SCHEME OF EXAMINATION FOR B.Sc. (ZOOLOGY) SEMESTER SYSTEM

w.e.f. Session 2011-12

Scheme of B.Sc. I

Semester I					
Sr. No.	Paper code	Nomenclature	Marks+IA	Periods / week	Exam. Duration
1.	1.1	Life and Diversity from Protozoa to Porifera and Cell Biology – I	40+10	4	3 hrs.
2.	1.2	Life and Diversity from Coelentrata to Helminthes and Cell Biology – II	40+10	4	3 hrs.
3.	P-101	Practical	40+10	4	3hrs.
Semester II					
4.	2.1	Life and Diversity from Annelida to Arthropoda and Genetics – I	40+10	4	3 hrs.
5.	2.2	Life and Diversity from Molluska to Hemichordata and Genetics – II	40+10	4	3 hrs.
6.	P-201	Practical	40+10	4	3hrs.
Total Semester I & II			300		

Scheme of B.Sc. II

Semester III					
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.	P-301	Practical	40+10	4	3hrs.
Semester IV					
4.	4.1	Life and Diversity of Chordates – II	40+10	4	3 hrs.
5.	4.2	Mammalian Physiology – II	40+10	4	3 hrs.
6.	P-401	Practical	40+10	4	3hrs.
Total Semester III & IV			300		

Scheme of B.Sc. III

Semester V					
Sr. No.	Paper code	Nomenclature	Marks+IA	Periods / week	Time
1.	5.1	Aquaculture	40+10	4	3 hrs.
2.	5.2	Ecology & Evolution	40+10	4	3 hrs.
3.	P-501	Practical	40+10	4	3hrs.
Semester VI					
4.	6.1	Pest Management	40+10	4	3 hrs.
5.	6.2	Developmental Biology	40+10	4	3 hrs.
6.	P-601	Practical	40+10	4	3hrs.
Total Semester V & VI			300		
Grand Total Semester I – VI			**900**		

SYLLABUS (B.Sc.: - Zoology)
w.e.f. session 2011-12
B. Sc. Semester - I (Theory)
Paper – 1.1

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

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.

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

I. 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-IV

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

B. Sc. Semester II (Theory):
Paper- 1.2

Life and Diversity from Coelentrata to Helminths & Cell Biology - II
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.

UNIT-I

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-II

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 *chistosoma, Ancylostoma, Trichinella, Wuchereria* and *Oxyuris.*

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 (Theory)
Paper – 2.1

Life and Diversity of Annelida to Arthropoda & Genetics- I

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. uestion 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.

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

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-IV

4. **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.
5. **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.
6. **Extra chromosomal and cytoplasmic inheritance:**
   i) Kappa particles in Paramecium.
   ii) Shell coiling in snails.
   iii) Milk factor in mice.

B. Sc. Semester - II (Theory)
Paper – 2.2

Life and Diversity of Mollusca to Hemichordata & Genetics - II

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.

UNIT-I

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-II

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*

UNIT-III

1. **Multiple allelism**: Eye colour in Drosophila; A, B, 0 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 (autoploidy, euploidy and polyploidy in animals)
2. **Applied genetics:** Eugenics, euthenics and euphenics; genetic counseling, pre-natal diagnostics, DNA-finger printing, transgenic animals

B.Sc.-Semester I
PRACTICAL PAPER (P-101)

(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 formaniferan ooze.
2. Parazoa (Porifera)	Specimens: *Sycon. Grantia, Euplectella, Hyalonema, Spongilla, Euspongia*
3. Coelenterata.	Specimens: *Porpita, Valella, Physalia, Aurelia, Rhyzostoma, Metridium, Millipora, Alcyonium, Tubipora, Zoanthus, Madrepora, Favia, Fungia,* and *Astrea,* Permanent prepared slides: *Hydra* (W.M.), *Hydra* with buds, *Obelia* (colony and medusa), *Sertularia, Plumularia, Tubularia, Bougainvillea, Aurelia* (sense organs and stages of life history).
4.Platyhelminthes	Specimens: *Dugesia, Fasciola, Taenia, Echinococus,* Permannt prepared slides: *Miracidium, sporocyst, redia, cercaria, scolex* and *proglotttids; Taenia* (mature and gravid).
5. Aschelminthes	*Ascaris* (male & female), *Trichinella, Ancylostoma, Meloidogyne.*

(B) Study of the following permanent stained preparations:

