B. Sc. Part - I:- ZOOLOGY (HONOURS)

Time: 3 Hours] **(Non-Chordate)** **[Full Marks: 75**

In all ten questions are to be set out of which number 1 and 2 shall consist of objective (1 x 15 marks) and short answers (3 x 5) requiring questions respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions, of which question numbered 1 and 2 shall be compulsory.

I. Bionomics general characters and classification (up to orders) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes Aschelminthes Annelida, Arthoropoda, Mollusca, Echinodermata and Hemichordate.

Detailed study of the following types:

1. **Protozoa:** Paramecium Parasitic protozoans and their modes of infection Polystomella (Elphidium).
2. **Porifera:** Sycon, Canal system in sponges, affinities of the phylum.
3. **Cnidaria:** Obelia, Aurelia Sea anemone
4. **Ctenophora:** General organization of Hormiphora affinities of the phylum.
5. **Platyhelminthes**: Fasciola hepatica. Teania sodium and Planaria.
6. **Aschelminthes:** Ascaris lumbricoides, Wuchereria bancrofti.
7. **Annelida:** Pheretima posthuma, Leech, Nereis.
8. **Arthropoda:** Paloemon, Peripatus, Adaptive variations in insect mouth parts. Sacculina.
9. **Ectoprocta:** Bugula.
10. **Mollusca**: Unio, Pila, Sepia, Torsion and detorsion in Gastropoda.
11. **Echinodermata:** Larval forms in Echinoderms, water Vascular System in Echinoderm

Time: 3 Hours] ***PAPER-IIA*** **[Full Marks: 75**

(Ecology, Animal Behaviors and Biometry)

I. Ecology:

1. Concept of Biosphere (Lithosphere, hydrosphere and atmosphere).
2. Ecosystem: Definition, structure and function of typical ecosystem
3. Structure (Abiotic and Biotic) and function (energy flow Biogeochemical cycles) of fresh water, grassland, desert and forest ecosystems.
4. Community structure and its ecological succession.
5. Pollution and its hazards (air, water and sound).
6. Wild- life conservation: Types and measures, National Parks and Sanctuaries.

II. Animal Behaviour:

1. Scope of Ethology, Innate and learned behaviour.
2. Social behavior in insects.
3. Parental care in fishes and amphibia.
4. Brooding, nesting and migratory behavior in birds.
5. Concept of Biological clock .

III. Biometry:

Scope and application of the following statistical method in Biology.

1. Normal distribution and its attribution range, mode, median and arithmetic mean.
2. Standard error, standard deviation, Simple test and Chi-square test.

PRACTICAL

ZOOLOGY PART-I (HONOURS)

Time: 4 Hours] ***PAPER-IB and IIB*** **[Full Marks: 50**

1. **Dissection:** **10**
   Pheretima, Leech-Alimentary canal, Reproductive, Excretory and Nervous systems. Palaemon - Alimentary canal, Nervous system.
   Unio Pila and Sepia- Nervous system, organs of Pallial complex of Pila.
2. **Permanent stained preparation of the following:** **05**
   Paramoecium gemmules, Spicules, obeliacolony, Nephridia and Ovary of Pheretima Jaw of Leech, statocyst of prawn, osphradium, radulla and gill of pila of unio, Glochidium larva, of crustace and Echinoderma, Pediceralia.

3. Spotting (Each of two marks): **14**

(i) Museum specimens - 02
(ii) Slides - 04
(iii) Specimens relating animal behavior or parental care. - 01

4. Ecology: **06**

(i) Analysis of soil/pond biota.

(ii) Determination of dissolved oxygen and pH of different water samples.

(iii) Community structure of Grassland.

(iv) Moisture content of soil sample.

5. Biometry: **05**

Calculation of the arithmetic mean and standard deviation of the samples provided.

6. Record and field work. **05**

7. Viva. **05**

B. Sc. Part - I:- ZOOLOGY (SUBSIDIARY & GENERAL)

Time: 3 Hours] **(Theory)** **[Full Marks: 75**

Five Questions are to be set from each group. Students will be required to answer five questions at least two from each group.

