



18110

**BRAINWARE UNIVERSITY****Term End Examination 2025-2026****Programme – B.Tech.(BT)-2024****Course Name – Cell Biology****Course Code - BTB30103****(Semester III)**

Library
Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125

Full Marks : 60**Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A**(Multiple Choice Type Question)****1 x 15=15**

1. Choose the correct alternative from the following :

- (i) Explain why do electron microscopes have a higher resolving power than light microscopes?
- a) They use glass lenses
b) They use a higher wavelength of light
c) Electrons have a shorter wavelength than light photons
d) They magnify less
- (ii) Select the correct formula to calculate the total magnification (M) of a compound microscope:
- a) $M = \text{Magnification of objective} + \text{Magnification of eyepiece}$
b) $M = \text{Magnification of objective} - \text{Magnification of eyepiece}$
c) $M = \text{Magnification of objective} / \text{Magnification of eyepiece}$
d) $M = \text{Magnification of objective} \times \text{Magnification of eyepiece}$
- (iii) Identify the type of ribosome found in prokaryotic cells.
- a) 70S
b) 80S
c) 60S
d) 50S
- (iv) Miller and Urey had experimented to prove the origin of life. Name the gases they took along with H_2O and CH_4 .
- a) N_2 and H_2O
b) NH_3 and H_2
c) CH_4 and N_2
d) CO_2 and NH_3
- (v) Observe the following that supports the RNA world hypothesis?
- a) Proteins were the first molecules to replicate
b) DNA is the most stable molecule for genetic information
c) RNA can both store genetic information and catalyze reactions
d) Lipids were the first molecules to form protocells
- (vi) Select the reason DNA is more resistant to hydrolysis than RNA:

- a) Presence of uracil
 c) Absence of 2'-OH group in sugar
 (vii) Predict the motor protein responsible for moving vesicles along microtubules.
 a) Myosin
 c) Actin
 (viii) Occluding junction is
 a) Adherence junction
 c) Tight junction
 (ix) Which of the following statements is true about carrier proteins?
 a) They bind specific molecules and undergo conformational change
 c) They are used only in active transport
 (x) Construct a signaling cascade involving cAMP.
 a) Ligand → RTK → cAMP
 c) Ligand → Ion channel → cAMP → ERK
 (xi) Compare functions of MAPK and PI3K pathways.
 a) MAPK causes apoptosis, PI3K causes survival
 c) PI3K inhibits survival
 (xii) Propose a method to detect receptor activity in a cell.
 a) Observe mitochondria
 c) Measure second messenger production
 (xiii) Distinguish metaphase I from metaphase II in meiosis.
 a) Homologs align in I, sister chromatids in II
 c) Spindles are absent in I
 (xiv) Define the phase where sister chromatids separate during mitosis.
 a) Prophase
 c) Anaphase
 (xv) Explain the role of CDKs in the cell cycle.
 a) Trigger DNA damage
 c) Destroy mitochondria
 b) Presence of phosphodiester bond
 d) Presence of telomerase
 b) Dynein
 d) Collagen
 b) Desmosomes
 d) Gap junction
 b) They form open pores in the membrane
 d) They transport only lipids
 b) Ligand → GPCR → Adenyl cyclase → cAMP
 d) Ligand → PLC → DAG → cAMP
 b) Both promote mitosis equally
 d) MAPK blocks gene expression
 b) Monitor signal molecule levels
 d) Quantify DNA content
 b) DNA replicates in II
 d) Crossing over in II only
 b) Metaphase
 d) Telophase
 b) Phosphorylate target proteins
 d) Promote apoptosis

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Quote in brief about the term " Ribozyme". (3)
3. Describe the three main components of the cytoskeleton, and how do they contribute to cell structure and movement? (3)
4. Write the primary functions of the nucleus and mitochondria in eukaryotic cells. (3)
5. Write the fundamental properties of light exploited in light microscopy, and how do they contribute to visualizing and magnifying specimens? (3)
6. Evaluate the biological significance of the G₀ phase in the cell cycle and its implications in tissue homeostasis and cell differentiation. (3)

OR

Distinguish between cytokinesis in plant cells and animal cells? (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Recall "hot dilute soup" hypothesis, and relate it with the prebiotic formation of organic molecules? (5)

8. Explain the structural and chemical features that enable DNA to act as a stable and reliable medium for long-term genetic information storage (5)
9. Distinguish between the various activation mechanisms of apoptosis? (5)
10. Analyze how the amphipathic structure of phospholipids contributes to the spontaneous formation of the hydrophobic lipid bilayer in aqueous environments. (5)
11. Describe the fundamental principle of fluorescence microscopy and their roles in the imaging process. (5)
12. Evaluate the impact of dysregulated receptor tyrosine kinase signaling on Cancer Development and How can this knowledge guide targeted therapeutic interventions? (5)

OR

Develop a structured summary or conceptual framework of autophagy, highlighting its key functions, types, regulatory pathways, and potential roles in the prevention or progression of various diseases. (5)

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