

# 3. ZOOLOGY

## B.Sc. Part-I

Scheme:

Max. Marks: 100

Min. Pass Marks: 36

Paper I	: 3 Hrs duration	33 Marks
Paper II	: 3 Hrs duration	33 Marks
Paper III	: 3 Hrs duration	34 Marks
Practicals	: 4 Hrs. duration	50 Marks

### NOTE:

1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering the entire syllabus.  
Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, *i.e.*, three from each unit /section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

### PAPER – I: Z-101

### DIVERSITY OF ANIMALS

#### Section – A

#### Biosystematics and Taxonomy

1. General principles of taxonomy, concept of five kingdom scheme, international code of nomenclature, cladistics, molecular taxonomy.
2. Concept of Protozoa and Metazoa, and levels of organization.
3. Taxonomy and basis of classification of non-chordata and chordata: symmetry, coelom, segmentation and embryogeny.
4. Detailed classification of Non- chordata and Chordata (up to suborders with examples).

#### Section – B

Habitat, Habit, Morphology, Structure, \*Locomotion, Organs and Systems (Digestive, Excretory, Respiratory, \*Osmoregulation, Nervous & Reproductive), Life Cycle, \*Affinities and \*Adaptations.

Note : \* indicates wherever required

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1. **Protozoa**  
:Amoeba,Entamoeba,Paramaecium,Euglena,Plasmodium,Trypanosoma and Leishmania.
2. **Porifera** : Sycon and Leucosolenia.
3. **Coelentrata**: Obelia and Aurelia.

### Section –C

Habitat,Habit,Morphology,Structure ,\*Locomotion, Organs and Systems (Digestive,Excretory,Respiratory,Nervous & Reproductive),Life Cycle,\*Affinities and \*Adaptations.

**Note** : \* indicates wherever required

1. **Ctenophora** : Beroe
2. **Platyhelminthes** ; *Fasciola hepatica* and *Taenia solium*.
3. **Aschelminthes** : *Ascaris*, *Dracunculus* and *Wuchereria*.
4. **Annelida** : Neries and Leech.

## PAPER – II: Z-102

### CELL BIOLOGY AND GENETICS

#### Section – A

##### Cell Biology

1. Introduction to cell: Morphology, size, shape, characteristics and structure of prokaryotic and eukaryotic animal cell; basic idea of virus and cell theory.
2. Cell membrane: Characteristics of cell membrane molecules, fluid–mosaic model of Singer and Nicholson, concept of unit membrane.
3. Cell membrane transport: Passive (diffusion and osmosis, facilitated, mediated) and active transport.
4. Cytoplasmic organelles:
  - (i) Structure and biogenesis of mitochondria; electron transport chain and generation of ATP molecules.
  - (ii) Structure and functions of endoplasmic reticulum, ribosome (prokaryotic and eukaryotic) and Golgi complex.
  - (iii) Structure and functions of lysosome, microbodies and centrioles.
  - (iv) Structure and functions of cilia, flagella, microvilli and cytoskeletal elements.

#### Section – B

1. **Nuclear Organization**:
  - (i) Structure and function of nuclear envelope, nuclear matrix and nucleolus.
  - (ii) Chromosomes: Morphology, chromonema, chromomeres, telomeres, primary and secondary constrictions, chromatids, prokaryotic chromosome.
  - (iii) Giant chromosome types: Polytene and Lampbrush.
  - (iv) Chromosomal organization: Euchromatin, heterochromatin and folded fiber model and nucleosome concept.

2. **Nucleic Acids:**
  - (i) DNA structure, polymorphism (A, B and Z types) and replication (semi conservative mechanism) experiments of Messelson and Stahl: elementary idea about polymerases, topoisomerases, single strand binding proteins, replicating forks (both unidirectional and bidirectional), leading and lagging strands, RNA primers and Okazaki fragments, elementary idea about DNA repair.
  - (ii) RNA structure and types (mRNA, rRNA and tRNA) and transcription.
3. **Genetic code and translation:** Triplet code, characteristics of triplet code, protein synthesis (translation).
4. **Cell in reproduction:**
  - (i) Interphase nucleus and cell cycle: S, G-1, G-2 and M phase.
  - (ii) Mitosis: Different stages, structure and function of spindle apparatus; anaphasic movement.
  - (iii) Meiosis: Different stages, synapses and synaptonemal complex, formation of chiasmata and significance of crossing over.

