

**SCHEME OF EXAMINATION FOR B.Sc. (ZOOLOGY) SEMESTER SYSTEM**  
**w.e.f. Session 2015-16**  
**B.Sc. I (2015-2016)**

| <b>Semester I</b>                |            |  |  |            |                                    |                       |
|----------------------------------|------------|--|--|------------|------------------------------------|-----------------------|
| Sr. No.                          | Paper code | Nomenclature                                     |  | Marks+IA   | Periods / week                     | Exam. Duration        |
| 1.                               | 1.1        | Life and Diversity from Protozoa to Helminthes   |  | 40+10      | 4                                  | 3 hrs.                |
| 2.                               | 1.2        | Cell Biology                                     |  | 40+10      | 4                                  | 3 hrs.                |
| 3.                               |            | Practical (1.1 & 1.2)                            |  |            | 6&6 (6 periods per group per week) |                       |
| <b>Semester II</b>               |            |  |  |            |                                    |                       |
| 4.                               | 2.1        | Life and Diversity from Annelida to Hemichordata |  | 40+10      | 4                                  | 3 hrs.                |
| 5.                               | 2.2        | Genetics   |  | 40+10      | 4                                  | 3 hrs.                |
| 6.                               |            | Practical (2.1 & 2.2)                            |  | -          | 6&6 (6 periods per group per week) | -                     |
| 7.                               | P-101      | Practical (1.1 to 2.2)                           |  | 100        |                                    | 6 Hrs. (In 2 session) |
| <b>Total Semester I &amp; II</b> |            |  |  | <b>300</b> |                                    |                       |

**B.Sc. II (2016-2017)**

| <b>Semester III</b>                |            |                                      |  |              |                                    |                        |
|------------------------------------|------------|--------------------------------------|--|--------------|------------------------------------|------------------------|
| Sr. No.                            | Paper code | Nomenclature                         |  | Marks+IA     | Periods / week                     | Time                   |
| 1.                                 | 3.1        | Life and Diversity of Chordates – I  |  | 40+10        | 4                                  | 3 hrs.                 |
| 2.                                 | 3.2        | Mammalian Physiology – I             |  | 40+10        | 4                                  | 3 hrs.                 |
| 3.                                 |            | Practical (3.1 & 3.2)                |  |              | 6&6 (6 periods per group per week) |                        |
| 4.                                 | 3.3        | <b>Disaster Management</b>           |  | <b>40+10</b> | <b>5</b>                           | <b>3 hrs.</b>          |
| <b>Semester IV</b>                 |            |                                      |  |              |                                    |                        |
| 5.                                 | 4.1        | Life and Diversity of Chordates – II |  | 40+10        | 4                                  | 3 hrs.                 |
| 6.                                 | 4.2        | Mammalian Physiology – II            |  | 40+10        | 4                                  | 3 hrs.                 |
| 7.                                 |            | Practical (4.1 & 4.2)                |  | -            | 6&6 (6 periods per group per week) |                        |
| 8.                                 | P-201      | Practical (3.1 to 4.2)               |  | 100          | -                                  | 12 Hrs. (in 2 session) |
| <b>Total Semester III &amp; IV</b> |            |                                      |  | <b>300</b>   |                                    |                        |

**B.Sc. III (2017-2018)**

| <b>Semester V</b>                  |            |                        |  |            |                                    |                        |
|------------------------------------|------------|------------------------|--|------------|------------------------------------|------------------------|
| Sr. No.                            | Paper code | Nomenclature           |  | Marks+IA   | Periods / week                     | Time                   |
| 1.                                 | 5.1        | Fish and fisheries     |  | 40+10      | 4                                  | 3 hrs.                 |
| 2.                                 | 5.2        | Ecology & Evolution    |  | 40+10      | 4                                  | 3 hrs.                 |
| 3.                                 |            | Practical 5.1&5.2      |  | -          | 6&6 (6 periods per group per week) | -                      |
| <b>Semester VI</b>                 |            |                        |  |            |                                    |                        |
| 4.                                 | 6.1        | Entomology             |  | 40+10      | 4                                  | 3 hrs.                 |
| 5.                                 | 6.2        | Developmental Biology  |  | 40+10      | 4                                  | 3 hrs.                 |
| 6.                                 |            | Practical (6.1&6.2)    |  | -          | 6&6 (6 periods per group per week) | -                      |
| 7.                                 | P-301      | Practical (5.1 to 6.2) |  | 100        | -                                  | 12 Hrs. (in 2 session) |
| <b>Total Semester V &amp; VI</b>   |            |                        |  | <b>300</b> |                                    |                        |
| <b>Grand Total Semester I – VI</b> |            |                        |  | <b>900</b> |                                    |                        |

Note: -

There will be an internal assessment, in each theory paper, inclusive of 20% of total marks i.e. 40+10

#1Period=45 minutes

Practicals will be held throughout the year and the examination will be held annually at the end of even semester. Disaster management paper of 50 lectures of 45 minutes each as per UGC guidelines (syllabus available on UGC website) & shall be qualifying in nature.

**SYLLABUS (B.SC.: - ZOOLOGY)**  
**W.E.F. SESSION 2015-16**  
**B. SC. SEMESTER - I (THEORY)**  
**PAPER – 1.1**  
**LIFE AND DIVERSITY FROM PROTOZOA TO HELMINTHES**

**Max Marks: 40+10 (Internal assessment)**

**Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 8 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

**UNIT-1**

**Phylum- 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*.

**UNIT-II**

**Phylum- 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

**UNIT-III**

**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

**UNIT-IV**

**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*.

**B. SC. SEMESTER II**  
**PAPER- 1.2**  
**CELL BIOLOGY**

**Max Marks: 40+10 (Internal assessment)**

**Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 8 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

**UNIT-I**

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. Goigi complex: Structure, Associated enzymes and role of golgi-complex in animal cell.

