

- (x) Adenine nucleotide translocase in mitochondria
- (b) Explain why solutions of chlorophyll appear green. (18,1)
2. (a) When chloroplasts are illuminated with 700 nm light cytochrome f, plastocyanin and plastoquinone are oxidized. When chloroplasts are illuminated with 680 nm light these electron carriers are reduced. Explain.
- (b) What is the chemical basis for the large standard free energy change associated with ATP hydrolysis?
- (c) What is the difference between Iron-sulphur protein and Reiske iron sulphur protein? (4,4,6)
3. (a) Describe F₁- F₀ ATPase. How does the passage of protons through this system induce the rotation of the C- rings and synthesis of ATP?
- (b) What is the photosynthetic efficiency of non cyclic phosphorylation? Why is it more than cyclic phosphorylation?
- (c) Calculate the free energy of hydrolysis of ATP in a rat liver cell in which the ATP, ADP and P_i concentrations are 3.4 mM, 1.3 mM and 4.8 mM, respectively. (6,4,4)
4. (a) Give the mode of action of the following inhibitors:
- (i) DCCD
 - (ii) Atracycloside
 - (iii) DCMU
 - (iv) Oligomycin
- (b) Elucidate the flow of electrons through complex III of mitochondrial ETC. Give the significance of Q cycle. (8,6)

5. (a) Explain the following:
- (i) Two photosystems are separated in the thylakoid membrane.
 - (ii) Oxidative phosphorylation is not reversible.
 - (iii) Bioluminescence is reverse of photosynthesis
 - (iv) Cytochrome c oxidase acts as a proton pump
- (b) Discuss the Peter Mitchell's chemiosmotic theory. (8,6)
6. (a) What are reactive oxygen species? How does the cell prevent the oxidative damage?
- (b) The photosynthetic machinery of Halobacterium is much simpler as compared to plants and cyanobacteria, justify.
- (c) What is energy charge? How is it buffered? (4,5,5)
7. (a) Discuss free energy, enthalpy and entropy and give their importance.
- (b) For the conversion of $A \rightarrow B$, ΔH is 7kJ/mole and ΔS is 20 J/K/mole. Above what temperature does the reaction become spontaneous?
- (c) What is the role of thermogenin protein? Give its significance in brief.
- (d) What are the different electron carriers in complex I of the mitochondrial electron transport chain? (4,4,4,2)
8. (a) Calculate the free energy change for the transfer of two electrons from NADH through the respiratory chain to molecular oxygen. The standard reduction potential of NAD^+/NADH and $\text{O}_2/\text{H}_2\text{O}$ redox pairs are -0.320V and +0.816V, respectively.

- (b) Explain the malate-aspartate shuttle for transporting the reducing equivalents from the cytosol to the mitochondria.
- (c) Give a brief introduction of proton motive force. (5,5,4)