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

### Scheme of B.Sc. I

#### Semester-I

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Paper</th>
<th>Marks</th>
<th>Exam. Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Internal Assessment*</td>
<td>External Marks</td>
</tr>
<tr>
<td>1.</td>
<td>Paper-I</td>
<td>Life and Diversity from Protozoa to Porifera and Cell Biology-I</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Paper-II</td>
<td>Life and Diversity from Coelentrata to Helminthes and Cell Biology-II</td>
<td>10</td>
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</table>

#### Semester-II

<table>
<thead>
<tr>
<th>Sr. No.</th>
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<td>External Marks</td>
</tr>
<tr>
<td>3.</td>
<td>Paper-I</td>
<td>Life and Diversity from Annelida to Arthropoda and Genetics-I</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Paper-II</td>
<td>Life and Diversity from Molluska to Hemichordata and Genetics-II</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Paper-III</td>
<td>Practical</td>
<td>--</td>
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</table>

**Total Semester I & II**

<p>| | | |</p>
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<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>40</td>
<td>260</td>
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### Scheme of B.Sc. II

#### Semester-III

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Paper</th>
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<td>Internal Assessment*</td>
<td>External Marks</td>
</tr>
<tr>
<td>1.</td>
<td>Paper-I</td>
<td>Life and Diversity of Chordates-I</td>
<td>10</td>
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<tr>
<td>2.</td>
<td>Paper-II</td>
<td>Mammalian Physiology-I</td>
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</table>

#### Semester-IV

<table>
<thead>
<tr>
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<td></td>
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<td>External Marks</td>
</tr>
<tr>
<td>3.</td>
<td>Paper-I</td>
<td>Life and Diversity of Chordates-II</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Paper-II</td>
<td>Mammalian Physiology-II</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Paper-III</td>
<td>Practical</td>
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### Scheme of B.Sc. III

**Semester-V**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Paper</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Paper-I</td>
<td>Environmental Biology</td>
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**Semester-VI**

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<thead>
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<th>Paper</th>
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<th>Exam. Duration</th>
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<tbody>
<tr>
<td>5.</td>
<td>Paper-III</td>
<td>Practical</td>
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</table>

<table>
<thead>
<tr>
<th>Total Semester V &amp; VI</th>
<th>40</th>
<th>260</th>
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</thead>
</table>

**Grand Total Semester I – VI** | 900 |

*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

### Semester-I

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Paper-I</td>
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<td>40</td>
</tr>
<tr>
<td></td>
<td>Life and</td>
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<tr>
<td></td>
<td>Diversity</td>
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<tr>
<td></td>
<td>from</td>
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</tr>
<tr>
<td></td>
<td>Protozoa to</td>
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<tr>
<td></td>
<td>Porifera</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Cell</td>
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</tr>
<tr>
<td></td>
<td>Biology-I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Paper-II</td>
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<td>40</td>
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<tr>
<td></td>
<td>from</td>
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<tr>
<td></td>
<td>Coelentrata</td>
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<td></td>
<td>to Helminthes</td>
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<td></td>
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<tr>
<td></td>
<td>and Cell</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biology-II</td>
<td></td>
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</tr>
</tbody>
</table>

### Semester-II

| 3.      | Paper-I     | 10    | 40             |
|         | Life and    |       | 3 hrs.         |
|         | Diversity   |       |                |
|         | from        |       |                |
|         | Annelida to |       |                |
|         | Arthropoda  |       |                |
|         | and Genetics-I |     |                |
| 4.      | Paper-II    | 10    | 40             |
|         | Life and    |       | 3 hrs.         |
|         | Diversity   |       |                |
|         | from        |       |                |
|         | Molluaska to|       |                |
|         | Hemichordata|       |                |
|         | and Genetics-II |   |                |
| 5.      | Paper-III   | --    | 100            |
|         | Practical   |       | 6 hrs. (Two   |
|         |             |       | session)       |
|         |             |       | Morning &     |
|         |             |       | Evening        |

* 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.

Total Semester I & II

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<tbody>
<tr>
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<td>260</td>
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</tbody>
</table>
SYLLABUS

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

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.
3. Endoplasmic reticulum (ER) : types, role of ER in protein synthesis and transportation 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.
9. Cilia and Flagella

10.
SYLLABUS

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

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) converting 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 pathogenesity 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)
4. An elementary idea of cellular basis of Immunity.
SYLLABUS

Life and Diversity from Annelida to Arthropoda & Genetics - I

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

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 – Enchinodermata :
   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

5. Inborn errors of metabolism (Alcaptonuria, Phenylketonuria, Albinism, sickle-cell anaemia).
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 (autoploidy, 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 Parmecium; permanent prepared slides: Amoeba, Euglena, Trypanosoma, Noctiluca, Eimeria, Parmecium (binary fission and conjugation), Opalina, Verticella, Balantidiium, Nyctotherus, radiolarian and formaniferan 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. Playhelminthes
   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 (beg bug), Pediculus (body louse), Millipedes, Scolopendra (centipedes), Palamnnaeus (scorpion), Aranea (spider), Limulus (king crab)