**UNIT-II**

1. Ribosomes: Types, biogenesis and role in protein synthesis.
2. Lysosomes: Structure, enzyme and their role; polymorphism
3. Mitochondria: Mitochondrial DNA; as semiautonomous body, biogenesis, mitochondrial enzymes ( only names), role of mitochondria.
4. Cytoskeleton: Microtubules, microfilaments, centriole and basal body.  
5 Cilia and Flagella

**UNIT-III**

1. Ultrastructure and functions of Nucleus: Nuclear membrane, nuclear lamina, nucleolus, fine structure of chromosomes, nucleosome concept and role of histones,
2. Euchromatin and heterochromatin, lampbrush chromosomes and polytene chromosomes.

**UNIT-IV**

1. Mitosis and Meiosis (Cell reproduction)
2. Brief account of causes of cancer.
3. An elementary idea of cellular basis of Immunity.

**B.SC. SEMESTER - II**  
**PAPER – 2.1**  
**LIFE AND DIVERSITY OF ANNELIDA TO HEMICHORDATA**

**Max Marks: 40+10 (Internal assessment)**

**Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 8 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

**UNIT-I**

**Phylum - Annelida:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance of Annelida
- iii) Type study - *Pheretima* (Earthworm)
- iv) Metamerism in Annelida
- v) Trochophore larva: Affinities, evolutionary significance

**UNIT-II**

**Phylum - Arthropoda:**

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

**UNIT-III**

**Phylum - Mollusca:**

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

**UNIT-IV**

**Phylum - Echinodermata:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- iii) Type Study -*Asteries* (Sea Star)
- iv) Echinoderm larvae
- v) Aristotle's Lantern

**Phylum – Hemichordata:**

Type study: *Balanoglossus*

**SEMESTER-II**  
**PAPER – 2.2**  
**GENETICS**

**Max Marks: 40+10 (Internal assessment)**

**Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 8 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

**UNIT-I**

1. Elements of Heredity and variations.
2. The varieties of gene interactions
3. Linkage and recombination: Coupling and repulsion hypothesis, crossing-over and chiasma formation; gene mapping.

**UNIT-II**

1. 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.
2. 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.
3. Extra chromosomal and cytoplasmic inheritance:
  - i) Kappa particles in Paramecium.
  - ii) Shell coiling in snails.
  - iii) Milk factor in mice.

**UNIT-III**

1. Multiple allelism: Eye colour in *Drosophila*; A, B, O blood group in man.
2. Human genetics: Human karyotype, Chromosomal abnormalities involving autosomes and sex chromosomes, monozygotic and dizygotic twins.
3. Inborn errors of metabolism (Alcaptonuria, Phenylketonuria, Albinism, sickle-cell anaemia).

**UNIT-IV**

1. Nature and function of genetic material; Structure and type of nucleic acids; Protein synthesis. 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)
2. Applied genetics: Eugenics, eugenics and eugenics; genetic counseling, pre-natal diagnostics, DNA-finger printing, transgenic animals

## **B.Sc.-SEMESTER I PRACTICAL**

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

- I. 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 foramaniferan ooze.
2. Parazoa (Porifera)        Specimens: *Sycon*, *Grantia*, *Euplectella*, *Hyalonema*, *Spongilla*, *Euspongia*
3. Coelenterata.              Specimens: *Porpita*, *Varella*, *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*, and *Bougainvillea*, *Aurelia* (sense organs and stages of life history).
4. Platyhelminthes            Specimens: *Dugesia*, *Fasciola*, *Taenia*, *Echinococcus*,  
Permannt prepared slides: *Miracidium*, *sporocyst*, *redia*, *cercaria*, *scolex* and *proglottids*; *Taenia* (mature and gravid).
5. Aschelminthes              *Ascaris* (male & female), *Trichinella*, *Ancylostoma*, *Meloidogyne*.

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

1. L.S. and TS. *Sycon*; gemmules, spicules and sponging fibres of *Sycon*, canal system of sponges.
2. TS. *Hydra* (testis and ovary region).
3. T.S. *Fasciola* (different regions).
4. T.S. *Ascaris* (male and female).

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

1. Temporary preparation of *Volvox*, *Paramecium*, Gemmules and spicules of *Sycon*
2. Preparation of permanent stained whole mounts of *Hydra*, *Obelia*, *Sertularia*, *Plumularia* and *Bougainvillea*.
3. Pathogenic protozoans: Plasmodium, Giardia or as available
4. Pathogenic Helminthes: *Ancylostma*; *Wuchereria* or as available

### **(D) Cell biology and Genetics:**

1. Cell division: Prepared slides of stages of mitosis and meiosis.
2. Temporary squash preparations of onion root tip / grasshopper testis for the study of mitosis using acetocarmine stain.

### **(E) Project:**

1. Parasitic adaptations ( Protozoa to helminthes)
2. DNA: types, structure and its model preparation
3. Survey- Diversity of particular family/taxa in your surrounding area
4. Microscopy: principles and its significance
5. Staining techniques and their significance

### **(F) Disaster Management Project Work: (Field Work, Case Studies)**

for details see the UGC Website

## **B.Sc.-Semester II PRACTICAL**

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

1. Annelida Specimens: Pheretima, Heteronereis, Polynoe, Aphrodite, Chaetopterus, Arenicola, Tubifex and Pontobdella.
2. 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, Forficula (earwig), Dragon fly, termite queen, bug, moth, beetle, Polistes (wasp), Apis (honey bee), Bombyx (silk moth), Cimex (bedbug), Pediculus (body louse). Millipedes, Scolopendra (centipedes), Palamnaeus (scorpion), Aranea (spider), Limulus (king crab).
3. 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.
4. Echinodermata Specimens: Asterias, Echinus, Cucumara, Ophiothrix, Antedon and Asterophyton.
5. Hemichordata Balanoglossus

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

1. T.S. Pheretima (pharyngeal and typhlosolar regions), Setae, septal nephridia and spermathecae of Pheretima.
2. Trachea and mouthparts of cockroach.
3. Statocyst of Palaemon.
4. Glochidium larva of Anodonta; radula and osphradium of Pila.
5. T.S. Star fish (arm)
6. T.S. Balanoglossus (through various regions).

