

M. Sc. (BIOTECHNOLOGY) EXAMINATION, 2023

(1st Year, 2nd Semester)

METABOLISM AND BIOENERGIES**PAPER – 232**

Time : Two hours

Full Marks : 50 (Written 40 + Internal Assessment 10)

Group – AAnswer *any three* questions.

1. 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) How are Glycolysis and gluconeogenesis reciprocally controlled? 2+2+3+3
2. a) Why TCA cycle is called a metabolic hub?
- b) How different kinds of food could enter into the TCA cycle?
- c) What are the major clues that “TCA cycle” does operates in a cycle?
- d) Name one inhibitor of TCA cycle. 4+4+1+1
3. a) Oxidative phosphorylation and substrate level phosphorylation take place in different sites in both eukaryotes and prokaryotes: Explain.
- b) Aerobic organisms have a repertoire to combat reactive oxygen species: Explain.
- c) Various shuttles participate in movement through mitochondrial membrane. Give one example. 4+4+2
4. 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
5. a) What are the non-carbohydrate sources of glucose?
- b) How are glycogen metabolism controlled reciprocally?
- c) What are the differences between PS I and PS II?
- d) What are the main importance of pentose phosphate pathway? 2+4+2+2=10
6. Write short notes on *any two* : 2×5
 - i) Calvin Cycle
 - ii) Committed step in glycolysis
 - iii) Glyoxalate cycle
 - iv) Pigments involved in photosynthesis

[Turn over

7. a) Give an example of – (i) Exergonic Reaction, (ii) Endergonic Reaction, and (iii) Coupling Reaction – in biological systems.
- b) How can you prove that pressure is a thermodynamic variable considering Euler's Criteria?
- c) What are the conditions under which biological systems perform the functions necessary for life with respect to thermodynamics?
- d) For a reaction – $aA + bB \leftrightarrow Cc + Dd$, if the ΔG° , is positive, now can we change the mass action ratio such that ΔG remains negative. Comment on the spontaneity of the reaction after making adjustments to the mass-action ratio. 3+2+3+2=10

Group – B

8. State the functions of 3-hydroxyacyl CoA dehydrogenase and Thiolase enzyme in fatty acid oxidation process. What is the difference between mitochondrial and peroxisomal fatty acid oxidation? How mTORC2 control lipogenesis in AKT-independent mechanism? 2+1+2=5

OR

9. Fatty acid synthesis may inhibits fatty acid oxidation process. Is the statement correct? Justify your answer. Explain the formation steps of HMG-CoA (β -hydroxy- β -methyl-glutaryl CoA) during cholesterol biosynthesis. Define Squalene. 2+2+1=5
10. Briefly explain the different steps of Urea Cycle. 3

OR

11. Explain in brief the pathway of synthesis of GMP and AMP from Inosine Monophosphate (IMP). 3
12. Name the different precursor from which the different Carbon and Nitrogen at different position of purine ring has been synthesized. 2

OR

13. What do you mean by N-terminal rule of maintenance of half-life of a cytosolic protein? 2