GROUP-A: Non-Chordata

1. Bionomics, Genera! characters and classification (up to orders) of the following phyla- Protozoa, Porifera , Coelenterata , Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata and Hemichordata .

Detailed study of the structure and life-history of the following types.

(i)	Protozoa	Paramecium
(ii)	Porifera	Sycon
(iii)	Cnidaria	Obelia
(iv)	Platyhelminthes	Fasciola
(v)	Aschelminthes	Ascaris
(vi)	Annelida	Pharetima
(vii)	Arthropoda	Palaemon
(viii)	Mollusca	Pila
(ix)	Echinodermata	Asteries
(x)	Hemichordata	Balanoglossus

GROUP-B: Cell Biology, Genetics and Evolution

1. Cell Biology and Genetics:

(i) Gametogenesis, Fertilization and Parthenogenesis.

(ii) Ultra structure and function of the following cell organelles- Plasma membrane. Endoplasmic reticulum, Mitochondria , Golgibody, Ribosomes, Chromosome Lysosome.

(iii) Structure and function of DNA.

(iv) Gene Mutation

(v) Linkage and Crossing ever.

2. Evolution:

(i) Sources of hereditary variation and their role in evolution.

(ii) Darwin's theory of Natural selection & Neo-Darwinism.

(iii) Isolating mechanisms and their role in evolution.

PRACTICAL

ZOOLOGY PART-I (SUBSIDIARY & GENERAL)

Time: 3 Hours] **[Full Marks: 25**

1. Dissection **06**

Pheretima: Reproductive system, nervous system, Alimentary canal.

Palaemon: Alimentary canal, Nervous system .

Pila: Alimentary canal, Nervous system, Organs of Pallial Complex.

2. Mounting (Permanent stained preparation) **04**

Septal nephridia, Ovary & Setae of Earthworm, Statocyst of Prawn, Radula and Osphradium of Pila.

3. Spoting **06**

(a) Museum specimens - 2

(b) Slides - 3

(c) Evolution. - 1

4. Cytology **04**

Squash preparation to show stages of Mitosis. (Onion root tipes)

and Meiosis (Grasshoper testis)

Giant chromosomes of Chironomous/Drosophile larvae.

5. Practical records. **05**

B. Sc. Part - II:- ZOOLOGY (HONOURS)

PAPER-III (Theory)

In all ten questions are to be set out of which number 1 and 2 shall consist to objective

1 x 15marks and short answers (3 x 5) requiring question respectively and both shall over the whole syllabus in the paper. Student would be required to answer five questions of which question numbered 1 and 2 shall be compulsory.

1. Origin and evolution of chordates.

2. Binomics, General characters and classification of the chordates (upto order) of the following groups. Protochordata, Cyclostomata, Pishes, Amphibia, Reptilia, Aves & Mammalia.

3. Study of the following Types:

(a) Urochordata - General organisation and life cycle of Herdmania and their affinities

(b) Cephalochordata - Amphioxus.

(c) Cyclostomata - Petromyzon.

(d) Fishes- (i) Labeo, scoliodon

(ii) Distribution general organisation and affinities of Dipnoi; Accessory respiratory organs in fishes.

(e) Amphibia-(i) Origin and evolution of Amphibia; Neoteny.

(f) Reptilia- 1. Any Lizard

2. Biting and feeding Mechanism in Snakes.

(g) Aves- (i) Columba

(ii) Origin of Birds

(iii) Flight adaptations.

(h) Mammals-(i) Characters and distribution of Protothertria, Metatheria

(ii) General organisation of primates.

PAPER-IV

Time: 3 Hours] **[Full Marks: 75**

Comparative Anatomy:

Study of the following organ systems in the vertebrate groups:

(i) Integument; its derivatives and function.
(ii) Gastrointestial tract.
(iii) Respiratory systems,
(iv) Heart, Aortic arches.
(v) Brain,
(vi) Evolution and fate of kidney, urinogential ducts, gonads,
(vii) Evolution of chondro-Splanchno & osteocranium.

Embryology:

(i) Gametogenesis, Fertilization and Parthenogenesis.
(ii) Types of vertebrate eggs cleavages patterns,
(iii) Development of Amphioxus (upto the formation of coelom),
(iv) Development extra-embryonic membranes in chick,
(v) Placenta in mammals it development types and functions,
(vi) Organogenesis of Heart, Brain and Eye in chick embryo.