### **(C) Demonstration by C. D.:**

1. Mouth parts and trachea of Periplaneta (cockroach), radula of Pila; pedicellariae of Asterias.
2. setae of earthworm, and mouth parts of Honey bee, House fly and cockroach.

### **(D) Preparation of models of the different systems of the following animals:**

1. Earthworm: Digestive, reproductive and nervous systems.
2. Grasshopper/ cockroach: Digestive, reproductive and nervous systems.
3. Pila: Pallial complex, digestive and nervous systems

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

1. Salivary gland and polytene chromosomes of Drosophila/Chironomus.
2. Numericals based on three point test cross

### **(F) Project:**

1. Survey- Diversity of particular family/taxa in your surrounding area
2. Vermicomposting: Earthworm rearing and economics of the project
3. Evolutionary significance of larvae belonging to different group of invertebrates



**B.Sc. PART- I (Zoology Practical)**  
**(Semester I & II)**  
**Guidelines/Instructions for Practical Examination**  
**P-101(1.1 to 2.2)**

**Max Marks: 100**

**Time allowed: 6Hrs**

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

| S. No. | Exercise   | Marks   |         |
|--------|--|---------|---------|
|        |  | P-I     | P-II    |
| 1.     | Dissection<br>(Exposition, labelled diagram)                     | x       | 3       |
| 2.     | Temporary mounting –one<br>(Staining, identification, sketch)    | 3       | 3       |
| 3.     | Museum specimens - four<br>(identification and classification)   | 12      | 12      |
| 4.     | Ecological note –one specimen                                    | 3       | 3       |
| 5.     | Permanent slides - two<br>(Identification with reasons)          | 4       | 4       |
| 6.     | Preparation of chromosome slide<br>(root tip/grasshopper testis) | 4       | 4       |
| 7.     | Invertebrate collection and report                               | 4 (2+2) | 4 (2+2) |
| 8.     | Practical record and slides                                      | 7 (5+2) | 7 (5+2) |
| 9.     | Viva   | 5       | 5       |
| 10     | Project report   | 8       | 5       |

## **B.Sc. PART- II (Zoology Practical)**

**(Semester 3 & 4)**

### **Guidelines/Instructions for Practical Examination**

**P-201(3.1 to 4.2)**

**Max Marks: 100**

**Time allowed: 6Hrs**

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

| <b>S. No.</b> | <b>Exercise</b>  | <b>Max Marks<br/>P-III</b> | <b>Max Marks<br/>P-IV</b> |
|---------------|--|----------------------------|---------------------------|
| 1.            | Model Preparation  | 5                          | 5                         |
| 2.            | Temporary mounting –one<br>(Staining, identification, sketch)  | 2                          | Not applicable            |
| 3.            | Museum specimens - four<br>(identification and classification) | 6                          | 6                         |
| 4.            | Ecological note –one specimen                                  | 2                          | 2                         |
| 5.            | Permanent slides - two<br>(Identification with reasons)        | 3                          | 3                         |
| 6.            | Bone – identification & sketch                                 | 4                          | 4                         |
| 7.            | Physiology (two exercise)                                      | 5                          | 5                         |
| 8.            | Zoological excursion and its report                            | 6                          |                           |
| 9.            | Collection and a brief note on feathers                        |                            | 4+4                       |
| 10.           | Practical record and slides                                    | 5                          | 5                         |
| 11.           | Viva   | 4                          | 4                         |
| 12.           | Project report   | 8                          | 8                         |

## B.Sc.-Semester III PRACTICAL

**Max. Marks:50**

**Time allowed: 3Hrs**

**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, Ostraczion, Tetradon, Echinus, Lophius, Solea and Polypterus.* Any of the Lung Fishes.

**2. Preparation of models of the different systems of the following animals:**

Herdmania: General anatomy

*Labeo* (locally available fish): Digestive and reproductive systems: cranial nerves

**3. Study of the skeleton of *Scoliodon, Labeo***

**4. Study of the following prepared slides:** Tornaria larva, T.S. *Amphioxus* (through different regions). *Oikopleura*, different types of scales.

**5. Make permanent stained preparations of the following:** *Salpa*, Spicules, and Cycloid scales

**6. Zoological excursion and its report**

**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.

**Project Report:**

1. Migration in fishes
2. Ornamental fishes

**7. Disaster Management Project Work: (Field Work, Case Studies.** for details see the UGC Website

## B.Sc.-Semester IV PRACTICAL

**Max. Marks: 50**  
**3Hrs**

**Time allowed:**

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

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

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

Aves : *Casuaris, 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. **Preparation of models of the different systems of the following animals:**

*Hemidactylus* : Digestive, arterial, venous and urinogenital systems.

Rat : Digestive, arterial, venous and urinogenital systems.

3. **Study of the skeleton** of *Rana* (Frog), *Varanus*, Pigeon or Gallus and *Oryctolagus*/rat

4. **Study of the following prepared slides:** Histology of rat (compound tissues).

