

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. Bionomic general characters and classification (upto orders) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes Aschelminthes Annelida, Arthropoda, 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 Ctenophora affinities of the phylum.
5. Platyhelminthes Fasciola hepatica. Planaria and Planaria.
6. **Aschelminthes:** Ascaris lumbricoides, Wuchereria bancrofti.
7. **Annelida:** Pheretima posthuma, Leech, Nereis.
8. **Arthropoda:** Palaemon, Peripatus, Adaptive variations in insect mouth parts. Sacculina.
9. **Ectoprocta:** Bugula.
10. **Mollusca:** Unio, Pila, Sepia, Torsion and detorsion in Gastropoda.
11. **Echinodermata:** Asterias larval form in Echinoderm.

Time: 3 Hours]

PAPER-IIA

[Full Marks: 75

(Ecology, Animal Behaviours and Biometry)

I. **Ecology:**

1. Concept of Biosphere (Lithosphere, hydrosphere and atmosphere).
2. Ecosystem: Definition, structure and function of typical ecosystem, major ecosystems of the world.
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.
6. Wild- life conservation.

II. Animal Behaviour:

1. Scope of Ethology, Innate and learned behaviour.
2. Social behaviour in insects.
3. Parental care in fishes and amphibia.
4. Brooding, nesting and migratory behaviour 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 Chisquare test.

PRACTICAL
ZOOLOGY PART-I (HONOURS)

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

1. Dissection: 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: Paramoecium Gemmules, Spicules, Obelical colony, Nephridia and Ovary of Pheretima Jaw of Leech, statocyst of prawn, osphradium, radulla and gill of pila of unio Glochidium larvae, of crustacean and Echinodermata, Pedicellaria.

3. Spotting (Each of two marks): (i) Museum specimens (ii) Slides (iii) Specimens relating animal behaviour or parental care.

4. Ecology: (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: Calculation of the arithmetic mean and standard deviation of the samples provided.

6. Record and field work.

7. Viva.

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: General characters and classification (up to orders) of the following phyla-Protozoa, Perifera, Coelenterata, Platyelminthes, Aschelminthes, Annelida, Arthropoda, Mollesca, Echinodermata and Homichordata. Detailed study of the structure and life-history of the following types.

(i)	Protozoa	Paramecium
(ii)	Perifera	Sycon
(iii)	Cnideria	Obelia
(iv)	Platyhelminthes	Fasciola
(v)	Aschelminthes	Ascaris
(vi)	Annelida	Pheretima
(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 organelles-Plasma membrane, Endoplasmic reticulum, Mitochondria, Golgi body, Ribosomes, Chromosome, Lysosome.
- (iii) Structure and function of DNA.
- (iv) Gene Mutation
- (v) Linkage and Crossing over.

2. Evolution:

- (i) Sources of hereditary variation and their role in evolution.
- (ii) Darwin's theory of Natural selection & New-Darwinism.
- (iii) Isolating mechanisms and their role in evolution.

PRACTICAL
ZOOLOGY PART-I (SUBSIDIARY & GENERAL)

Time: 3 Hours]

[Full Marks: 25

1. **Pherotima:** Reproductive system, nervous system, Alimentary canal.
Palaeinon: Alimentary canal, Nervous system .
Pila: Alimentary canal, Nervous system, Organs of Pallial Complex.
2. **Mounting (Permanent stained preparation):** Septal nephridia, Ovary
Setae of Earthworm, Statocyst of Prawn, Radula and Osphradium of Pila.
3. **Spotting:** (a) Muscum specimens (b) Slides (c) Evolution.
4. **Cytology:** Squash preparation to show stages of Mitosis. (Onion root tips) and Meiosis (Grasshoper testis Or Giant chromosomes of Chironomous/Drosophile larvae.
5. **Practical records.**

B. Sc. Part - II:- ZOOLOGY (HONOURS)**PAPER-III (Theory)**

1. Origin and evolution of chordates.
2. Binomics, General characters and classification of the chordates (upto order) of the following groups. Protochordate, cyclostemate fishes, Amphibia, Reptillia, Aves & Mammalia.
3. **Study of the following Types:**
 - (a) **Urochordata** - General organisation and life cycle of Hormani & Salpa.
 - (b) **Cephalochordate** - Amphioxus. (c) **Cyclestomata** - Petromyzon. (d) **Fishes-** (i) Labeo or any bony fish scoliodox (ii) Distribution general organisation and affinities of Dipnoi, Accessory respiratory organs in fishes. (e) **Amphibia-**(i) Origin evolution of Amphibia (ii) Neoteny. (f) **Reptilia-**1. Biting and feeling Mechanism in Snakes. 2. Any Lizard. (g) **Aves-**(i) Columba (ii) Origin of Birds (iii) Flight adaptations. (h) **Mammals-**(i) Characters and distribution of Protothertria Metetheria (ii) General organisation of primates. Note-In all ten questions are to be set out of which number 1 and 2 shall consist to objective (1 x 15 marks) 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.

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) Gastrointestinal tract. (iii) Respiratory systems, (iv) Heart, Aortic arches. (v) Brain, (vi) Evolution and fate of kidney, urinogenital ducts, gonads, (vii) Evolution of chonda-Splanchno & osteocranium.

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

PRACTICAL
ZOOLOGY PART-II HONOURS

Time: 6 Hours]

PAPER-III B & VI B

[Full Marks: 50

1. Dissections.

(i) Seoliodon and any Bony fish - Afferent and efferent branchial vessels : (V, VII, IX, X) cranial nerves; Eywe muscles and their nerve supply; Internal ear; necessary 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 tendons).

