

Sl. No. of Ques. Paper : 1768

GC-3

Unique Paper Code : 32491102

Name of Paper : Cell Biology BCH C-2

Name of Course : B.Sc. (Hons) Biochemistry (CBCS)

Semester : I

Duration : 3 hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all. Question No. 1 is compulsory.

1. (a) Name the following:

- (i) An inner nuclear membrane protein that helps in anchoring nuclear lamina to nuclear membrane.
- (ii) Organelle where PDI is specifically found.
- (iii) Marker enzyme of mitochondrion.
- (iv) A cytoskeletal element that plays an important role in cell division. 1×4 = 4

(b) State True or False and justify your answer:

- (i) Mitochondria and chloroplast have an endosymbiotic origin.
- (ii) Upon sub-cellular fractionation of cells using differential centrifugation, nucleus is the first cellular component to sediment.
- (iii) Intermediate filaments show treadmilling.
- (iv) Oocytes of most vertebrates may remain arrested for many years at diplotene stage of meiosis.
- (v) Smooth endoplasmic reticulum is over-represented in cells producing steroid hormones. 2×5 = 10

(c) Match the following:

- | | |
|----------------------|---------------|
| (i) Flippase | Golgi complex |
| (ii) I-cell disease | Actin |
| (iii) Polysaccharide | RBC |
| (iv) Cell cortex | Lysosome |
| (v) Spectrin | Phospholipid |
- 1×5 = 5

2. (a) Explain the principle of Transmission Electron Microscopy giving its essential components. Write its two applications. 5
- (b) Differentiate between the following:
- (i) Gap junctions and Plasmodesmata
 - (ii) Confocal and conventional fluorescence microscope
 - (iii) Focal adhesions and Hemidesmosomes. $3 \times 3 = 9$
3. (a) Explain the structure of nuclear pore complex and the process of import of proteins into the nucleus. 6
- (b) What is the role played by KDEL signal sequence in targeting proteins? What would be the effect of mutating this sequence in a protein? 4
- (c) Explain how apical and basolateral domains of an intestinal cell membrane are kept functionally distinct. 4
4. (a) Explain the advantage of yeast cells over *E. coli* cells as a model system. 2
- (b) Give reasons for the following:
- (i) Spindle assembly checkpoint maintains the integrity of the genome towards the end of mitosis.
 - (ii) Mitochondrial inner membrane is analogous to chloroplast thylakoid membrane.
 - (iii) The powerful hydrolytic enzymes of lysosome do not digest the organelle itself.
 - (iv) Glycosaminoglycans form hydrated gels in extracellular matrix.
 - (v) Theoretical limit of resolution of a light microscope is 0.22 micron.
 - (vi) Apoptosis does not lead to inflammation. $2 \times 6 = 12$
5. (a) What are oncogenes? Write down salient features of a transformed cell. (5)
- (b) Discuss the functions and assembly of peroxisomes. (5)
- (c) An organism has 40 chromosomes in its diploid stage. Indicate how many chromosomes are present in the following cases:
- (i) Somatic Cells
 - (ii) Metaphase of mitosis
 - (iii) Telophase I of meiosis I
 - (iv) Telophase II of meiosis II $1 \times 4 = 4$
6. (a) Write short notes on the following:
- (i) Phase-contrast microscopy.
 - (ii) Quality control pathway in ER

- (iii) Organization of actin filaments in cell
- (iv) Role of caspases in apoptosis. 3.5×4 = 14
7. (a) Outline the process of how a polypeptide synthesized in cytosol moves to chloroplast stroma. 4
- (b) Explain the differences between:
- (i) Homophilic and Heterophilic interactions
- (ii) Mechanism of action of cytochalasin and phalloidin on microfilaments. 2×2 = 4
- (c) Explain briefly the application of the following:
- (i) FRET
- (ii) Herceptin
- (iii) FACS. 2×3 = 6
8. (a) Explain how Golgi complex helps in sorting of proteins to different destinations within the cell. 6
- (b) Explain the significance of following briefly:
- (i) Fibronectin
- (ii) MTOC
- (iii) Coat proteins
- (iv) SRP. 2×4 = 8