5. **Study and collection of Quill, Contour, Filoplume and Down feathers**

### PHYSIOLOGY PRACTICALS:

1. Estimation of abnormal constituents of urine (Albumin, sugar, ketone bodies).
2. Use of respirometer.
3. Haematein crystal preparation.
4. Estimation of Hb.
5. DLC of Man/RBC count/WBC count.

### Project Report:

1. Survey of diversity
2. Parental care
3. Dentition in mammals
4. Migration in birds

**B.Sc. PART- III  
Semester V & VI**

**Guidelines/Instructions for Practical Examination**

**P-301(5.1 to 6.2)**

**Max. Marks: 100**

**Time allowed: 6 Hrs**

| <b>SNo</b> | <b>Title of experiment</b>  | <b>MM<br/>P-V</b> | <b>MM<br/>P-VI</b> |
|------------|---|-------------------|--------------------|
| 1.         | Chemical analysis of water/soil   | 5                 | -                  |
| 2.         | Identification and Classification of specimens (Four)   | 8                 | -                  |
| 3.         | Ecological note on economically important specimen (two+two)                                      | 6                 | 6                  |
| 4.         | Evolutionary evidences  | 3                 | -                  |
| 5.         | Slides/nets etc   | 3                 | -                  |
| 6.         | Field report  | 8                 | -                  |
| 7.         | Identification and Classification of specimens (Four)   | -                 | 8                  |
| 8.         | Comment on the Life cycle of a given pest   | -                 | 5                  |
| 9.         | Identification of embryological slides with reasons of identification (Two)                       | -                 | 6                  |
| 10.        | Preparation of window in the egg  | -                 | 4                  |
| 11.        | Preparation of the permanent/temporary slides of the various development stages of frog/mosquito. | -                 | 4                  |
| 12.        | Project report  | 7                 | 7                  |
| 13.        | Practical note book   | 5                 | 5                  |
| 14.        | Viva-voce   | 5                 | 5                  |

Note: Field report/collection to be submitted during exam

**B.Sc. Part-III**  
**Semester V**  
**PRACTICAL**

1. Identification of *Catle*, *Labeo rohita*, *L. calbasu*, *Cirrhuis*, *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*.
2. Chemical analysis of pond water and soil for pH, dissolved oxygen, free CO<sub>2</sub> nitrates, phosphates and chlorides.
3. A study of the slides of fish parasites.
4. A study of the different types of nets, e.g., cast net, gill net, drift net and drags net.
5. A visit to lake/reservoir/fish breeding centre.
6. Evolutionary evidences and/or its demonstration through models/video/CD etc and preparation of working models of the different systems of the following animals:
  - Adaptive modifications in feet and beaks of birds
  - Evolutionary evidences of man and horse.
7. Project report :
  - i) Pearl culture
  - ii) Prawn culture

## B.Sc. Part-III

### Semester VI PRACTICAL

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. Preparation of permanent/temporary slides of developmental stages of frog/mosquito
3. Study of permanent slides of WM of chick embryo (13-18h, 24-36h, 36-48h, 48-72h).
4. Window preparation and identification of stages of development in chick egg.
5. Project report:
  1. Apiculture
  2. Sericulture

