191038326	Pass
8	191038338	Pass
9	191038345	Pass

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Off. Principal  
Indira Gandhi National College  
LADWA Dist. Kurukshetra

**PAPER – III PRACTICALS**  
**B.Sc 6th semester April-May 2021**

Session 2020-21  
Max. Marks -80+20\*

**Time- 6 Hrs. (2 Sessions)**

Serial Number	Roll No	Attendance
1	170340503	Pass
2	180037736	Pass

PS-1

  
**Offg. Principal**  
**Indira Gandhi National College**  
**LADWA Dist, Kurukshetra**