Indian Association for the Cultivation of Science

(Deemed to be University under *de novo* Category)

Master's/Integrated Master's-PhD Program/Integrated Bachelor's-Master's Program/PhD Course

End-Semester Examination-Spring 2024

Subject: Biochemistry Genetic & Evolution ***Subject Code(s): BIS 1201***

Full Marks: 50 ***Time Allotted: 3 h***

Answer any 10 question 5X10=50

1. Lauric acid is a 12-carbon fatty acid with no double bonds. How many molecules of ATP will be generated from the beta oxidation of this fatty acids? Consider a hypothetical case where the complex I of ETC was temporally inhibited by a reversable inhibitor. is there any alteration in ATP production of same fatty acid beta oxidation? Comment with justification.

2. Fatty acids synthesize in cytosol but its metabolism is taken place in mitochondria. How fatty acids transports cytoplasm to mitochondria? What would be the end product of odd number of fatty acid oxidation? How further energy can be produced from that product?

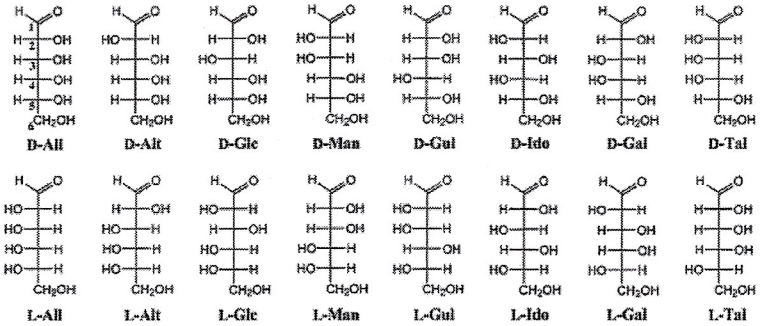
3. **A)** When you are starving for a long time, your breaths smell like acetone. Explain from biochemical point of view?
   B) Plant can convert Acetyl CoA to pyruvate or oxalate but animal can't. Explain.

4. **A)** Calculate how much of the α and β anomers of glucose are present in equilibrium mixture with a specific rotation of 52.6 degrees. (pure α D- glucose has specific rotation = + 112.2 degrees and that of β- D-glucose has specific rotation + 19 degrees)
   B) Glucose and fructose both are hexoses, then in glycolysis why Glucose to Fructose conversion is required give proper justification.

5. **A)** A patient has been detected Non-Alcoholic fatty liver. And the dietitian suggests him to avoid few things. Can you guess what are those? Justify.
   B) Cellulose and Maltose both are homopolymer of glucose, but we can digest one. which one and why? Why Cattel can digest both?

6. **A)** In a police station, two couples claim their parenthood for a single baby. DNA matching is time consuming expensive process. So the biochemist, who has been called by the police did the simple blood group test and the results reveal as follows,
   Couple 1 Male AB + Female O+ Couple 2 Male AB+ Female A+ Baby AB+
   From this result can the biochemist predict the false parent? Explain.
   B) Why N Acetyl Glucosamine often prescribe as the food supplement for Arthritis?

7. **A)**



i) Which aldohexose will produce same alditol that of D Glucose upon reduction.

ii) Which aldohexoses will produce optically inactive alditol upon reduction

B) Draw the relative position of a) α and β anomers of D glucose and b) α and β anomers of galactose in the same energy profile diagram.

8. Glycolytic energy production in cardiac muscle and liver cells are less than other tissues. Is this statement true or false? Explain with mechanism.

9. A) Can Gluconeogenesis be considered as reversal of Glycolysis? Justify
B) How Glucose metabolism is different than fructose metabolism in order to produces the intermediates Explain

10. Based on binding change mechanism calculate the approximate proton transport required to produce a single ATP.

11. A) In a population of rabbits, coat colour can be either brown (dominant) or white (recessive), with brown being dominant over white. There are 653 individuals in a population. 104 rabbits have white coats and 549 have brown coats. Find: the frequency of the dominant and recessive alleles and the frequency of individuals with dominant, heterozygous, and recessive genotypes.
B) The next generation of rabbits has 560 individuals with brown coats and 840 individuals with white coats. Is the population in Hardy-Weinberg Equilibrium? Solve for p and q.
C) What is inbreeding depression?

12. A) What is the difference between silent and neutral mutation?
B) Within a population of Bird, the colour blue (B) is dominant over yellow (Y), and 40% of the birds are yellow (YY). Given this simple information calculate the percentage of birds that are heterozygous.
C) A very large population of randomly-mating laboratory mice contains 35% white mice. White coloring is caused by the double recessive genotype, "aa". Calculate allelic and genotypic frequencies for this population.
D) In a given population, only the "A" and "B" alleles are present in the ABO system; there are no individuals with type "O" blood or with O alleles in this particular population. If 200 people have type A blood, 75 have type AB blood, and 25 have type B blood, what are the alleleic frequencies of this population (i.e., what are IA and IB)?