# Annexure II

## SCHEME OF EXAMINATION FOR B.Sc. ZOOLOGY (HONS.) SEMESTER SYSTEM w.e.f. Session 2015-16

| Semester I   |            |  |              |                            |                |  |
|--------------|------------|--|--------------|----------------------------|----------------|--|
| S.No.        | Paper Code | Nomenclature   | Marks        | Periods /week <sup>#</sup> | Exam. Duration |  |
| 1.           | 101        | Introduction to biology                                | 40+10        | 4                          | 3 hrs.         |  |
| 2.           | 102        | Biodiversity-I Non-Chordata                            | 40+10        | 4                          | 3 hrs.         |  |
| 3.           | 103        | Biodiversity-II Non-Chordata                           | 40+10        | 4                          | 3 hrs.         |  |
| 4.           | 104        | Chemistry I  | 40+10        | 3                          | 3 hrs.         |  |
| 5.           | 105        | Botany I Plant Diversity                               | 40+10        | 3                          | 3 hrs.         |  |
| 6.           | 106        | English  | 40+10        | 3                          | 3 hrs.         |  |
| 7.           | P-I        | Practical (101, 102, & 103)                            |              | 12                         |                |  |
| 8.           | P-II       | Practical (104, 105)                                   |              | 6                          |                |  |
| Semester II  |            |  |              |                            |                |  |
| 1            | 201        | Biodiversity-III Chordata                              | 40+10        | 4                          | 3 hrs.         |  |
| 2            | 202        | Biodiversity-IV Chordata                               | 40+10        | 4                          | 3 hrs.         |  |
| 3            | 203        | Animal Physiology & Histology I                        | 40+10        | 4                          | 3 hrs.         |  |
| 4            | 204        | Chemistry II   | 40+10        | 3                          | 3 hrs.         |  |
| 5            | 205        | Botany II Plant Physiology and Metabolism              | 40+10        | 3                          | 3 hrs.         |  |
| 6            | 206        | English  | 40+10        | 3                          |                |  |
| 7            | P-I        | Practical (101, 102, & 103)                            | 50+50+50     |                            | 6 hrs.         |  |
| 8            | P-II       | Practical (104, 105)                                   | 50+50        |                            | 6 hrs.         |  |
| 9            | P-III      | Practical (201-203)                                    | 50+50+50     | 12                         | 6 hrs.         |  |
| 10           | P-IV       | Practical (204, 205)                                   | 50+50        | 6                          | 6hrs.          |  |
| Semester III |            |  |              |                            |                |  |
| 1            | 301        | Cell Biology I   | 40+10        | 4                          | 3 hrs.         |  |
| 2            | 302        | Molecular Biology I                                    | 40+10        | 4                          | 3 hrs.         |  |
| 3            | 303        | Animal Physiology & Histology II                       | 40+10        | 4                          | 3 hrs.         |  |
| 4            | 304        | Chemistry III  | 40+10        | 3                          | 3 hrs.         |  |
| 5            | 305        | Botany III Plant Anatomy, Reproduction & Biotechnology | 40+10        | 3                          | 3 hrs.         |  |
| 6            | 306        | <b>Disaster Management</b>                             | <b>40+10</b> | <b>5</b>                   | <b>3 hrs.</b>  |  |
| 7            | P-V        | Practical (301-303)                                    |              | 12                         |                |  |
| 8            | P-VI       | Practical (304, 305)                                   |              | 6                          |                |  |
| Semester IV  |            |  |              |                            |                |  |
| 1            | 401        | Cell Biology II  | 40+10        | 4                          | 3 hrs.         |  |
| 2            | 402        | Molecular Biology II                                   | 40+10        | 4                          | 3 hrs.         |  |
| 3            | 403        | Animal Ecology   | 40+10        | 4                          | 3 hrs.         |  |
| 4            | 404        | Chemistry IV   | 40+10        | 3                          | 3 hrs.         |  |
| 5            | 405        | Environmental Management                               | 40+10        | 3                          | 3 hrs.         |  |
| 6            | P-V        | Practical (301-303)                                    | 50+50+50     |                            | 6hrs.          |  |
| 7            | P-VI       | Practical (304, 305)                                   | 50+50        |                            | 6 hrs.         |  |
| 8            | P-VII      | Practical (401, 402, & 403)                            | 50+50+50     | 12                         | 6hrs.          |  |
| 9            | P-VIII     | Practical (404,405)                                    | 50+50        | 6                          | 6 hrs.         |  |
| Semester V   |            |  |              |                            |                |  |
| 1            | 501        | Genetics & Genomics I                                  | 40+10        | 4                          | 3 hrs.         |  |
| 2            | 502        | Evolutionary Biology                                   | 40+10        | 4                          | 3 hrs.         |  |
| 3            | 503        | Immunology I   | 40+10        | 4                          | 3 hrs.         |  |
| 4            | 504        | Biochemistry & Metabolism                              | 40+10        | 4                          | 3 hrs.         |  |
| 5            | 505        | Computer and Biostatistics                             | 40+10        | 4                          | 3 hrs.         |  |
| 6            | P-IX       | Practical (501, 502, & 503)                            |              | 12                         |                |  |
| 7            | P-X        | Practical (504, 505)                                   |              | 6                          |                |  |
| Semester VI  |            |  |              |                            |                |  |
| 1            | 601        | Genetics & Genomics II                                 | 40+10        | 4                          | 3 hrs.         |  |
| 2            | 602        | Applied Zoology  | 40+10        | 4                          | 3 hrs.         |  |
| 3            | 603        | Immunology II  | 40+10        | 4                          | 3 hrs.         |  |
| 4            | 604        | Animal Biotechnology                                   | 40+10        | 4                          | 3 hrs.         |  |
| 5            | 605        | Developmental Biology                                  | 40+10        | 4                          | 3 hrs.         |  |



|   |       |                             |  |          |    |        |
|---|-------|-----------------------------|--|----------|----|--------|
| 6 | P-IX  | Practical (501, 502, & 503) |  | 50+50+50 |    | 6hrs.  |
| 7 | P-X   | Practical (504, 505)        |  | 50+50    |    | 6 hrs. |
| 8 | P-XI  | Practical (601, 602, & 603) |  | 50+50+50 | 12 | 6 hrs. |
| 9 | P-XII | Practical (604, 605)        |  | 50+50    | 6  | 6 hrs. |

**Grand Total of Semesters = 2200**

Note: -

- There will be an internal assessment, in each theory paper, inclusive of 20% of total marks i.e. 40+10
- #1Period=45 minutes
- Practicals will be held throughout the year and examination will be held annually.
- Disaster management paper of 50 lectures of 45 minutes each as per UGC guidelines (syllabus available on UGC website) be introduced at UG level in any one of the semester as decided by Govt. of Haryana/University authority.

# SYLLABUS

B.Sc. (Hons) Zoology

SEMESTER - I

**PAPER-102**

**BIODIVERSITY-I: NON-CHORDATA**

**Max Marks: 40+10 (Internal assessment) Time allotted: 3 Hours**

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

2. Question number I is compulsory consisting of 10 parts (1.0 mark each) covering the entire syllabus.

Answer to each part should not exceed 20 words.

2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

## **THEORY**

### **Unit I**

General characters and outline classification of different phyla

#### **Protozoa**

General characters and outline classification

Locomotion and reproduction in Protozoa.

Type study of *Paramecium*, *Plasmodium* Structure and life history

### **Unit II**

#### **Metazoa**

Origin of metazoa, metamerism and coelom.

#### **Phylum Porifera**

General characters and outline classification

Type study of *Sycon*: Structure and life history

Canal System and spicules in sponges

### **Unit III**

#### **Phylum Cnidaria**

General characters and outline classification

Polymorphism in Cnidarians; corals and coral reefs

Type study of *Aurelia*: Structure and life history

### **Unit IV**

#### **Phylum Platyhelminthes**

General characters and outline classification

Type study of *Taenia*, *Fasciola* : Structure and life history; parasitic adaptations and evolution of parasitism

#### **Phylum Aschelminthes**

General characters and outline classification

Type study of *Ascaris*: Structure and life history; parasitic adaptations.

## **SEMESTER - I**

### **PAPER-103**

#### **BIODIVERSITY-II: NON-CHORDATA**

**Max Marks: 40+10 (Internal assessment) Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 10 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

#### **THEORY**

**General characters and outline classification of different phyla:**

##### **Unit I**

##### **Phylum Annelida**

General characters and outline classification

Adaptive radiations in Polychaeta.

