B.Sc. Part II Examination, 2025

ZOOLOGY

There shall be three written papers of three hours duration each.

Theory

Max. Marks: 150 (Min. Pass Marks; 54)

Paper I: Chordate Structure and function - 50

Paper II: Developmental Biology - 50

Paper III: Immunology, Microbiology and Biotechnology 50

Practical:

Max. Marks - 75 (Min. Pass Marks; 27)

Duration of Theory examination - 3 hours

Duration of practical examination - 5 hours

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section – C.

Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark.

Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.

Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks

PAPER I

Chordate Structure and Function

Unit 1: Classification and characters of phylum Chordata (excluding extinct forms) up to orders, Comparisons of habit, habitat, external features and anatomy of *Balanoglossus*, *Herdmania* and *Branchiostoma* (excluding development).

Unit 2: Ascidian tadpole larva and its Metamorphosis, Affinities of Hemichordate, Urochordate and Cephalochordates, Habit, Habitat and salient features of Petromyzon, Ammocoete larva.

Unit 3: Integument including structure and development of placoid scales, feathers and hairs, Jaw suspensorium, limbs and girdles of *Rana, Uromastix, Columba* and *Oryctolagus*.

Unit 4: Heart and aortic arches, respiratory system and alimentary canal of *Scoliodon, Rana, Uromastix, Columba* and *Oryctolagus*.

Unit 5: Brain, urinogenital system (*Scoliodon, Rana, Uromastix, Columba* and *Oryctolagus*), Identification of poisonous and non poisonous snakes. Biting mechanism in snakes, flight adaptations in birds. Adaptations in aquatic mammals.

PAPER II

Developmental Biology

Unit 1: Formation of egg and sperm, vitellogenesis and fertilization. Types of eggs and sperms, parthenogenesis, regeneration.

Unit 2: Planes and patterns of cleavage in chordates, significance of cleavage and blastulation, Morphogenetic cell movement, Fate maps and significance of gastrulation.

Unit 3: Development of *Branchiostoma* (*Amphioxus*) up to gastrulation; chick egg and its development up to the formation of primitive streak, Extra embryonic membranes of chick, development of placenta in rabbit, types and functions of placenta in mammals.

Unit 4: Various types of stem cells and their applications (with special reference to embryonic stem cells),Cloning of animals: nuclear embryonic transfer technique, nuclear transfer technique; Identical, Siemese and fraternal twins and Artificial insemination.

Unit 5: Organogenesis of alimentary canal, eye, kidney, gonads and brain in mammal.

PAPER III

Immunology, Microbiology and Biotechnology

Unit 1: Types of immunity (innate and acquired, humoral and cell mediated), Antigen: Antigenicity of molecules, haptens, Antibody: Structure and functions of each class of immunoglobulins (IgG, IgM, IgD, IgA and IgE), antigen – antibody reactions.

Unit 2: Theory of spontaneous generation; Germ theory of fermentation and diseases: Works of Louis Pasteur, John Tyndal, Rober-Koch and Jenner, Bacteria: Cell membrane, patterns of arrangement; structure of capsule and cell envelops; organization of cytoplasmic membrane of Gram - negative and Gram - positive strains, Genetic material of bacteria: (i) Chromosome (ii) Plasmids.

Unit 3: Asexual and sexual reproduction in Bacteria, Culture of Bacteria: Carbon and energy source, Nitrogen and minerals and Organic growth factors, Effect of environmental factors on bacterial culture: Temperature, hydrogen ion concentration; Medical importance of Gram-negative and Gram-positive bacteria.

Unit 4: Recombinant DNA technology: Introduction and principles, restriction endonucleases, cloning vehicles (plasmids, bacteriophages); methods of gene transfer and applications.

Unit 5: Environmental Biotechnology (outline idea only): Metal and petroleum recovery, pest control, waste-water treatment, Food, Drink and Dairy Biotechnology (outline idea only): Fermented food production: dairy products, alcoholic beverages and vinegar: microbial spoilage and food preservation.

Practical

1. Study of microbes in food material (like curd, etc.)
2. Bacteria culture
3. Demonstraton of dissection:

Scoliodon : General anatomy, alimentary canal, afferent and efferent blood vessels, urinogenital system, brain and cranial nerves – V, VII, IX and X only and internal ear *Labeo / Wallago,* Brain V, VII, IX and X Cranial nerves, afferent and efferent blood vessels, air sacs, and internal ear.

Rattus: General anatomy, digestive, blood vascular and urinogenital systems

4. OSTEOLOGY

Articulated and disarticulated skeleton of *Rana, Varanus, Gallus* and *Oryctolagus*

5. PERMANENT PREPARATIONS

Scoliodon: Placoid scales, Ampulla of Lorenzini.

6. Identification, systematic position and comments of the following animals: Cephalochordata: *Amphioxus,* Hemichordata: *Balanoglossus*

Urochordata: *Salpa, Doliolum* and *Herdmania*

Cyclostomata: Petromyzon and Myxine

Pisces: *Zygaena, Scoliodon, Pristis, Torpedo, Trygon, Protopterus, Labeo, Heteropneustis* (*Saccobranchus*), *Belone, Exocoetus, Anabas* and *Echeneis* Amphibia: *Necturus, Amphiuma, Amblystoma, Axolotal larva, Hyla, Uraeotyphlus* Reptilia: *Trionyx, Chelone, Varanus, Uromastix, Ophiosaurus, Naja, Bungarus, Echis, Hydrophis, Eryx, Ptyas, Crocodilus* and *Gavialis*

Aves: *Columba, Pavo, Choriotis, Francolinus, Streptopelia*

Mammalia: *Meriones, Funambulus, Rattus, Hemiechinus, Suncus, Ptecopus, Presbytis* and *Macaca*

7. Microscopic Study

Hemichordata: Section through proboscis and branchiogenital region *Branch stoma:* T.S. oral hood, pharynx, gonads, intestine and caudal region *Scoliodon*: T.S. gill and scroll valve

Rana: T.S. through various organs, T.S. and L.S. of developmental stages Reptilia: V.S. skin of lizard

Aves: V.S. skin, different types of feathers

Chick embryology: Whole mounts of embryos of 18, 24, 33, 48 and 72 hours Mammalia: T.S. through various organs

Note: Each regular student is required to keep a record of practical work done by him/her duly checked by the teacher which will be submitted at the time of practical examination.

Distribution of Marks

Maximum Marks: 75	Minimum Pass Marks: 27	
	Regular	Ex.
Diagrammatic presentation of dissection	05	06
Permanent preparation	10	12
Spots (Ten)	30	30
Experimental Zoology	10	12
Viva-voce	10	15
Practical Record	10	---
Total	**75**	**75**