I. 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.*

(D) **Dissections and/or its demonstration through models/video/CD etc and preparation of working models of the different systems of the following animals:**

1. Pathogenic protozoans: Plasmodium, Giardia or as available
2. Pathogenic Helminthes: Ancylostma; Wuchereria or as available

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

I. 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.

(F) Project:

1. Parasitic adaptations
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

B.Sc.-Semester II
PRACTICAL PAPER (P-201)

(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, 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), *Palamnaeus* (scorpion), *Aranea* (spider), *Limulus* (king crab).
3. 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.*
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 mouthpmts of cockroach.
3. Statocyst of *Palaemon.*
4. Glochidium larva of *Anodonta;* radula and osphradium of *Pila.*
5. TS. Star fish (arm)
6. T.S. *Balanoglossus* (through various regions).

(C) Preparation of the following slides:

1 . Mouth parts and trachea of *Periplanata* (cockroach), radula of *Pila;* pedicillarae of *Asterias.*

2. Preparation of setae of earthworm, and mouth parts of Honey bee, House bee, House fly and cockroach.

(D) Dissections and/or its demonstration through models/video/CD etc and preparation of working models of the different systems of the following animals:

I. 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. Pearl culture

4. Apiculture: Rearing of bees and honey production

5. Evolutionary significance of larvae belonging to different group of invertebrates

B.Sc. PART- I (Zoology Practical)

(Semester I & II)

Guidelines/Instructions for Practical Examination (Paper-101 & 201)

Max Marks: 40+10 each **Time allowed: 3Hrs each**

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

S. No.	Exercise	Marks	
		P101	**P102**
1.	Dissection –one	3	3
	(Exposition, labelled diagram)		
2.	Temporary mounting –one	3	3
	(Staining, identification,		
3.	Museum specimens - four	6	6
	(identification and		
4.	Ecological note –one specimen	2	2
5.	Permanent slides - two	3	3
	(Identification with reasons)		
6.	Preparation of chromosome	3	3
	(root tip/grasshopper testis)		
7.	Invertebrate collection and	4	4
8.	Practical record and slides	2+2	2+2
9.	Viva	4	4
10	Project report	8	8

SYLLABUS

B.Sc. Part-II

SEMESTER - III

Paper 3.1

Life and Diversity of Chordates – I

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.

UNIT-I

Chordates: Principles of classification; Origin and Evolutionary tree; Role of amnion in evolution; Salient features of chordates; Functional morphology of the types with examples emphasizing their biodiversity, economic importance and conservation measures where required.

UNIT-II

General characters and classification of phyla upto orders with examples emphasizing their biodiversity, economic importance and conservation measures where required.

Protochordates: Systematic position, distribution, ecology, morphology and affinities

Urochordata: *Herdmania* – type study

Cephalochordata; *Amphioxus* – type study

UNIT-III

General characters and classification of phyla upto orders with examples emphasizing their biodiversity, economic importance and conservation measures where required.

Cyclostomes: Classification and ecological significance

Type study of *Petromyzon.*

UNIT-IV

General characters and classification of all phyla upto orders with examples emphasizing their biodiversity, economic importance and conservation measures where required.

Pisces: Scales & Fins, Parental care in fishes, fish migration.

Types study of Labeo

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

SEMESTER - III

Paper 3.2

Mammalian Physiology – I

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.

UNIT-I

Introduction, Classification, Structure, function and general properties of carbohydrates and lipids.

UNIT-II

Introduction, Classification, Structure, function and general properties of proteins; Nomenclature, Classification and mechanisms of enzyme action.

Transport through biomembranes (Active and Passive), buffers

UNIT-III

Nutrition: Nutritional components; Carbohydrates, fats, lipids, Vitamins and Minerals. Types of nutrition & feeding, Digestion of dietary constituents, viz. lipids, proteins, carbohydrates & nucleic acids; symbiotic digestion. Absorption of nutrients & assimilation; control of enzyme secretion.

UNIT-IV

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.

Bones: Structure and types, classification, bone growth and resorption, effect of ageing on Skeletal system and bone disorders.

SEMESTER - IV

Paper 4.1

Life and Diversity of Chordates – II

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.

UNIT-I

Amphibia: Origin, Evolutionary tree. Type study of frog (*Rana tigrina*), Parental Care in Amphibia

UNIT-II

Reptilia: Type study of Lizard (Hemidactylus), Origin, Evolutionary tree. Extinct reptiles; Poisonous and non-poisonous snakes; Poison apparatus in snakes.

