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S. No. of Question Paper : 918

Unique Paper Code : 249501

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Name of the Paper : Paper—BCHT—508 : Membrane Biology

Name of the Course : B.Sc. (Hons.) Bio-Chemistry

Semester : V

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.

Use of scientific calculator/log tables may be allowed.

1. Give explanation for the following :

- (i) Phospholipids when dissolved in water spontaneously form bilayer vesicles.
- (ii) Peripheral proteins can be dissociated from the membrane by changing ionic strength.
- (iii) Glycolipids are predominantly found on the outer leaflet of the plasma membrane.
- (iv) RBC swell or shrink rapidly in response to abrupt changes in blood osmolarity.
- (v) Myelination increases the velocity of nerve impulse conduction.
- (vi) Gap junctions form intercellular communication channels.
- (vii) Liposomes have been successfully used as magic bullets for the treatment of Leishmaniasis.
- (viii) Ethyl urea penetrates more readily into the membrane than urea.
- (ix) Homeoviscous adaptations takes place in organisms surviving at extreme temperatures.

2×8,3

P.T.O.

2. (a) Give details of technique used in the study of the following :
- (i) Membrane structure
 - (ii) Membrane fluidity
 - (iii) Topology of membrane proteins.
- (b) What are the *two* different secondary structures that transmembrane segment of membrane proteins form as they traverse the bilayer ? Give their distinctive features taking a protein as example of each type. 9,5
3. (a) Give the significance of the following in membranes :
- (i) Tight junctions
 - (ii) SNAREs
 - (iii) Rafts.
- (b) What are the different types of lipid links that anchor proteins to membranes ? Give an example of each type of lipid linked protein. What is the functional importance of these lipid anchors ? 6,8
4. (a) Give the mechanism of transport by $\text{Na}^+\text{-K}^+$ ATPase. How does Ouabain inhibit this transporter ?
- (b) Explain the following terms :
- (i) Detergents
 - (ii) Membrane fluidity
 - (iii) Leaky channels.
- (c) Calculate the equilibrium potential of Na^+ if the external concentration is 200 mM and internal concentration is 10 mM at 25°C. 6,6,2

5. (a) Show how ?
- (i) KcsA channel selects K^+ over other cations like Na^+ .
 - (ii) Bacteriorhodopsin is a light driven H^+ pump.
 - (iii) Tumor cells become simultaneously resistant to several chemotherapeutic drugs.
- (b) Tabulate differences between simple diffusion, facilitated diffusion and active transport in terms of :
- (i) Energy requirement
 - (ii) Directionality
 - (iii) Competitive inhibition
 - (iv) Saturation kinetics
 - (v) Solute transported. 9,5
6. (a) How do parietal cells transport H^+ into the acidic stomach lumen ?
- (b) How is Glucose transported in *E.coli* via group translocation ?
- (c) How do Malto porins act as molecular sieve ?
- (d) What is the mechanism of lactose uptake in *E.coli* ? 4,4,3,3
7. (a) Show the diagrammatic model of RBC membrane with associated cytoskeletal proteins. Explain the Gates and Fences model with reference to RBC membrane.
- (b) Explain the role of Flippases, Floppases and Scramblases in maintaining lipid asymmetry in membranes.
- (c) Give the basis of the following diseases :
- (i) Cystic Fibrosis
 - (ii) Diabetes Insipidus. 6,6,2

8. (a) What is resting membrane potential ? How is action potential initiated and propagated ?
- (b) Describe the Patch Clamp Technique and give *two* applications.
- (c) Give the mode of action of the following :
- (i) Tetrodotoxin
 - (ii) Botulinus toxin
 - (iii) Dendrotoxin.

6,5,3

$$[R = 8.315 \text{ J/mol.K} \quad F = 96,500 \text{ J/V.mol}]$$