[This question paper contained printed pages.]

Your Roll No.....

Sr. No. of Question Paper: 1128

Unique Paper Code : 2492012302

Name of the Paper : Bioenergetics

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

Semester : III

Duration: 2 Hours Maximum Marks: 60

Instructions for Candidates

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

- 2. There are six questions in this question paper.
- Attempt any four questions. All questions carry equal marks. Question No. 1 is compulsory.

1. (a) Explain the following:

- (i) Many thermodynamically favorable reactions like hydrolysis of ATP do not occur readily at room temperature.
- (ii) Accessory pigments funnel light energy to the reaction center.

- (iii) Oxygen is not evolved in cyclic photophosphorylation.
- (iv) An inhibitory protein inhibits ATP hydrolysis during ischemia.
- (v) Each cytochrome present in the ETC has a different reduction potential.
- (vi) Bioluminescence is the reverse of photosynthesis.
- (b) Define the following terms:
 - (i) Standard reduction potential
 - (ii) Action spectrum
 - (iii) Uncoupler (12,3)
- 2. (a) Give the role of the following:
 - (i) Isoprenoid chain in ubiquinone
 - (ii) Brown fat in newborn mammals
 - (iii) ANT in mitochondria
 - ATP synthase. ... the Binding change mechanism of the enzyme.

- (c) Plant mitochondria have an alternate rotenone insensitive NADH dehydrogenase and a cyanide resistant oxidase that constitutes an alternate pathway to oxidize NADH. Comment on the role of this alternate pathway in plants. (6,6,3)
- 3. (a) What is the role of cytochrome b₆f complex in the photosynthesis carried out by plants. Depict the flow of electrons and protons through this complex.
 - (b) A thermodynamically unfavorable reaction can be driven in forward direction by coupling it to hydrolysis of ATP.
 - (c) Differentiate between the universal electron carriers and the mitochondrial electron carriers.

 (6,6,3)
- 4. (a) With the help of a diagram explain the Z-scheme of photosynthesis.
 - (b) Calculate the standard free-energy change for the oxidation-reduction reaction at pH 7.0 Acetaldehyde + NADH + H⁺ → Ethanol + NAD⁺ Given that the standard reduction potential of acetaldehyde/ethanol redox pair= -0.197 and the standard reduction potential of NAD+/NADH redox pair= -0.320V.

(c) Give the mode of action of the following inhibitors:

(i) Amytal

(ii) Dinitrophenol

(iii) Atractyloside (iv) Cyanide

(v) DCMU

(6.4.5)

- (a) Explain the chemiosmotic theory and discuss two 5. evidences in support of the theory.
 - (b) Describe the photosynthetic machinery of purple bacteria.
 - (c) Calculate the Standard Free Energy change of the following reaction

Glucose-1-phosphate → Glucose-6-phosphate

Given that starting with 20 mM of Glucose-1phosphate and no Glucose-6-phosphate, the final equilibrium mixture at 25° C and at pH = 7.0, contains 1.0 mM Glucose-1-phosphate and 19m M Glucose-6-phosphate.

Does the reaction proceed with a loss or gain of (5,5,5)energy?

- 6. Write short notes on the following:
 - (a) Cyclic photophosphorylation
 - (b) Complex II of ETC

(5,5,5)(c) Q-Cycle

(200)