PRACTICAL

ZOOLOGY PART-II HONOURS

Time: 6 Hours] ***PAPER-IIIB & VI B*** **[Full Marks: 50**

1. Dissections. **10**

(i) **Scoliodon and any Bony fish -** Afferent and efferent branchial vessels :

(V, VII, IX, X) cranial nerves; Eye muscles and their nerve supply; Internal ear; Accessory respiratory organs.

(ii) **Frog -** Cranial nerves (V, VII, IX, X).

(iii) **Lizard -** Arterial and venous system.

(iv) **Pigeon -** Arterial and venous systems, air sacs, flight (muscles with the origin and insertion to tendoms).

(v) Mammals Neck nerve, Urino-genital organs.

2. Mounting: **05**

Velum and Oralhood of Amphioxus, Ampulla of Lorenzini, respiratory membrance of air, breathing-structures, scales of fishes, pecten and feathers, Mounting of chick embryo (24 & 48 hours).

3. Permanent stained Preparation of paraffin sections provided. **5**

4. Spotting: **20**

(i) Musecum specimens 2

(ii) Slides Histology & Embryology 4

(iii) Bones Limbs of Frog Girdies Skull Varanus

Vertebrate Fowl & Rabbit 4

5. Record and field work **5**

6. Viva-voce **5**

B. Sc. Part - II:- ZOOLOGY (SUBSIDIARY & GENERAL)

Time: 3 Hours] ***PAPER-II (Theory)*** **[Full Marks: 75**

Five questions are to be set from each group. Students shall answer five questions attempting not more than three from any group.

GROUP-A (CHORDATA)

1. Binomics, General Characters and Classification (up to orders only) of living chordates of the following groups: protochordata Cylostomata, pisces, Amphibia, Reptilia, Aves and Mammalia.
2. Study of the following types:

(i) Urochordata - Herdmania (including reterogressive metamorphosis),

(ii) Cephalochordata- Amphioxus.

(iii) Fishes-Socoliodon -Type study: differences with that of a Bony fish.

(iv) Reptilia-Biting & feeding mechanism of Snakes.

(v) Aves - Columba Flight adaptation , elementary idea of bird migration & Sancturies of India.

(vi) Mammals-Characters, distribution and affinities of Prototheria & Metatheiria.

3. Comparative study of the following in Vertebrates integument, Heart, Aortic Arches and Brain.

GROUP-B (EMBRYOLOGY)

(i) Types of vertebrate eggs and their early cleavage.

(ii) Development of Amphioxus (Up to the formation of Coelom) and chick(up to 3 germ layers).

(iii) Placenta in Mammals their development, types and functions.

Biochemistry Physiology and Endocrinology

(i) Structure and classification of Protein, Carbohydrate & fats.

(ii) Physiology of Digestion, Excretion and Respiration in mammals.

(iii) Histophysiology of the following Endocrine glands in mammals: Is-lets of Langerhans. Testis, Ovary, Thyroid, Adrenal & Pituitary gland.

PRACTICAL

ZOOLOGY PART-II (SUBSIDIARY & GENERAL)

Time: 5 Hours] **[Full Marks: 25**

1. **Dissection** **7**

   Scoliodon - Afferent and efferent branchial arteries, Carnial nerves (V, VII) and (IX, X) Internal ear, eye, muscles & their nerves supply, Urinogential system.

   Columba - Flight muscles, Arterial and Venous system.

2. Mounting Permanent stained prepartion. **4**

   Scales of fishes pecten and Filoplume feather of birds, Ampulla of Lorenzini.

3. Spotting Museum specimen-I. **6**

   Bones-3 (Limb) girdle, Skull, Vertebrate of varanus and fowl.

4. Slides-I (Endocrinology & Embryology) 2 x 2= **4**

   (i) Identification of Permanent slides of the various developmental stages of frog and Chick, (ii) Identification and comment upon the hitological structure of various Endocrine glands.