Type study of *Leech*: Structure and life history

##### **Unit II**

##### **Phylum Arthropoda**

General characters and outline classification.

Larval forms of crustacea; social life, moulting and metamorphosis in Insecta; vision in Arthropoda.

Type study of Scorpion: Structure and life history

Affinities of **Onychophora**

##### **Unit III**

##### **Phylum Mollusca**

General characters and outline classification

Torsion and detorsion; modifications of shell and foot

Type study of *Pila*: Structure and life history

##### **Unit IV**

##### **Phylum Echinodermata**

General characters and outline classification

Water-vascular system and larval forms

Type study of *Asterias*: Structure and life history

## **SEMESTER - II**

### **PAPER-201**

#### **BIODIVERSITY-III: CHORDATA**

**Max Marks: 40+10 (Internal assessment) Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 10 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

#### **THEORY**

##### **General account of Chordates:**

##### **Unit I**

##### **Chordates**

Introduction, affinities and origin.

##### **Protochordates**

General features, Phylogeny & classification of Hemichordates, Urochordates & Cephalochordates. Retrogressive metamorphosis.

##### **Agnatha**

General features of living Agnatha and classification upto classes.

Type study of *Pteromyzon*: Structure and life history

##### **Unit II**

##### **Pisces**

General features & Classification of Placodermi upto subclasses, Chondrichthyes up to suborders and Osteichthyes upto orders. Osmoregulation, migration and Parental care.

Type study of *Scoliodon*.

##### **Amphibia**

General features & Classification upto orders

Type study of *Rana*.

Origin and evolution of terrestrial ectotherms/tetrapods, Parental care & pedomorphosis.

##### **Unit III**

##### **Reptiles**

General features & Classification upto orders. Origin of reptiles skull types, Poisonous and non-poisonous snakes in

India, Biting mechanism in snakes, Status of *Sphenodon* and Crocodiles.

##### **Aves**

General features & Classification upto orders.

Origin of birds, Flight adaptations, Mechanism of flight and Migration.

##### **Unit IV**

##### **Mammals**

Type study of Rat

General features & Classification upto orders.

Origin of mammals, dentition.

## **PAPER -202**

### **BIODIVERSITY-IV: CHORDATA**

**Max Marks: 40+10 (Internal assessment) Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 10 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

## **THEORY**

### **Unit I**

#### **Comparative Anatomy of Chordates:**

**Integument** Structure and derivatives of integument

#### **Bone**

Structure and types, Ossification, bone growth.

### **Unit II**

**Digestive System** Alimentary canal and associated glands

#### **Respiratory system**

Skin, Gills, Lungs, Air sacs and voice apparatus, Air bladder and accessory breathing organs in fishes.

### **Unit III**

#### **Circulatory System**

Evolution of heart and aortic arches, Venous system and lymphatic system.

#### **Skeleton System**

Axial and appendicular skeleton, Jaw suspensorium and Visceral arches.

### **Unit IV**

#### **Nervous System**

Central & Autonomic Nervous System, Cranial nerves.

#### **Sense Organs**

Classification of receptors, structure and working of Mammalian eye and ear.

#### **Urinogenital System**

Succession of kidney, Evolution of Urinogenital ducts.

## **BSc I Hons PRACTICALS Paper 102**

### **Protozoa:**

1. Study of permanent slides; *Amoeba*, *Euglena*, *Paramecium*, *Ceratium*, *Noctiluca*, and *Vorticella*, *Eimeria*, *Opalina*, *Balantidium*, *Nyctotherus*, *Radiolarian* & *Foraminiferans* ooze.
2. Culture & stained lamination of *Euglena*, *Amoeba*, *Paramecium*
3. Study of slides of Malarial parasites positive & negative smears and different stages of malarial parasite life cycle.

### **Porifera:**

1. Study of *Sycon*, *Grantia*, *Leucosolenia*, *Hyalonema*, *Euplectella*, *Spongilla*, *Cliona* and *Euspongia*;
2. Permanent slides of T.S. *Sycon*, Canal system, gemmules, spicules and sponging fibres
3. Temporary mounts of spicules, gemmules and sponging fibres.

### **Cnidaria:**

1. Study of *Porpita*, *Vellela*, *Physalia*, *Millepora*, *Aurelia*, *Rhizostoma*, *Metridium*, *Zoanthus*, *Alcyonium*, *Tubipora*, *Madrepora*, *Favia*, *Fungia*, *Astrea*.
2. Study of permanent slides *Obelia*, *Hydra* (W.M. & sections), *Sertularia*, *Plumularia*, *Bougainvillea*, *Aurelia* (Sense organs & stages of life history) *Scyphistoma* and *Ephyra* larvae.
3. Preparation of permanent stained mount of *Obelia*, *Hydra*, *Sertularia*, *Plumularia*, *Bougainvillea*.

#### **Platyhelminthes:**

1. Study of *Dugesia*, *Fasciola*, *Taenia*, *Echinococcus*;
2. Life history and sections of *Fasciola* and *Taenia*
3. Permanent slides of Miracidium, Sporocyst, Radia, Cercaria, Metacercaria; Scolex & proglottids of *Taenia*

#### **Aschelminthes:**

1. Study of male and female *Ascaris*, *Ancylostoma*, *Trichinella*, *Meloidogyne*, *C. elegans*
2. Study of permanent slides including T.S. Male & Female *Ascaris*
3. Prepare a report on Parasitic adaptations in Helminthes

### **BSc I Hons PRACTICALS Paper 103**

#### **Annelida:**

1. **Demonstrations, models, CD's etc:** digestive, nervous and reproductive systems of earthworm.
2. **Temporary mounts:** Ovary, spermathecae, pharyngeal and septal nephridia of earthworm.
3. **Slides:** T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
4. **Specimens:** *Aphrodite*, *Heteronereis*, *Arenicola*, *Polynoe*, *Eunice*, *Chaetopterus*, *Pheretima*, *Tubifex*, *Hirudinaria*, *Pontobdella*.

