SHRI GNANAMBICA DEGREE COLLEGE, MADANAPALLE

(AUTONOMOUS)

PROGRAMME: B.SC. HONOURS IN BIOTECHNOLOGY

(W.E.F. ACADEMIC YEAR 2025 - 26)
FIRST YEAR FIRST SEMESTER

COURSE 1: INTRODUCTION TO CELL BIOLOGY AND GENETICS

QUESTION BANK

Unit I – Cell Structure and Types

Five Marks Questions

1. Define glycocalyx and mention its functions.
2. Differentiate between prokaryotic and eukaryotic cells (any 5 points).
3. Draw and label a generalized bacterial cell.
4. What is the chemical composition of the cell wall in plants?
5. Compare bacterial and viral cell structures briefly.

Ten Marks Questions

1. Describe the structure and functions of the plasma membrane.
2. Discuss the differences among bacterial, fungal, plant, and animal cells.
3. Explain the structure, function, and composition of the cell wall.
4. Write an account on glycocalyx and its role in pathogenicity.
5. Elaborate on the cell as the basic unit of life with suitable examples.

Unit II – Eukaryotic Sub-Cellular Organization

Five Marks Questions

1. Write a short note on nuclear envelope and its transport mechanisms.
2. What is the role of mitochondria in the cell?
3. Differentiate between smooth and rough endoplasmic reticulum.
4. What are salivary gland chromosomes? Mention their features.
5. List the components of the cytoskeleton and their functions.

Ten Marks Questions

1. Describe the structure and functions of any four eukaryotic organelles.
2. Explain the processes of active and passive transport with examples.
3. Describe the morphology and structural organization of chromosomes.
4. Discuss the structure and function of the Golgi apparatus.
5. Write detailed notes on microtubules, microfilaments, and intermediate filaments.

Unit III – Mendelian Genetics and Chromosomes

Five Marks Questions

1. Define incomplete dominance with an example.
2. Differentiate between prokaryotic and eukaryotic chromosomes.

3. What are multiple alleles? Give an example.
4. Briefly explain Mendel's law of segregation.
5. What are histone proteins? Mention their types.

Ten Marks Questions

1. Explain Mendel's laws of inheritance with suitable examples.
2. Discuss the deviations from Mendel's laws: Incomplete and co-dominance.
3. Write an account on the structure and organization of eukaryotic chromosomes.
4. Explain the concept of multiple alleles with the example of ABO blood group.
5. Describe the packaging of DNA in chromosomes with the role of histones.

Unit IV – Mutagenesis and DNA Repair

Five Marks Questions

1. Define point mutation and give an example.
2. Differentiate between spontaneous and induced mutations.
3. What is mismatch repair?
4. Name any two physical and two chemical mutagens.
5. Write a short note on SOS repair.

Ten Marks Questions

1. Explain the types of gene mutations with examples.
2. Describe the factors responsible for DNA damage.
3. Discuss the various DNA repair mechanisms in detail.
4. Explain the process and significance of excision repair.
5. Write an essay on mutagenesis: types, agents, and applications.

Unit V – Cell Cycle, Cancer, and Apoptosis

Five Marks Questions

1. List the phases of the eukaryotic cell cycle.
2. Differentiate between mitosis and meiosis.
3. What are oncogenes and proto-oncogenes?
4. Define apoptosis and its significance.
5. What are cyclins and CDKs?

Ten Marks Questions

1. Describe the phases of mitosis with diagrams.
2. Explain cell cycle regulation and the role of checkpoints.
3. Write a detailed note on cancer development and metastasis.
4. Compare and contrast cancer cells with normal cells.
5. Discuss programmed cell death (apoptosis) and its role in development.

SHRI GNANAMBICA DEGREE COLLEGE, MADANAPALLE

(AUTONOMOUS)

PROGRAMME: B.SC. HONOURS IN BIOTECHNOLOGY

(W.E.F. ACADEMIC YEAR 2025 - 26)
FIRST YEAR FIRST SEMESTER

COURSE 2: BIOLOGICAL CHEMISTRY

QUESTION BANK

UNIT I: Nucleic Acids

Five Marks Questions

1. Define nucleotides and nucleosides with examples.
2. State Chargaff's rules and explain their significance.
3. Compare A-DNA and Z-DNA.
4. What are the main differences between DNA and RNA?
5. Describe the forces that stabilize the DNA double helix.

Ten Marks Questions

1. Describe the chemical structure of DNA in detail.
2. Describe the chemical structure of RNA in detail
3. Explain the Watson-Crick model of B-DNA with a neat diagram.
4. Discuss the alternative forms of DNA and their structural features.
5. Write an essay on the base composition of nucleic acids and its biological implications.
6. Explain the hydrogen bonding and hydrophobic interactions that stabilize nucleic acids.

UNIT II: Carbohydrates and Lipids

Five Marks Questions

1. Define monosaccharides, disaccharides, and polysaccharides with one example each.
2. Differentiate between saturated and unsaturated fatty acids.
3. Write a note on heteropolysaccharides with examples.
4. What are triglycerides? Mention their structure.
5. Mention the structure and role of porphyrins.

Ten Marks Questions

1. Describe the classification and structure of carbohydrates.
2. Explain the structure and function of phospholipids.
3. Write an essay on the chemistry of heme and chlorophyll.
4. Describe the process of β-oxidation of fatty acids.
5. Explain the structure and biological significance of heteropolysaccharides.

UNIT III: Amino Acids and Proteins

Five Marks Questions

1. Classify amino acids based on polarity.
2. Write the structure of any three essential amino acids.
3. Define and differentiate between primary and secondary protein structure.
4. What is a Ramachandran plot? State its importance.
5. Describe the physicochemical properties of amino acids.

Ten Marks Questions

1. Explain the classification of amino acids based on pH, polarity, and nutrition.
2. Describe the four levels of protein structure with suitable diagrams.
3. Write an account of the structure and bonding in proteins.
4. Explain the significance and interpretation of the Ramachandran plot.
5. Discuss the chemical structure and properties of amino acids in detail.

UNIT IV: Enzymes

Five Marks Questions

1. Differentiate between holoenzyme and apoenzyme.
2. Define substrate specificity and explain any two types.
3. What is competitive inhibition? Give an example.
4. Compare lock-and-key and induced-fit models.
5. Define immobilized enzymes and mention two uses.

Ten Marks Questions

1. Explain enzyme classification and nomenclature with examples.
2. Describe the Michaelis-Menten equation and factors affecting enzyme activity.
3. Write a detailed note on enzyme inhibition (competitive, uncompetitive, non-competitive).
4. Explain the structural components of enzymes and the role of cofactors.
5. Discuss the different models of enzyme-substrate interaction with diagrams.

UNIT V: Bioenergetics

Five Marks Questions

1. Define free energy and redox potential.
2. What is a high-energy phosphate bond? Give examples.

3. Mention any three bypass reactions in gluconeogenesis.
4. Outline the steps of glycolysis.
5. Write a short note on oxidative phosphorylation.

Ten Marks Questions

1. Explain the concepts of free energy, entropy, and enthalpy in biological systems.
2. Describe the glycolytic pathway with enzymes and intermediates.
3. Write a detailed account of the electron transport chain and its components.
4. Explain the Kreb's cycle with all steps, enzymes, and energy yield.
5. Discuss the gluconeogenesis pathway, highlighting bypass reactions and regulation.