

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III EXAMINATION – SUMMER 2025

Subject Code:3130406

Date:31-05-2025

Subject Name: Cell Biology

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

Marks

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|------------|--|-----------|
| Q.1 | (a) List three key characteristics that distinguish apoptosis from necrosis. | 03 |
| | (b) Differentiate between adhesion junctions and gap junctions with examples. | 04 |
| | (c) Describe the origin and evolution of cells, highlighting key transitions from akaryotic to prokaryotic and eukaryotic cells. | 07 |
| | | |
| Q.2 | (a) If a cell surface receptor is mutated and cannot bind its signaling molecule, explain how this might affect the cell's response to external stimuli. Provide an example. | 03 |
| | (b) Explain with an example how misuse of biology can lead to environmental or ethical concerns. | 04 |
| | (c) Analyze the role of microbial locomotion mechanisms | 07 |
| OR | | |
| | (c) Discuss the organization of signaling networks. How do they contribute to the specificity and robustness of cellular responses? | 07 |
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| Q.3 | (a) Describe the role of cyclins and cyclin-dependent kinases (CDKs) in cell cycle regulation. | 03 |
| | (b) Analyze the functional differences between tight junctions in epithelial cells and plasmodesmata in plant cells. | 04 |
| | (c) Discuss how growth factors regulate stem cell maintenance and differentiation in adult tissues. | 07 |
| OR | | |
| Q.3 | (a) List three types of signaling molecules and give one example of each. | 03 |
| | (b) Differentiate between the roles of receptor tyrosine kinases and ion channel receptors in intracellular signal transduction | 04 |
| | (c) Analyze how defects in cell signaling and cell cycle regulation can lead to diseases such as cancer. | 07 |
| | | |
| Q.4 | (a) What are the events of M phase in the cell cycle? List them in order. | 03 |
| | (b) Explain the concept of reprogramming and its significance in regenerative medicine. | 04 |
| | (c) Describe the structure of a eukaryotic chromosome, including chromatin organization, and relate this to gene expression. | 07 |
| OR | | |
| Q.4 | (a) Explain how the fluid mosaic model describes the structure of the eukaryotic cell membrane. | 03 |
| | (b) Explain the role of cytoskeleton in maintaining cell shape and facilitating intracellular transport. | 04 |
| | (c) Assess the significance of lysosomes and peroxisomes in protecting the cell from damage and maintaining homeostasis. | 07 |

- Q.5** (a) Explain the function of mesosomes in prokaryotic cells and their proposed role in cell division. **03**
- (b) Compare the roles of microtubules and microfilaments in the eukaryotic cytoskeleton, providing one specific function for each. **04**
- (c) Evaluate the significance of prokaryotic adaptations in enabling survival in harsh environments. **07**

OR

- Q.5** (a) Describe the structure and function of the outer membrane in gram-negative bacteria. **03**
- (b) Design an experiment to study the role of plasmids in conferring antibiotic resistance in a bacterial population. Include hypothesis, method, and expected outcomes. **04**
- (c) Compare the ribosomes of prokaryotic and eukaryotic cells in terms of structure and function. **07**
