

SEM - I

<i>Paper</i>	<i>Module</i>	<i>Course content</i>	<i>Marks</i>
<i>Paper 1</i>	<i>Module - BGCZ-01TH</i>	<i>Non-Chordate – Structure and Function</i>	<i>50</i>
<i>Paper 2</i>	<i>Module - BGCZ-02TH</i>	<i>Biochemistry and biotechnology</i>	<i>50</i>
<i>Paper 3</i>	<i>Module - BGCZ-03TH</i>	<i>Cell and tissue</i>	<i>50</i>
<i>Paper 4</i>	<i>Module - BGCZ-04TH</i>	<i>Methods in biology – I</i>	<i>50</i>
<i>Paper 5A</i>	<i>Module - BGCZ-05PR</i>	<i>Non-Chordate</i>	<i>30</i>
<i>Paper 5B</i>	<i>Module - BGCZ-06PR</i>	<i>Biochemistry</i>	<i>30</i>
<i>Paper 5C</i>	<i>Module - BGCZ-07PR</i>	<i>Methods in biology – I</i>	<i>40</i>

THEORY PAPER - 1

Module - BGCZ-01TH

Non-Chordate - Structure and Function

1. Protozoa - Forms and Function

Nucleus and Reproduction

Feeding and Digestion

Foraminifera - General outline and Importance

2. Porifera - Forms and Function

Exoskeleton - Cell types and Spicules

3. [Cnidaria](#) - Forms and Function

Nematocysts

4. [Helminthes](#) - Forms and Function

Tegument and Muscles

Larval forms

5. [Mollusca](#) - Forms and Function

Modifications of foot

Nutrition - microphagy and microphagy

Sense Organs

6. [Annelida](#) - Forms and Functions

Movement - Hydrostatic skeleton

Metamerism

7. [Arthropoda](#) - Forms and Functions

Movement - Insect flight

Nutrition - Diversity of Mouth parts

Sense Organs - Compound eyes

Respiratory pigments

8. [Echinodermata](#) - Forms and Functions

Water vascular system and internal transport

Development - Larval forms and their significance

9. Minor Phyla - Forms and Functions

Rotifera - General outline with special reference to cyclomorphosis

Bryozoa - General outline

Theory PAPER - 2

Module - BGCZ-02TH

Biochemistry and Biotechnology

Biochemistry

1. Structure of atom. Molecules and chemical bonds. VSEPR theory, isomerization, configuration. D/L and R/S forms, conformation, cyclic and acyclic system.
2. Composition, structure and function of biomolecules (Carbohydrates, lipids, Proteins, Nucleic acids and vitamins)
3. Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, and biological energy transducers. Carbohydrate glycocalyx pentose phosphate pathway.
4. Principals of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes, allosterity.
5. Metabolism of carbohydrates, lipid, amino acids nucleotides and vitamins.
6. Malfunction., genetic defects of metabolism.

Biotechnology

1. Animal Cell and Tissue Culture Technology - Cell culture laboratory design and equipments
Media & reagents, Different types of cell culture, application, scale up.
2. Biotechnology in the improvement of livestock - breeding and manipulation of fish and livestock, androgenesis and gynogenesis and polyploidy in fish, gene manipulation in dairy industry.
3. Reproductive Biotechnology - cryopreservation, hybridization, polyploidy and Transgenesis in fish, assisted reproductive technology, In vitro fertilization and embryo transfer, ICSI, sperm sexing.
4. Gene & Somatic cloning techniques - Animals as Bioreactors, knockout model systems & their utility.
5. Environmental Biotechnology - bioprocess technology, bioassay and biosensors in ecotoxicological screening, biomarkers in ecotoxicological screening.
6. Medical Biotechnology - Disease Diagnostic markers. Gene therapy, mechanism of gene therapy, drug delivery and targeting.

Theory paper 3

Module - BGCZ-03TH

Cell & Tissue

1. Membrane structure & Function: Structure of model membrane; lipid bilayer and membrane protein diffusion, osmosis, Ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.
2. Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and role of different adhesion molecules, gap junctions,

extracellular matrix, integrins, neurotransmission and its regulation.

3. Structural organization and function of intracellular organelles : Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.

4. Organization of chromosomes: Structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons.

5. Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

6. Apoptosis and Necrosis.

7. Microbial Physiology: growth, yield and characteristics, strategies of cell division, stress response.

8. Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways (RTK & JAK-STAT pathways), second messengers, regulation of signaling pathways, bacterial and plant two component signaling systems, bacterial chemotaxis and quorum sensing.

TISSUE

1. Epithelial Tissue - Basic Organization, Types, Ultrastructure of sebaceous Gland.

2. Connective Tissue - Basic Organization, Types, Collagen.

3. Muscular Tissue - Basic Organization, Types, Muscle Contraction (Molecular Basis).

4. Skeletal Tissue - Basic Organization, Types.

Theory paper - 4

Module - BGCZ-04TH

Methods in Biology – I

1. Microtomy, Tissue, preparations and Staining.
2. Fixation and Techniques in Microscopy. TEM, SEM, STEM, freeze-etch, freeze-fracture.
3. Centrifugation - Principles, Differential and Density gradient, Sedimentation Coefficient.
4. Gel electrophoresis and chromatography.
5. Purification of Biomolecules.
6. Sequencing of peptides.
7. pH and Buffer.
8. ELISA. Western Blotting and RIA.
9. Methods of Estimating Population.
10. Remote Sensing and GIS Techniques.
11. Behavioral Studies.
12. Xenobiotics and Toxicology - LC50 and LD50 determination, Xenobiotic translocation, biological indicators of pollution, methods for biological assessment of the effects of waste on aquatic organisms, determination of heavy metal accumulation by AAS method, bio marker study.
13. Modern techniques in fishery and management - techniques of stock improvement, breeding, disease management, and fish seed raising technologies, culture system.

PRACTICAL

PAPER - 5A

Module - BGCZ - 05PR

Non-chordates

- Identification of museum species.

Major Dissections

- Stomatogastric Nervous System of Cockroach.
- Reproductive System of Grasshopper.
- Reproductive and Nervous System of Achatina.
- Reproductive System of Earthworm.

Minor Dissections

- Mouth parts of Mosquito - Identification of genera and sex
- Sting of Honey Bee.
- Setae and Nerve Ring of Earthworm.
- Identification of Museum Specimens.

PAPER - 5B

Module - BGCZ-06PR

Biochemistry

- Preparation of Buffer
- Estimation of sugar of blood and urine
- Qualitative and Quantitative estimation of protein - Lowry and Bradford's methods
- Estimation of hemoglobin content
- Determination of ESR
- Determination of amino acid/amino nitrogen /ammonia
- Spectrophotometric analysis of DNA and protein purity
- Assay of an enzyme

PAPER - 5C

Module - BGCZ-07PR

Methods in Biology

- 1.**Microtomy, sectioning and staining.
- 2.**Camera Lucida drawing, micrometry
- 3.**Gel Electrophoresis
- 4.**Quadrat sampling of population study.
- 5.**Nesting behavior of any one bird/insect
- 6.**Xenobiotics - LD50,LC50
- 7.**Computer Application - Basic Theories, MS-Word, MS-Excel, PowerPoint, Internet, html etc.

8.Preparation of pituitary extracts from major carps and hypophysation techniques.

9.Visit to a fish farm in West-Bengal.