### Section – C

#### Genetics

1. Mendelism: Brief history of genetics and Mendel's work; Mendelian laws, their significance and current status, chromosomal theory of inheritance.
2. Chromosomal mutations: Classification, translocation, inversion, deletion and duplication; Variations in chromosome numbers; haploidy diploidy, polyploidy, aneuploidy, euploidy and polysomy.
3. Linkage and crossing over, elementary idea of chromosome mapping.
4. Genetic interaction: Supplementary genes, complementary genes, duplicate genes, epistasis, inhibitory and polymorphic genes.
5. Multiple gene inheritance: ABO blood groups and Rh factor and their significance.
6. Cytoplasmic inheritance.
7. Sex determination in *Drosophila* and man, pedigree analysis.
8. Genetic disorders: Down's, Turner's and Klinefelter's syndromes, color blindness, Hemophilia, Phenylketonuria.
9. Concept of gene: Recon, muton and cistron.


### PAPER – III: Z-103

### GAMETE AND DEVELOPMENTAL BIOLOGY

#### Section – A

#### Developmental Biology: Scope and Early Events

1. Historical review, types and scope of embryology.
2. Gametogenesis:
  - (i) Formation of ova and sperm.
  - (ii) Vitellogenesis.
3. Fertilization: Activation of ovum, essence of activation: Changes in the organization of the egg cytoplasm.
4. Parthenogenesis.

  
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## Section – B

### Developmental Biology: Pattern and Processes

1. Cleavage: Definition, planes and patterns of cleavage among non chordates and chordates, significance of cleavage, blastulation and morulation.
2. Fate maps, morphogenetic cell movements, significance of gastrulation.
3. Embryonic induction, primary organizer, differentiation and competence.
4. Development of chick up to 96 hours stage.
5. Embryonic adaptations:
  - (i) Extra embryonic membranes in chick, their development and functions.
  - (ii) Placentation in Mammals: Definition, types, classification on the basis of morphology and histology, functions of placenta.
  - (iii) Paedogenesis and neoteny.

## Section – C

### Dimensions in Developmental Biology

1. Regeneration.
2. Various types of stem cells and their applications.
3. Cloning of animals:
  - (i) Nuclear transfer technique.
  - (ii) Embryo transfer technique.
4. Teratogenesis (Genetic and Induced).
5. Biology of aging.
6. Cell death.

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### Practical – Zoology

**Min. Marks: 18**

**4 Hrs. / Week**

**Max. Marks: 50**

#### I. Microscopic Techniques:

1. Organization and working of Optical Microscope: Dissecting and compound microscopes.
2. General methods of microscopic slide preparations: Narcotization; fixing and preservation; washing; staining; destaining; dehydration; clearing and mounting.
3. General idea of composition, preparation and use of:
  - (i) Fixatives: Formalin, Bouin's fluid.
  - (ii) Stains: Aceto-carmin, Aceto-orcin, Haematoxylin, Eosin.
  - (iii) Common reagents: Normal saline, Acid water, Acid alcohol and Mayer's albumin.
4. Collection and Culture Methods:
  - (i) Collection of animals from their natural habitat during field trips such as *Amoeba*, *Paramecium*, *Euglena*, *Daphnia*, *Cyclops*, etc.
  - (ii) Culture of *Paramecium* in the laboratory and study of its structure, life – processes and behavior in live state.

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## II. Study of Microscopic Slides and Museum Specimens:

**Protozoa:** *Amoeba*, *Euglena*, *Trypanosoma*, *Giardia*, *Entamoeba*, *Elphidium* (*Polystomella*), *Foraminiferous shells*, *Monocystis*, *Plasmodium*, *Paramecium*, *leishmania*, *Paramecium* showing binary fission and conjugation, *Opalina*, *Nyctotherus*, *Balantidium*, *Vorticella*.