UNIT-III

Aves: Type study of Pigeon (*Columba livia*); Flight adaptation, Principles of aerodynamics in Bird flight, migration in birds.

UNIT-IV

Mammals: Classification, type study of Rat; Adaptive radiations of mammals and dentition.

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

SEMESTER - IV

Paper 4.2

Mammalian Physiology – II

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.

UNIT-I

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

UNIT-II

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.

Excretion: Patterns of excretory products viz. Amonotelic, ureotlic uricotelic, ornithine cycle (Kreb's– Henseleit cycle) for urea formation in liver.

UNIT-III

Excretion: Urine formation, counter-current mechanism of urine concentration, osmoregulation, micturition.

Neural Integration: Nature, origin and propagation of nerve impulse along with medullated & non-medullated nerve fibre, conduction of nerve impulse across synapse.

UNIT-IV

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

Reproduction: Spermatogenesis, Capacitation of spermatozoa, ovulation, formation of corpus luteum, oestrous-anoestrous cycle, Menstrual cycle in human; fertilization, implantation and gestation.

B.Sc.-Semester III
PRACTICAL PAPER (P-301)

Max. Marks: 40+10 **Time allowed: 3Hrs**

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

Protochordata : *Molqula, 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. **Dissections and/or its demonstration through models/video/CD etc and preparation of working models of the different systems of the following animals:**
Herdmania: General anatomy *Labeo* (locally available fish) : Digestive and reproductive systems: cranial nerves, Ear ossicle

3. Study of the skeleton of *Scoliodon, Labeo*
4. Study of the following prepared slides:
Tornaria larva, T.S. *Amphioxus* (through different regionds). Oikopleura, different types of scales.

5. Make permanent stained preparations of the following: *Salpa,* Spicules, and Pharynx of *Herdmania, Amphioxus,* 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.

3. Use of Kymograph unity

Project Report:

1. Migration in fishes
2. Ornamental fishes

B.Sc.-Semester IV
PRACTICAL PAPER (P-401)

Max. Marks: 40+10 Time allowed: 3Hrs

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, 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, Pteropus*

2. **Dissections and/or its demonstration through models/video/CD etc and preparation of working models of the different systems of the following animals:**
   Hemidactylus : Digestive, arterial, venous and urinogenital systems.

   Rat : Digestive, arterial, venous and urinogenital systems.

7. Study of the skeleton of *Rana* (Frog), *Varanus*, Pigeon or Gallus and *Orcyctolagus*/rat, Palates of birds, skulls of dog & rabbit.
8. Study of the following prepared slides:
   Histology of rat (compound tissues).

9. Zoological excursion and its report is compulsory in the practical examination.

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- II (Zoology Practical)

(Semester 3 & 4)

Guidelines/Instructions for Practical Examination (Paper-301 & 401)

Max Marks: 40+10 each **Time allowed: 3Hrs each**

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

S. No.	Exercise	Max Marks P-301	Max Marks P-401
1.	Dissection –one (CD/Demonstration/Model/Exposition, labelled diaddiagramdiagram)	3	3
2.	Temporary mounting –one	4	Not applicable
	(Staining, identification, sketch)		
3.	Museum specimens - four	6	6
	(identification and classification)		
4.	Ecological note –one specimen	2	2
5.	Permanent slides - two (Identification with reasons)	3	3
6.	Bone – identification & sketch	Not applicable	4
7.	Physiology (two exercise)	5	5
8.	Practical record and slides	5	5
9.	Viva	4	4
10	Project report	8	8

B.Sc. Part-III (Theory)

SEMESTER - V

Paper 5.1

Aquaculture

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 the compulsory question

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

Unit I

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.

Unit II

3 Fishing crafts and gears.

4. Fin fishes, Crustaceans, Molluscs and their culture.

Unit III

Seed production: Natural seed resources – its assessment, collection, Hatchery production.

2 **Nutrition:** Sources of food (Natural, Artificial) and feed composition (Calorie and Chemical ingredients).

Unit IV

3 **Field Culture:** Ponds-running water, recycled water, cage, culture; poly culture.

4. **Culture technology:** Biotechnology, gene manipulation and cryopreservation of gametes.

B.Sc. Part-III (Theory)

SEMESTER – V

Paper – 5.2

Ecology & Evolution

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 the compulsory question

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

Unit I

1. **Basic concepts of ecology:** Definition, significance. Concepts of habitat and ecological niche.

