Paper / Subject Code: 24240 / Microbiology: Microbial Biochemistry-I

[Time 3 Hours] **[Marks: 100]**

N.B. (1) Attempt all questions, all questions carry equal marks.
(2) Do not write any explanation for labelled diagram and schematic representation questions.

Q. I. A. Answer the following (Attempt any two) **[12]**

1. Discuss the different methods which use whole cells to study solute transport.
2. With the help of a neat labeled diagram represent various transport systems in bacteria.
3. Discuss the role of Na-K ATPase to create an electrochemical potential.
4. Write a short note on PTS in bacteria.

Q. I. B. Do as directed (Attempt any eight) **[08]**

1. Define mechanosensitive channels.
2. Give significance of ABC transporter.
3. Name the Scientist who worked with membrane vesicles to study solute transport.
4. State true or false. Proton motive force drives the uniport of a cation into cells.
5. Define secondary active transport.
6. Choose the correct alternative and rewrite the statement: Phospholipids are polar at one end due to ___________ (Phosphate group, fatty acid, Glycerol)
7. What are proteoliposomes?
8. Define siderophore.
9. Give an example of a cellular process which involves membrane fusion.
10. Name the gene coding for water channel protein in *E coli.*
11. Name the process used to extract binding proteins from the periplasmic space.
12. Define leader peptide.

Q. II. A. Answer the following (Attempt any two) **[12]**

1. Discuss the role of nicotinamide and flavin nucleotides as universal electron acceptors.
2. a) Write a brief note on terminal oxidases found in bacteria. (3)
   b) Schematically represent generalized ETC found in bacteria under aerobic condition. (3)
3. Explain the structure of mitochondrial ATP synthase with the help of a suitably labelled diagram.
4. Write a note on emission of light by bacteria.

Q. II. B. Do as directed (Attempt any eight) **[08]**

1. Define substrate level phosphorylation.
2. Electron carriers are capable of undergoing irreversible oxidation-reduction reactions. State true or false.
3. Name a lipid soluble electron carrier.
4. Choose the correct alternative and rewrite the statement.
   Mitochondrial complex___________ is not a coupling site. (I, II, IV)
5. Name the quinone found in highest proportion in *E. coli* growing anaerobically and using NO_3 as the final electron acceptor.

6. Give an example of agents which uncouple phosphorylation from electron transfer through ETC.
7. Who proposed chemiosmotic theory?
8. Name a subunit of BFo complex of bacterial ATPase.
9. Choose the correct alternative and rewrite the statement.
   End product efflux involves extrusion of ________ with fermentation end product. (Na^+, H^+, either Na^+ or H^+)
10. Bacteriorhodopsin can act as a proton pump. State true or false.
11. Name the electron carrier with heme as prosthetic group.
12. Explain- $P/2e^-$ ratio

Q. III. A. Answer the following (Attempt any two) **[12]**

1. Explain how radioisotopes find use in study of metabolic pathways.
2. Schematically explain action of cellulases on cellulose.
3. With the help of chemical structure, enzymes, cofactors/coenzymes represent conversion of 2(Acetyl CoA) to OAA by Glyoxylate pathway.
4. With the help of chemical structure, enzymes, cofactors/coenzymes represent the conversion of 3[D Glucose-6 phosphate] to 2[Fructose-6 phosphate] + PGALD via HMP

Q. III. B. Do as directed (Attempt any eight) **[08]**

1. State the biological function of beta-Galactoside acetyl transferase.
2. Write a word equation for the reaction catalyzed by E1 enzyme of multienzyme PDH complex.
3. Fumarate reductase is an enzyme of oxidative TCA cycle. State true or false.
4. State one use of NMR in study of metabolism.
5. Name the enzyme that catalyzes following reaction:
   maltose + Pi $\rightarrow$ glucose-1-phosphate + Glucose
6. Sequential Induction is used to elucidate ____ pathways [constitutive/inducible]
7. Give the structure of 2-phosphoglyceric acid.
8. Write word equation for the reaction catalyzed by Glucose: Galactose1-phosphate uridylyl transferase.
9. _______ hydrolyzes the α $(1\rightarrow6)$ linkages in starch.
10. State the significance of anaplerotic reactions.
11. Write a word equation for the reaction catalyzed by 1-phosphofructokinase.
12. Give the structure of PEP.

Q. IV. A. Answer the following (Attempt any two) **[12]**

1. Using structures and enzymes, write the synthesis of UDP-N-Acetylglucosamine.
2. Using an appropriate scheme, represent 2, 3-butanediol fermentation of Enterobacter.
3. Schematically represent gluconeogenesis using Pyruvate as the substrate.
4. Discuss glucose metabolism of *Bifidobacterium bifidum.*

Q. IV. B. Do as directed (Attempt any eight) **[08]**

1. Give chemical structure of Ethanol.
2. Identify and name the metabolic intermediate: **CH_3-CHOH-CO~SCoA**
3. Write a word equation for the reaction catalyzed by S-methyl Malonyl CoA: Pyruvate transcarboxylase.
4. State true or false: Glycogen synthase can carry out de novo synthesis of glycogen.
5. Which Vitamin is required for catalysis by methyl malonyl CoA mutase?
6. What is N-Acetyl muramic acid?
7. Name any one: Non-standard amino acid present in peptidoglycan.
8. Give an example of a bacterium carrying out alcohol fermentation via ED pathway.
9. Choose the correct alternative:
   Propionate:Acetate are produced in the ratio of ______ (2:1/1:2) from three molecules of lactate during Acrylate pathway.
10. Name an enzyme catalyzing the biochemical reaction
    $$CH_3\text{-}CO\text{-}CH_2\text{-}COOH \rightarrow CH_3\text{-}CO\text{-}CH_3 + CO_2$$
11. Which high energy intermediate of mixed acid fermentation yields ATP by substrate level phosphorylation?
12. Give an example of an antibiotic inhibiting bacterial cell wall synthesis.

Q. V. Answer the following (Attempt any four) **[20]**

1. Discuss the role played by bacterial cell membrane in solute transport with respect to lipids and permeability.
2. Write a note on mitochondrial complex III.
3. Write a short note on Glycogen degradation.
4. Using structures and enzymes, write conversion of Pyruvate to Butyric acid by *Clostridium butyricum*.
5. Explain the mechanism of energy generation in *Oxalobacter formigenes.*
6. Give five differentiating points between EMP pathway and ED pathway.