#### **Arthropoda:**

5. **Demonstrations, models, CD's etc:** digestive, nervous and reproductive systems of cockroach.
6. **Temporary mounts:** salivary glands and mouth parts of cockroach, Honey Bee, Housefly; *Pediculus* & Ticks W.M.; Statocyst of Prawn.
7. **Specimens/slides:** *Peripatus*, *Palaeomon*, *Palinurus*, *Cancer*, *Sacculina*, *Eupagurus*, *Iepas*, *Balanus*, *Cyclops*, *Daphnia*, *Crustacean larvae*, *Scolopendra*, *Julus*, *Lepisma*, *Periplanata*, *Schistocerca*, *Poecilocus*, *Gryllus*, *Grylotalpa*, *Mantis*, *Cicada*, *Forficula*, *Dragon Fly*, *Microtreme*, *Belostoma*, *Polistes*, *Bombyx*, *Apis*, *Cimex*, *Pediculus*, *Limulus*, *Araneae*, *Palamneus*.
8. Collection of insects from 10 different orders.

#### **Mollusca:**

8. **Demonstrations, models, CD's etc:** digestive & nervous system of *Pila*;
9. **Temporary mounts-** radula & osphradium of *Pila*.
9. **Specimens:** *Neopalina*, *Chiton*, *Dentalium*, *Pila*, *Aplysia*, *Doris*, *Limax*, *Unio*, *Ostrea*, *Teredo*, *Mytilus*, *Cardium*, *Pholas*, *Solen*, *Pecten*, *Heliotis*, *Patella*, *Cypraea*, *Loligo*, *Sepia*, *Octopus* and *Nautilus*.

### **Echinodermata:**

10. **Slides:** T. S. arm of *Asterias*, Echinoderm larvae.

11. **Specimens:** *Antedon, Holothuria, Cucumaria, Echinus, Echinocardium, Clypeaster, Pentaceros, Astropecten, Astrophyton, Ophiothrix.*

### **Hemichordata**

12. *Balanoglossus*

## **Bsc I Hons.PRACTICAL Paper 201**

### **1. Protochordata:**

Study of *Herdmania, Molgula, Botryllus, Ciona, Salpa, Doliolum, Oikopleura, Branchiostoma.*

*Amphioxus* - oral hood, Whole Mount sections through pharyngeal, intestinal & caudal regions.

Mounting of spicules and pharynx of *Herdmania*; Oral Hood & velum *Branchiostoma.*

Demonstration through CD's/ Models of Digestive system and general anatomy of *Herdmania*

### **2. Cyclostomes & Pisces:**

Study of *Petromyzon, Ammocoet Larva, Myxine, Scoliodon, Zygonea, Pristis, Trygon, Torpedo, Raja, Rhinobatus, Chimaera, Polypterus, Acipenser, Lepidosteus, Muraena, Notopterus, Labeo, Catla, Cirrihina, Heteropneustes, Mystus, Exocoetus, Anabas, Diodon, Tetradon, Ostracion, Lophius, Solea, Protopterus.*

Demonstrations, models, CD's etc: Afferent & Efferent branchial arteries and Cranial Nerves of *Scoliodon.*

Weberian ossicles of *Mystus.*

Temporary unstained preparation of Placoid, Cycloid and Ctenoid scales.

Study of Endoskeleton of *Scoliodon & Labeo*

### **3. Amphibia:**

Study of *Uraeotyphlus, Necturus, Proteus, Siren, Amblystoma, Salamandra, Axolotl larva, Alytes, Bufo, Hyla, Rana, Rhacophorus.*

Demonstration through Models/CD's Digestive, Arterial, Venous and urinogenital systems of *Rana.*

Study of Endoskeleton of *Rana.*

**4. Project Report-** Pisciculture/ local inland edible fish, their culturing, rearing, harvesting, and marketing.

## **Bsc II Hons.PRACTICAL Paper 202**

### **1. Reptiles:**

Study of *Chelone, Testuda, Kachuga, Hemidactylus, Varanus, Uromastix, Ophiosaurus, Chameoleon, Draco, Calotes, Phrynosoma, Typhlops, Eryx, Hydrophis, Bungarus, Viper, Krait, Coral snakes, Naja, Crotalus, Python, Crocodiles*

Demonstration through models/ CD's of Digestive, Arterial, Venous and Urinogenital systems of Hemidactylus.

Disarticulated skeleton of *Varanus*, Carapace & plastron of tortoise.

**5. Aves:** Report on dozen Birds of your District/State

Study of *Casuaris*, *Anas*, *Milvus*, *Pavo*, *Eudynamis*, *Tito*, *Ardea*, *Corvus*, *Psitaculla*, *Passer*, *Alcedo*, *Penguin*, *Emu*, *Struthio*, *Kiwi*, *Columbo*.

Study of Quill, Countour, Filoplule and down feathers.

Demonstration through Models/ CD's of Digestive, Arterial, venous and urinogenital system of pigeon

Disarticulated skeleton of Fowl.

**6. Mammals:**

Study of *Ornithorynchus*, *Echidna*, *Didelphys*, *Dasypos*, *Maropus*, *Histrix*, *Herpestes*, *Sorex*, *Shrew*, *Hedgehog*, *Pteropus*, *Funambulus*, *Felisdomesticus*, *Canisdomesticus*, *Capra*.