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

2. Mounting: Velum and Oralhood of Amphioxus, Ampulla of Lorenzini, respiratory membrane 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: (i) Musecum specimens 2

(ii) Slides Histology & Embryology 4

(iii) Bones Limbs 1

of Frog Girdles-3 Skull 1

Varanus vertebrate 1

Fowl & Rabbit 5

5. Record and field work

6. Viva-voce

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 (CHORDATE)

1. Binomica, (General Characters and Classification up to orders only) of living chordates of the following groups: protochordate Cylostomata, pisces, Amphibia, Reptilia, Avas and Mammalia.
2. Study of the following types:
 - (i) Urochordate - Herdmania (including reterogressive metamorphosis),
 - (ii) Cephalochordate- 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. (iv) Mammals-Characters, distribution and affinities of Prototheria & Metatheiria.
3. Comparative study of the following in Vertebrates Intequent, Heat, 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) Placeta in Marmals 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 & Pitutary.

PRACTICAL
ZOOLOGY PART-II (SUBSIDIARY & GENERAL)

Time: 5 Hours]

[Full Marks: 25

1. Dessection
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.
Scales of fishes pecten and Filoplume feather of birds, Ampulla of Lorenzini.
3. Spotting Museum specimen-I.
Bones-3 (Limb) girdle, Skull, Vertebrate of varanus and fowl.
4. Slides-I (Endocrinology & Embryology) 2 x 2
(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.

B. Sc. Part - III:- ZOOLOGY (HONOURS)**Time: 3 Hours]****PAPER-V (Theory)****[Full Marks: 100****Biochemistry, Physiology & Endocrinology**

Biochemistry: (i) Structure and classification of Protein. Carbohydrate & fats. (ii) Structure and classification of Amino acids. (iii) Metabolism of Carbohydrate Glycolysis-Glycogenesis and Krebs's cycle. (iv) Beta oxidation of fatty acids. (v) Vitamins -Definition, Types and functions. (vi) Ph, buffers and electrolyte dissociation.

Physiology (Mammals): 1. Physiology of digestion. 2. Physiology of Respiration (Ventilation of lungs and transport of gases). 3. Physiology of excretion and Osmoregulation 4. Physiology of Blood coagulation. 5. Mechanism of thermo regulation. 6. Acid base balance. 7. 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.

Note : 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 question numbered 1 and 2 shall be compulsory.

Time: 3 Hours]**PAPER-VI (Theory)****[Full Marks: 100****(Cell Biology, Genetics and Economic Zoology)**

Cell Biology: 1. Ultrastructure & function of the following cell organism Plasma membrane, mitochondria & golgi complex. 2. Gametogenesis, fertilization and Parthenogenesis. 3. Ribosome & Protein synthesis. 4. Genetic code, Transcription & Translation. 5. Chromosomes & Giant chromosomes. 6. Active transport across cell membrane.

Genetics: (i) Linkage and crossing over. (ii) Structure and Replication of DNA; transcription and translation. (iii) Chromosomal aberrations the genetic and cytological manifestations and significance. (iv) Genemutation and molecular mechanism of its origin. (v) Extra-nuclear genetic system. (vi) 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 kala-azar, malaria and filariasis, their Biology mode of infection, prevention and control. (vii) Wild-life conservation.

Note: 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.

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

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

Note: 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.

PRACTICAL**Time: 6 Hours]****PAPER-VIIIA****[Full Marks: 50****(Biochemistry, Physiology & Endocrinology)**

1. Biochemistry: 1. Benedict's test for reducing sugar. 2. Molisch's test. 3. Iodine test for starch and glycogen. 4. Ninhydrin reaction for glycine / tyrosine / tryptophan. 5. Millan's reaction for glycine / tyrosine / phenylethylamine.

2. Physiology: Experiments to be performed in frog/ bird/ mammal (Two experiments each of 7 marks)-7 x 7 marks: 1. Enumeration of total RBC. 2. Estimation of haemoglobin (gm/ 100 ml) in blood. 3. Determination of ESR of blood. 4. Determination of bleeding and clotting time. 5. Determination of O₂ 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.

4. Identification and comment upon the histological slides (four in number) of the following: Pituitary, Adrenal, Ovary, Testes, Islets Langerhans, Thymus, Thyroid, Parathyroid and Vaginal smears.

5. Practical records-5 marks. 6. Viva-5 marks.

PRACTICAL**Time: 6 Hours]****PAPER-VIII B****[Full Marks: 50****(Cell Biology, Genetics, Paleozoology and Evolution)**

Cells Biology-10 marks: 1. Vital staining of secretory granules in Salivary glands of Cockroach and Mitochondria in the buccal epithelium.

Genetics: 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 chironomid/drosophila larvae.

Evolution and Paleontology: 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. Identification and comments upon the specimens/slides on Economic Zoology (3) and Cytology (2).

Practical Record-5 marks. Viva-5 marks.

B. Sc. Part - III:- ZOOLOGY (GENERAL)**THEORY****Time: 3 Hours]****PAPER-III A****[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 Amphibians. (iii) Social Behaviour in insects. (iv) Migratory behaviour in birds.

GROUP -B

Palaeozoology 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, Filariasis their prevention and control.

PRACTICAL**ZOOLOGY (GENERAL)****PAPER - IIIB****Ecology, Animal Behaviour, Palaeozoology, Zoogeography & Economic Zoology.****Time: 3 Hours]****[Full Marks: 25**

1. Quantitative estimation of dissolved O₂ 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, Museum specimens showing parental care; Mouth parts of male and female Culex, Anopheles, Sand fly and their different development stages.

5. Practical records-5 marks.