2 **Factors affecting environment:** Abiotic factors (light-intensity, quality and duration), temperature, humidity, topography; edaphic factors; Biotic factors.

Unit II

1. **Ecosystem:** Concept, components, properties and functions; Ecological energetics and energy flow-food chain, food web, trophic structure; ecological pyramids concept of productivity.

2. **Biogeochemical cycles:** Concept, reservoir pool, gaseous cycles and sedimentary cycles.

3. **Population:** Growth and regulation.

Unit III

Origin of life.

1. Concept and evidences of organic evolution.
2. Theories of organic evolution.

3.. Concept of microevolution and concept of species

Unit IV

1. Concept of macro-and mega-evolution.
2. Phylogeny of horse.
3. Evolution of man.

B.Sc. Part-III (Theory)

SEMESTER - VI

Paper 6.1

Pest Management

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 the compulsory question

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

Unit I

Study of important insect pests of crops and vegetables :

1 **Sugarcane:**

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

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

2 **Cotton:**

(a) Pink bollworm *(Pestinophora gossypfolla)*
(b) Red cotton bug *(Dysdercus Cingulatus)*
(c) Cotton grey weevil *(Myllocerus undecimpustulatus)*
(d) Cotton Jassid *(Amrasca devastans)*

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

Unit II

3 **Wheat:**

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

4 **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 *Loptocorisa acuta.*

Unit III

5 **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.*

6 **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.*

Unit IV

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.

B.Sc. Part-III (Theory)

SEMESTER - VI

Paper 6.2

Developmental 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 the compulsory question

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

Unit I

1. Historical perspectives, aims and scope of developmental biology.
2. Generalized structure of mammalian ovum & sperm. Spermatogenesis and Oogenesis.

Unit II

1. Fertilization, parthenogenesis, different types of eggs and patterns of cleavage in invertebrates and vertebrates.
2. Process of blastulation in invertebrates and vertebrates
3. Fate-map construction in frog and chick.

Unit III

1. Gastrulation in invertebrates and vertebrates
2. Gastrulation & formation of three germinal layers in frog and chick.
2. Elementary knowledge of primary organizers.

Unit IV

1. Extra embryonic membranes: structure & significance in birds and mammals.
2. Concepts of competence, determination and differentiation.
3. Concept of regeneration.

B.Sc. Part-III

Semester V

PRACTICAL PAPER (P-501)

1. Identification of *Catle, Labeo rohita, L. calbasu, Cirrhius, mrigala Puntius sarana, Channa punctatus, C. marulius. C. stariatus, Trichogaster fasciata, Mystus seenghala, M. cavasius, M. tengra, Callichrous pabola, C. bimaculatus, Wallago attu, Prawns, Crabs, Lobsters, Calms, Mussels & Oysters.*

2. Chemical analysis of pond water and soil for pH, dissolved oxygen, free CO_2 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 drag 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.

B.Sc. Part-III

Semester VI

PRACTICAL PAPER (P-601)

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 tecarious*, *Epilachna* (any three).

   (vi) **Pests of stored grains:** Pulse beetle, Rice weevil, Grain & Flour moth, Rust-red flour beetle, lessergrain borer (any three).

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

3. Preparation of permanent/temporary slides of developmental stages of frog/mosquito.

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

5. Window preparation and identification of stages of development in chick egg.

B.Sc. PART- III (Practical)

Guidelines/ Instructions for Practical (Paper-501)

Max. Marks: 40+10 **each** **Time allowed: 3 Hrs each**

SNo	Title of experiment	MM
1.	Chemical analysis of water/soil	5
2.	Identification and Classification of specimens (Eight)	8
3.	Ecological note on economically important specimen (two)	6
4.	Evolutionary evidences	3
5.	Slides/nets etc	3
6.	Field report	5
7.	Practical note book	5
8.	Viva-voce	5

Note: Field report to be submitted during examination

B.Sc. PART- III (Practical)

Guidelines/ Instructions for Practical (Paper- 601)

Max. Marks: 40+10 each Time allowed: 3 Hrs each

S.No.	Title of experiment	MM
1.	Identification and Classification of specimens (Four)	8
2.	Comment on the Life cycle of a given pest	3
3.	Identification of embryological slides with reasons of identification (Two)	6
4.	Preparation of window in the egg	4
5.	Preparation of the permanent/temporary slides of the various development stages of frog/mosquito.	4
6.	Field report/Insect pest collection	5
7.	Practical note book	5
8.	Viva-voce	5

Note: Field report/collection to be submitted during exam