Disarticulated skeleton of Rabbit

Demonstration through models/ CD's of Digestive, Arterial, Venous, Urinogenital system, Neck region of Rat.

**7.** Report on common diseases in cattle and buffalo.

Demonstration through models/ CD's of Digestive, Arterial, Venous, Urinogenital system, Neck region of Rat.

**B.Sc. (Zoology Hons.)**  
**SEMESTER –IV (w.e.f. 2014-15)**  
**PAPER-403**  
**ANIMAL ECOLOGY**

**Max Marks: 40+10 (Internal assessment)**  
**Hours**

**Time allotted: 3**

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

1. Question number I is compulsory consisting of 8 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

**UNIT I**

**Introduction to Ecology**

Relevance of studying ecology, its history, autecology, synecology. Species- Sympatric, parapatric and Allopatric, Population, Community.

**Ecosystem, Biome, Biosphere and Ecosphere**



Abiotic Factors: Laws of limiting factors- Liebig's law of minimum and Shelford's law of tolerance. A brief account of light and temperature as limiting factors, soil types and soil erosion.

## UNIT II

### **Population**

Unitary and modular populations, its unique and group attributes- population density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio. Population dispersal and distribution patterns.

### **Population growth**

Exponential/Malthusian and Sigmoid growth patterns, Verhulst-Pearl growth equation, 'r' and 'k' strategies.

## UNIT III

### **Population Growth regulation**

Intrinsic mechanism- Density dependant fluctuations and oscillations, Extrinsic mechanism- Density independent, environmental and climatic factors, population interactions- types in a tabular form with examples.

Niche concept, Gause's principle of competitive exclusion with laboratory and field examples, Lotka Volterra Equation for prey predator interaction, functional and numerical responses of prey and predator

## UNIT IV

### **Ecosystem and Community**

Ecosystems- terrestrial (grassland), marine, and aquatic (pond).

### **Community**

Characteristics of community diversity, diversity index, types of biodiversity species richness, abundance, species area relationship, community stratification, ecotone/edge effect, succession, stages of primary succession, climax community. Energy flow through an ecosystem- food chains, food web, trophic levels, grazing and detritus type of food chain, Y- shaped food chain in forest, one example of food web- Terrestrial or Aquatic, Nutrient cycle, Nitrogen cycle.

## PRACTICALS

1. Study of all the biotic and abiotic components of any simple ecosystem- natural pond or terrestrial ecosystem or human modified ecosystem.
2. Determination of population density in a terrestrial community or hypothetical community by quadrat method and calculation of the Simpson's and Shannon- Weiner diversity index for the same community.
3. **Biochemical analysis of pond or river water for dissolved O<sub>2</sub>/CO<sub>2</sub>/Chloride/Nitrate and sulphate**
4. Study of the life table and fecundity table, plotting of the three types of survivorship curves from the hypothetical data.
5. Study of the types of soil, their texture by sieve method and rapid tests for -pH, chlorides,

- nitrates, carbonates and organic carbon
6. Study any five endangered/ threatened species- one from each class.

### SUGGESTED BOOKS

1. Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
2. Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
3. Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
4. Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Press

### SEMESTER - V PAPER-502 Organic Evolution

**Marks: 40+10 (Internal assessment)**

**Time allotted: 3 Hours**

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

1. Question number I is compulsory consisting of 10 parts (1.0 mark each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight questions, two questions are to be set from each unit (I to IV), possibly splitting them in parts. Candidate is required to attempt four questions, selecting one question from each unit.

### THEORY

#### Unit I – Theories of Evolution

Concept of Evolution; Origin of Life; Evidences in favour of Evolution; Theories of Evolution viz, Lamarckism, Wiesman's theory of continuity of Germ Plasam, Neo-Lamarckism, Darwinism and Modern Synthetic Theory of Evolution

#### Unit II – Mechanism of Evolution

Sources of variability amongst populations; Mutations; Isolation; Natural Selection; Hardy – Weinberg Principle; Speciation and its types; Micro and Macro Evolution

#### Unit III – Results of Evolution

Structural and Functional Adaptations; Mimicry and protective coloration; Zoo-Geographical Distribution of animal species (Realms).

#### Unit IV – Paleontology

Fossils – Formation, Kinds, Interpretation, Age and significance; Evolution of Man.

### PRACTICALS

1. Study of Homologous organs through forelimbs of *Talpa*, **Bat**, **Monkey**, **Gibbon**, **Whale** and **horse**.
2. Study of adaptive modifications of feet and claws in birds.
3. Study of adaptive modifications in mouth parts of insects viz *Anopheles*, *Musca*, *Apis* and **butterfly**.
4. Study of evolution of Man and horse through charts, models and CD's. The questions will be asked to explain the peculiar evolutionary characteristics of two specific stages from these models/ charts/ CD's.
5. Study of evolutionary significance of *Peripatus*, *Neopalina*, *Balanoglossus*, *Amphioxus*, *Chimaera*, *Protopterus*, *Ichthyophes*, *Ureotyphlus*, *Amblyostoma*, *Sphenodon*, *Crocodylus*, *Archaeopterus*, *Echidna*, *Ornithorhynchus*.
6. Preparation of an anthropological survey report on the basis of morphometric trait analysis of atleast 50 students of a specific social group from your college.

## **SUGGESTED BOOKS**

1. Ridley, M. (2004) Evolution. III Edition. Blackwell Publishing
2. Barton, N. H., Briggs, D.E.G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). Evolution. Cold Spring Harbour Laboratory Press.
3. Hall, B.K. and Hallgrímsson, B. (2008) Evolution. IV Edition. Jones and Bartlett Publishers
4. Pevsner, J. (2009) Bioinformatics and functional genomics. II Edition. Wiley-Blackwell