Question Paper Code : 5715

M.Sc. (Semester-II) Examination, 2018

BIOCHEMISTRY

[BC-201]

(Molecular Cell Biology)

Time : Three Hours] **[Maximum Marks : 70**

Note : Attempt **five** questions in all. Question **No.1** is **compulsory**. Besides this, **one** question is to be attempted from each unit.

1. Write short notes on the following :

   (a) Eukaryotic cells in culture were probed with various antibodies or molecular probes, using confocal laser scanning microscopy. Some of the observations are listed below. Analyze the observations and comment upon the unique condition indicated. [5x3=15]

   (i) Green fluorescence from Cyt c-GFP is seen in the cytosol.

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(ii) PKA-GFP fluorescence concentrates in the nucleus.

(iii) Fluorescent antibodies against γ tubulin are seen located at two opposite ends of a cell.

(iv) Intense fluorescence from p53-GFP appears in the cytoplasm of cells after irradiation with ionizing radiation.

(v) Intense fluorescence from PKC-GFP is seen to localize where the DSC image shows the presence of plasma membrane.

(b) Cyan fluorescent protein (CFP) and yellow fluorescent protein (YFP) constructs have revealed several molecular interactions. Analyze the following results from different FRET experiments and comment upon the nature of the interaction. Only CFP relevant excitation is given and the major emission color is mentioned.

[5x3=15]

(i) Cyclin D-CFP and cdk4-YFP. Yellow fluorescence is obtained.

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(ii) p53-CFP and MDM2-YFP. Cyan fluorescence obtained

(iii) Gα CFP and β Arrestin YFP. Yellow fluorescence obtained

(iv) Sos-CFP and Ras-YFP. Yellow fluorescence obtained.

(v) Apaf-1-CFP and Cytochromec-YPF. Cyan fluorescence obtained.

UNIT-I

2. (a) How does lipid geometry dictate the formation of a bilayer or micelle ? [5]

(b) What factors affect the fluidity of a lipid membrane ? [5]

3. What do you understand by the term topology in the context of arrangement of proteins in a membrane ? Illustrate your answer giving examples of different classes of intrinsic proteins. [10]

UNIT-II

4. (a) What is the basis of detergent solubilization of membranes ? Discuss CMC and solubilization

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temperatures appropriate for preserving membrane protein activity. [5]

(b) What are the different classes of biological detergents ? Discuss their uses briefly. [5]

5. A cell line is grown at 28°C and separately at 37°C for two generations and the cells separately subjected to FRAP without mentioning the growth temperature. Give details of the experiment and mention which of the two samples was grown at 28°C and which at 37°C . Give reasons. [10]

UNIT-III

6. (a) What is slowest phase in the assembly of actin microfibrils and how can you accelerate their assembly in vitro such that the lag phase in their assembly is nearly eliminated ? [5]

(b) What is dynamic instability of a microtubular assembly and what do you understand by the terms 'catastrophe' and 'rescue' in this context ? [5]

7. (a) How do GPCRs protect themselves against over activations when faced with an abnormally high

concentration of their cognate ligand ? [5]

(b) Justify the statement that 'commencement of signaling is induced, but its reversal is constitutive'. Give a few illustrative examples.[5]

UNIT-IV

8. (a) Describe the process by which secretory proteins are targeted to and moved into ER. [5]

(b) Which steps of endocytosis and exocytosis are energetically most demanding ? [5]

9. (a) What do you understand by 'Checkpoints of the cell cycle' ? What is the significance of these checkpoints in controlling cell division ? [5]

(b) What are oncogenes ? Give a few examples and explain their relationship with proto-oncogenes. [5]

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