

Sl. No. of Ques. Paper : 1427 **F-7**
Unique Paper Code : 2491303
Name of Paper : Membrane Biology and Bioenergetics
Name of Course : B.Sc. (Hons.) Biochemistry (FYUP)
Semester : III
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.
Log tables and/or scientific calculators may be provided.*

1A. Explain How?

- a. Membranes are self-sealing.
- b. Cholesterol decreases membrane fluidity.
- c. Ubiquinone is a two electron carrier.
- d. ATP transfers its energy by group transfers.
- e. Cell organelle membranes have distinct lipid composition.
- f. Phosphocreatine reservoir in skeletal muscle is used to replenish ATP during exercise.
- g. Accessory pigments funnel light energy to the reaction center.
- h. Dinitrophenol acts as an uncoupler of oxidative phosphorylation.

B. Give the contribution of the following scientists:

- a. Albert Lehninger
- b. Peter Agre
- c. Paul Boyer

(16,3)

2A. Differentiate between the following:

- a. Isolated and closed system
- b. Endergonic and exergonic reactions

B. Give the basis of high free energy of hydrolysis of the following:

- a. Phosphoenolpyruvate
- b. GTP
- c. 1,3 BPG

C. Consider a cell with $[ATP] = 3.0\text{mM}$, $[ADP] = 0.8\text{mM}$, and $[P_i] = 4.0\text{mM}$. Determine the phosphorylation potential at 37°C .

(4, 6, 4)

P.T.O.

- 3A. State the chemiosmotic theory. Give experimental proof that oxidation is obligatory coupled to phosphorylation in mitochondria.
- B. Give the structure of F_0F_1 ATP synthase, with functional role of different subunits.
- C. What are the reactive oxygen species and how are they produced.

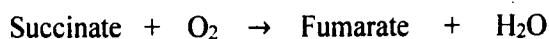
(6, 6, 2)

- 4A. Give the schematic presentation of ETC in mitochondria. Give the site of inhibition of following inhibitors:

- Antimycin A
- Azide
- Barbiturates

- B. Give at least one mechanism of transport of NADH from cytosol into the mitochondria.

- C. Calculate the free energy change, $\Delta G'^0$ for the reaction given below:



$$\text{When } \frac{1}{2} \text{O}_2 / \text{H}_2\text{O} \quad E'^0 = 0.816\text{V}$$

$$\text{Fumarate} / \text{Succinate} \quad E'^0 = 0.031$$

(6, 4, 4)

5. Differentiate between the following:

- PS I and PSII in thylakoid membranes
- Purple and green photosynthetic bacteria.
- Proton motive force across mitochondrial and chloroplast membranes.

(5, 5, 4)

6. Give the detailed mechanism of the following:

- Active transport of Na^+ and K^+ across the membrane by $\text{Na}^+ \text{K}^+$ ATPase.
- Lactose uptake by lactose permease in bacteria.
- Porins as molecular sieve.
- Aquaporins as water channels.

(4, 4, 3, 3)

- 7A. Give a technique to study the following:

- Membrane fluidity
- Membrane structure
- Transition studies of lipid bilayer.

- B. Give a diagrammatic representation of RBC membrane architecture.

- C. Give the detailed mechanism of membrane fusion.

(6, 4, 4)

8. Differentiate between the following:

- a. COP I and COP II mediated vesicular transport.
- b. Rafts and caveolae
- c. Ligand gated and voltage gated ion channels
- d. Carrier and channel ionophores.

(4, 4, 4, 2)

[$R=8.314\text{J/mol.K}$, $F=96,480\text{J/V.mol.}$]