5. Practical Records. **4**

Time: 3 Hours] ***PAPER-V (Theory)***

[Full Marks: 100

In all ten questions are to be set out of which number 1 and 2 shall consist of objective (1 x 15 marks and short answers (3 x 5) requiring question respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions, of which quest ion number 1 and 2 shall be compulsory.

Biochemistry, Physiology & Endocrinology

Biochemistry:

(i) Structure and classification of of Amino Acids, Protein, Carbohydrate & fats.
(ii) Metabolism of Carbohydrate Glycolysis, Glycogenesis and Kreb's cycle.
(iii) Beta-oxidation of fatty acids.
(iv) Vitamins -Definition, Types and functions.
(v) pH, buffers and electrolyte dissociation.
(vi) Enzymes classification and mechanism of action

Physiology (Mammals):

1. Physiology of digestion, Respiration (Ventilation of lungs and transport of gases), Excretion & Osmoregulation and circulation
2. Mechanism of thermoregulation.
3. Acid base balance.
4. Physiology of Vision and Hearing.

Endocrinology (Mammal):

1. Histo-physiology of the various endocrine glands.
2. Chemical nature and physiological actions of the hormones secreted by Adenohypophysis. Neurohypophysis Adrenal, thyroid, Islets of Langerhans and Gonads.

Time: 3 Hours] ***PAPER-VI (Theory)*** **[Full Marks: 100**

In all ten questions are to be set out of which number 1 and 2 shall consist of objective (1 x 15 marks and short answers (3 x 5) requiring question respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions, of which quest ion number 1 and 2 shall be compulsory.

(Cell Biology, Genetics and Economic Zoology)

Cell Biology:

1. Ultrastructure & function of the following cell organelles-Plasma membrane, mitochondria & golgi complex.
2. Ribosome & Protein synthesis.
3. Chromosomes & Giant chromosomes.
4. Active transport across cell membrane.

Genetics:

(i) Mendelian Inheritence
(ii) Linkage and crossing over.
(iii) Structure and Replication of DNA; transcription, genetic code and translation.
(iv) Chromosomal aberrations the genetic and cytological manifestations and significance.
(v) Gene mutation and molecular mechanism of its origin.
(vi) Extra-nuclear genetic system.
(vii) Eugenics.

Economic Zoology:

(i) Lac Culture
(ii) Sericulture
(iii) Apiculture
(iv) Pisciculture

(v) Elementary idea of the common pests of paddy, wheat , sugarcane and vegetables , their control.
(vi) Vectors of kalazar, malaria and filaria, their biology mode of infection, prevention and control.

Time: 3 Hours] ***PAPER-VII (Theory)*** **[Full Marks: 100**

In all ten questions are to be set out of which number 1 and 2 shall consist of objective (1 x 15 marks and short answers (3 x 5) requiring question respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions, of which quest ion number 1 and 2 shall be compulsory.

(Evolution, Zoogeography & Paleozoology)

Evolution:
(i) Sources of hereditary variations and their role in evolution.
(ii) Principles of evolution; Lamarkism, Neo-Lamarkism, Darwinism & Neo-Darwinism.
(iii) Isolating mechanisms and their role in evolution.
(iv) Mimicry and colouration.
(v) Fossil history of Horse & Man.
(vi) Introduction to population genetics and Hardy-Weinberg Law

Zoogeography and Paleozoology:
(i) Zoogeographical realms of the world, their boundaries and climatic peculiarities.
(ii) Characteristic & Peculiar fauna of Oriental Ethopian and Australian regions.
(iii) Characteristics of Island fauna.
(iv) Theories & Principles pertaining to animal distribution.
(v) Different geological eras of the world, their duration and climatic conditions.
(vi) Faunistic Peculiarities of Paleozoic, Masozoic and Cenozoic eras.
(vii) fossils, their mode of formation & age determination.

PRACTICAL

Time: 6 Hours] ***PAPER-VIIIA*** **[Full Marks: 50**

(Biochemistry, Physiology & Endocrinology)

1. Biochemistry: **10**

1. Benedicts test for reducing sugar.
2. Molisch's test.
3. Iodine test for starch and glycogen.
4. Ninhydrin reaction for glycine / tyrosine I tryptophan.
5. Millon's reaction for glycine / tyrosine / phenylelanine.

