

**M. Sc. (Biotechnology) Examination, 2023**

Metabolism and Bioenergetics

Paper 232

Time: Two hours

Full Marks: 40

Question number 1 is compulsory and answer *any three* questions from the rest.

1. Answer *any five* from the following [ 5 x 2 = 10]
  - (i) Hydrogen is the main fuel in the Universe: Explain
  - (ii) Mention the importance of Succinyl- CoA in biology.
  - (iii) Explain the role of vitamin B6 in amino acid catabolism.
  - (iv) Why Dihydrofolate reductase inhibitors are all potential anticancer agents/drugs?
  - (v) Why cholesterol is an important biomolecule?
  - (vi) In Biological systems equilibrium means death. Explain.
  - (vii) Give example of an uncoupling agent. What does it uncouple?
  - (viii) Why Cyanide is poisonous to aerobic organisms?
  - (ix) What is the function of Fo-F1 ATPase. Name one inhibitor of Fo-F1 ATPase.
  - (x) What are the different possible fates of pyruvate?
  
2. (a) Glucose generates only a few ATP via Glycolysis. Nevertheless, Glycolysis is important for humans. Why?
  - (b) Differentiate between the enzymes hexokinase and glucokinase.
  - (c) How lactose could be utilized via glycolysis?
  - (d) Glycolysis and gluconeogenesis are reciprocally controlled. Explain how.  
[2+2+3+3=10]
  
3. (a) Why TCA cycle is called a metabolic hub?
  - (b) How different kinds of food could enter into the TCA cycle?
  - (c) What is the site of TCA cycle in eukaryotes?
  - (d) Name one inhibitor of TCA cycle.  
[4+4+1+1=10]
  
4. (a) Oxidative phosphorylation and substrate level phosphorylation takes place in different sites in both eukaryotes and prokaryotes: Explain.
  - (b) How aerobic organisms combat different reactive oxygen species?.
  - (c) Various shuttles participate in movement through mitochondrial membrane. Give one example. [4+4+2=10]

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5. (a) Discuss the important structure and function of the protein bacterial rhodopsin.  
(b) What is RUBISCO?  
(c) How is RUBISCO placed differently in C3 and C4 plants?

(d) Microbial photosynthesis are mostly an-oxygenic: Explain. [3+1+3+3=10]

6. (a) How glycogen metabolism is reciprocally controlled?  
(b) What are the main importance of pentose phosphate pathway?  
(c) What are the role of activated PRPP? [4+2+4=10]

7. Write short notes on *any two* [ 2 x 5 =10]

- (i) Calvin Cycle  
(ii) Committed step in cholesterol biosynthesis  
(iii) Pigments involved in photosynthesis  
(iv) Glyoxalate cycle