2015

BIOCHEMISTRY

Paper – BCT – 206

(Bioenergetics)

Full Marks – 25

The figures in the margin indicate full marks
Candidates are required to give their answers in their own words as far as practicable

Answer *any two* from *Question No's 1 to 3*

1. (a) Discuss in brief the concept of entropy supply and entropy production in an open system. Which of these quantities will always be increased with time by second law ?   1

     (b) Explain in brief the concept of coupling. Can coupling between two reactions occur without a common chemical intermediate ?   4

2. (a) Assuming that electron transport and ATP synthesis are not directly coupled, prove that under steady state condition where proton flux is zero, the phenomenological equation is reduced to : $J_o = l_{oo}, (-DG_o) + l_{op}(DG_P)$ and $J_P = l_{op}(-DG_o) + l_{pp}(-DG_P)$ 2

     (b) Show that when the proton conductance is very high, the coupling coefficient term l_{OP} to assume a null value.   3

3. Briefly describe what happens if the
     (a) whether the membrane is in Nernst equilibrium of protons
     (b) Nernst equilibrium of potassium.

Discuss how can you determine the two components of the protonmotive forces using the Nernst equilibrium principle. Briefly explain the concept of efficiency of coupling.   2+2+1

4. (a) How do you manipulate the ETC such that the electrons flow from the complex I only ? Name the complex in ETC that reduces molecular oxygen. Why is it thought that this complex plays major role in peroxide formation ? $1+\frac{1}{2}+2\frac{1}{2}$

     (b) Describe the use of membrane vesicles to demonstrate that F_1-F_0 ATPase synthesize ATP only when there is a proton movement to a specific direction through it. (**Must use schematic diagrams**)   3+1

[Turn over]

(c) Draw a flow diagram to link oxidation of nutrients in our body to harnessing the energy thus evolved in the form of ATP and heat. In older days, uncouplers at a very low dose had been used to reduce body mass. Briefly justify. 2+2

(d) Oligomycin and valinomycin are both inhibitors of oxidative phosphorylation. Explain the difference in their modes of action. $1\frac{1}{2}+1\frac{1}{2}$

Or

5. (a) Hemoglobin b in the complex III does not directly take part in the ETC but mutations in it has been traced in some head-neck cancers. Briefly justify. 3

(b) Define P:O ratio. Briefly explain the experimental layout for determining its values. $2+2\frac{1}{2}$

(c) What is Ubiquinone? Briefly explain its role and significance in ETC. (**Equation and schematic diagrams are essential**) $1\frac{1}{2}+(1\frac{1}{2}+1\frac{1}{2})$

(d) While Fe is a common ingredient of the ETC complexes, Cu is present only in one of the complexes. Name that complex. Briefly explain the role of Cu using schematic diagram. $\frac{1}{2}+2\frac{1}{2}$