2. Physiology: **7+7 = 14**

Experiments to be performed in frog/ bird/ mammal (Two experiments each of 7 marks)-7 + 7 marks:

1. Enunmeration of total RBC.
2. Estimation of haemoglobine (gm/ 100 ml) in blood.
3. Determination of ESR of blood.
4. Determination of bleeding and clotting time.
5. Determination of O_2 uptake by terrestrial animal.
6. Simple heart-beat and muscle curve by drum method.

3. Dissection and display of any four the following endocrine glands in a mammal gonad, thyroid, adrenal, Pancreas. **8**
4. Identification and comment upon the histological slides (four in number) of the following: Pituitary, Adrenal, Ovary, Testes, Islets Langerhanns, Thymus, Thyroid, Parathyroid and Vaginal smears. **2X4=8**
5. Practical records- **5**
6. Viva- **5**

PRACTICAL

Time: 6 Hours] ***PAPER-VIIIB*** **[Full Marks: 50**

(Cell Biology, Genetics, Paleozoology and Evolution)

1. Cells Biology- **10**

1. Vital staining of secretary granules in Salivary glands of Cockroach and Mitochondria in the buccal epithelium.

2. **Genetics:** **8**

1. Acetocarmine stained squash preparation of the onion root tips and testes of grasshopper to demonstrate stages of mitotic and meiotic divisions respectively.

2. Acetocarmine preparation of the giant chromosomes of the chironomus/drosophila larvae.

3. **Evolution and Paleontology:** **12**

1. Serial homology is exhibited by the appendages of prawn.

2. Homology and Analogy as exhibited by the wings of birds, bat and insect.

3. Adaptive radiation as exhibited by beaks of birds and dentition of mammals.

4. Study of Fossils.

4. Identification and comments upon the specimens/slides on Economic Zoology (3) **2X5=10** and Cytology (2).

5. Practical Record **5**

6. Viva **5**

B. Sc. Part - III:- ZOOLOGY (GENERAL)

THEORY

Time: 3 Hours] ***PAPER-IIIA*** **[Full Marks: 75**

Five questions are to be set from each group. Students shall answer five questions attempting not more than three from any group.

GROUP -A

Ecology : 1. Concept of Biosphere; **2**. Definitions structure and functions of a typical ecosystem; **3**. Major Ecosystems of the world and their features; **4**. Pond ecosystem and Forest ecosystem; **5**. Physical and Biotic factors ; **6**. Biogeochemical Cycles of Oxygen, Nitrogen and Carbon; **7**. Energy flow in Ecosystems. **Animal Behaviour**: (i) Scope of Ethology; Innate and Learned Behaviour. (ii) Parental care in fishes and Amphibias. (iii) Social Behaviour in insects. (iv) Migratory behaviour in birds.

GROUP -B

Palaezoology and Zoogeography: (i) Different geological eras of the world, their climatic conditions and fauna. (ii) Zoogeographical realms of the world and their boundaries. (iii) Biogeographical distribution of animals in Oriental, Ethiopian and Australian regions. (iv) Fossils and their mode of formation. **Economic Zoology**: (i) Sericulture-Lac Culture and Pisciculture. (ii) Preliminary idea of the common pests of Paddy & Wheat, their control. (iii) Vectors of Kalazar, Malaria, Filaria their prevention and control.

PRACTICAL

ZOOLOGY (GENERAL)

PAPER - IIIB

Ecology, Animal Behaviour, Palaozoology, Zoogeography & Economic Zoology.

Time: 3 Hours] **[Full Marks: 25**

1. Quantitative estimation of disolved O_2 in water with the help of winkler ' s volumetric method. **2**. Determination of *pH* of different water samples-3 marks. **3**. Moisture content of soil, identification and comment on the organisms present in water soil samples-5 marks, **4**. Identification and comment on the specimens (spotting) on-**6 marks:** (i) Palaeozoology-Fossils. (ii) Economic zoology-Silk yarn, Larva, Pupa Adults of silk worm.

Lac sticks, Lac insect, fishing gears, Meseum specimens showing parental care; Mouth parts of male and female Culex, Anopheles, Sand fly and their different development stages.

5. Practical records-**5 marks.**