8. Mollusca
   Specimens: Mytilus, Ostrea, Cardium, Pholas, Solen (razor Fish), Pecten, Holiotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus (complete and T.S.), Chiton and Dentalium

9. Echinodermata
   Specimens: Asterias, Echinus, Cucumara, Ophiوثrix, Antedon and Asterophyton

10. Hemichordata
    Balinglossus

(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. Pheterima (pharyngeal and typhlosolar regions), Setae, septal nephridia and spermathecae of Pheterima.
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 *Volvos, Paramecium, Gemmules* and spicules of *Sycon*; mouth parts and trachea of *Periplanata* (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:**

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.
ANNEXURE-IV

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.

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

### Semester-III

<table>
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<td>1.</td>
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<td>2.</td>
<td>Paper-II</td>
<td>Mammalian Physiology-I</td>
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### Semester-IV

| 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 |

**Total Semester III & IV**

|                | 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
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


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	\quad Time allowed : 3 Hours

Note: \textit{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.

\textbf{SECTION-A}

1. \textbf{Amphibia}: Origin, Evolutionary tree. Type study of frog \textit{(Rana tigrina)}, Parental Care in Amphibia

2. \textbf{Reptilia}: Type study of Lizard (Hemitactylus), Origin, Evolutionary tree. Extinct reptiles; Poisonous and non-poisonous snakes; Poison apparatus in snakes.

\textbf{SECTION-B}

3. \textbf{Aves}: Type study of Pigeon \textit{(Columba livia)}; Flight adaptation, Principles of aerodynamics in Bird flight, migration in birds.

4. \textbf{Mammals}: Classification, type study of Rat; Adaptive radiations of mammals dentition.

\textbf{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, haempoiesis.

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, ureotlic uricotelic, ornithine cycle (Kreb’s – Henseleit cycle) for urea formation in liver. Urine formation, counter-current mechanism of urine concentration, osmoregulation, micturition.

SECTION-B


5. **Chemical integration of Endocrinology**: Structure and mechanism of hormone action; physiology of hypothalamus, pituitary, thyroid, parathyroid, adrenal, pancreas and gonads.

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 : *Molpula, Hetryllus, Pyrosoma, Doliolum, Oikopleura,* and *Amphioxus.*

Cyclostomata : *Myxine, Petromyzon* and *Ammocoetus larva.*

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


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

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

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

Mammalia : *Ornithorphynchus, Echidna, Didelphis, Macropus, Loris, Macaque, Hystrix, Funambulus, Telix, Panthera, Canis, Herpestes, Capra,* and *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 *Orcytolagus/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.
4. Use of Kymograph unit & respirometer.
5. Haematein crystal preparation.
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
   (exposition, labeled diagram) : 12

2. Temporary Mountign – One
   (staining, identification, sketch) : 06

3. Museum specimens – five
   (identification, classification) : 15

4. Ecological note – one specimen
   : 05

5. Permanent slides – Three
   (identification with reasons) : 09

6. Bone – Two pieces
   (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)

#### Semester-V

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Paper</th>
<th>Marks</th>
<th>Exam. Duration</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Paper-I Environmental Biology</td>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>

#### Semester-VI

| 5.      | Paper-III Practical                                       | --    | 100            | 6 hrs. (Two session) Morning & Evening |

Total Semester V & VI | 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

2. Factors affecting environment: Abiotic factors (light-intensity, quality and duration), temperature, humidity, topography; edaphic factors; Biotic factors.
3. Introduction to major ecosystems 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.

SECTION-B

7. Concept of biodiversity and conservation of natural resources.
8. Migration in fishes and birds.
9. Parental care in animals.
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

2. Concept and evidences of organic evolution.
3. Theories of organic evolution.
4. Concept of micro, macro-and mega-evolution.
5. Concept of species

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.
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.
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. Sugarcane:
   (a) Sugarcane leaf-hopper (*Pyrilla perpusilla*)
   (b) Sugarcane Whitefly (*Aleurolobus barodensis*)
   (c) Sugarcane top borer (*Scirophophaga nivella*)
   (d) Sugarcane 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 (*Pestinophora gossypfolla*)
   (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 *Pectinophore 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 (*Diceladispa 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*. 
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.
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, Lesser grain borer (any three).

2. Stages of life history of silk moth and honey bee.


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.


10. Study of permanent slides of WM of chick embryo (13-18h, 24-36h, 36-48h, 48-72h).


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  
   (a) Section cutting and stretching  
   (b) Staining, mounting, (c) identification & sketch : 18 marks (6,6)
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.