**Porifera:** *Leucosolenia*, *Euplectella*, *Spongilla*, T. S. Sycon, Spicules, Spongin fibers, Gemmules.

**Coelenterata:** *Millepora*, *Physalia*, *Veella*, *Aurelia*, *Alcyonium*, *Gorgonia*, *Pennatula*, Sea anemone, Stone corals, *Obelia* colony and medusa.

**Ctenophora:** Any Ctenophore

**Platyhelminthes :** *Taenia*, *Planaria*, *Fasciola* (WM), T. S. body of *Fasciola*, *Miracidium*, *Sporocyst*, *Redia* and *Cercaria* Larvae of *Fasciola*, *Scolex*, T. S. mature proglottid of *Taenia*, gravid proglottid, *Cysticercus* larva.

**Aschelminthes :** *Ascaris*, *Wuchereria*, *Dracunculus*

**Annelida :** *Neries*, *Heteroneries*, *Arenicola*, *Aphrodite*, *Chaetopterus*, *Tubifix*, *Glossiphonia*, *Pontobdella*, *Polygordius*.

## III. Anatomy:

**Earthworm:** External features, general viscera, alimentary canal, reproductive system and nervous system.

**Leech:** External features, alimentary canal, reproductive and nervous system.

## IV. Study of the Following Through Permanent Slide Preparation: *Paramecium*, *Euglena*, Foraminiferous shells, Sponge spicules, Spongin fibres, Gemmule, *Hydra*, *Obelia* colony and Medusa; Parapodium of *Nereis* and *Heteronereis*.

## V. Exercises in Cell Biology:

1. Squash preparation for the study of mitosis in onion root tip, permanent slides of mitosis (all stages).
2. Squash preparation for the study of meiosis in grasshopper or cockroach testes, permanent slide of meiosis (all stages).
3. Study of giant chromosomes in salivary glands of *Chironomus* or *Drosophila* larva.
4. Study of cell permeability using mammalian R.B.C.


## VI. Exercises in Genetics:

### A. Study of *Drosophila*:

1. Life cycle and an idea about its culture
2. Identification of male and female
3. Identification of wild and mutants (yellow body, ebony, vestigial wing and white eye)
4. Study of permanent prepared slides: Sex comb and salivary gland chromosomes.

B. Numerical problems based on monohybrid and dihybrid cross.

C. Identification of blood groups (A, B, AB, O & Rh factor)

  
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## VII. Developmental Biology:

## 1. Study of development of frog/toad with the help of Charts/Slides/Models:

- (i) Eggs, cleavage, blastula, gastrula, neurula, tail-bud, hatching, mature tadpole larvae, metamorphic stages, toadlet / froglet.
- (ii) Histological slides: Cleavage, blastula, gastrula, neurula and tail-bud stage.

## 2. Study of development of chick with the help of whole mounts/Charts/Slides/Models

- (i) 18 hrs, 21 hrs, 24 hrs, 33 hrs, 48 hrs, 72 hrs and 96 hrs of incubation.
- (ii) Primitive streak stage in living embryo, if possible, after removal of the blastoderm from the egg.
- (iii) Study of the embryo at various stages of incubation *in vivo* by making a window in the egg-shell may also be demonstrated.
- (iv) Study of various foetal membranes in a 10-12 day old chick embryo.

## B.Sc. Part - I

## Scheme of Practical Examination and Distribution of Marks

Time: 4 Hrs.

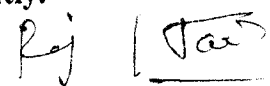
Min Pass Marks: 18

Max. Marks: 50

	Regular	Ex. /N.C. Students
1. Anatomy (any system)	6	5
2. Permanent Preparation	4	7
3. Cell Biology and Genetics	4+4	6+6
4. Developmental Biology	6	5
5. Identification and comments on Spots (1 to 8)	16	16
6. Viva Voce	5	5
7. Class Record	5	-
	<b>50</b>	<b>50</b>

## Notes:

1. Anatomy: Study of systems of the prescribed types with the help of dissection.
2. With reference to microscopic slides, in case of non-availability, the exercise should be **substituted with diagrams / photographs.**
3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.
5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
6. **It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.**

  
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