M.Sc. BIOTECHNOLOGY
FIRST SEMESTER
BIOCHEMISTRY
MBT-102
(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs.   Full Marks : 70

[PART-A : Objective]

Time : 20 min.   Marks : 20

Choose the correct answer from the following: *1×20=20*

1. Nutritional polysaccharide is:
   a. Starch and glycogen   b. Starch and chitin
   c. Starch and cellulose   d. Starch and glucose

2. The synthesis of glucose from fats are called:
   a. Glycolysis   b. Krebs cycle
   c. Glycogenolysis   d. Gluconeogenesis

3. What is the H^+ ion concentration in pure water?
   a. 1×10^{-7} b. 1×10^{7} c. 1×10^{14} d. 1×10^{-14}

4. As the pKa of an acid increases the acid will be:
   a. More weaker   b. More stronger
   c. Converted to weaker solution d. Converted to basic solution

5. According to Henderson-Hasselbalch equation when the pH of a solution becomes equal to its pKa the solution becomes a buffer, this condition is achieved when:
   a. The concentration of proton donar equals the concentration of proton acceptor.
   b. Conentration of proton donar becomes zero.
   c. Concentration of proton acceptor becomes zero.
   d. The concentration of proton donar becomes log1/10th of concentration of proton acceptor.

6. A short length of DNA molecule has 80 thymine and 80 guanine bases. The total number of nucleotide in the DNA fragment is:
   a. 160   b. 40   c. 320   d. 640

7. Adjacent nucleotides are joined by:
   a. Covalent bonds   b. Phosphodiester bonds
   c. Ionic bonds   d. Peptide bonds

8. Which of the following best describes a protein domain?
   a. The α-helical portion of a protein.
   b. Discrete region of polypeptide chain that has folded into a self-contained three-dimensional structure.
   c. The β-pleated sheet portion of a protein.
   d. A feature that rarely occurs in globular proteins.

9. Smallest carbohydrates are trioses. Which of the following is a triose?
   a. Glucose   b. Ribulose
   c. Ribose   d. Glyceraldehyde

10. Greater the number of carbon atom in chain of fatty acid:
    a. The boiling point will be higher   b. The boiling point will be lesser
    c. The melting point will be higher   d. The melting point will be lower

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11. Enzyme which helps in changing shape of a molecule:
    a. Ligases   b. Dehydrogenases
    c. Hydrolases   d. Isomerases

12. Which type of bonding is responsible for the secondary structure of protein?
    a. Disulphide bridges between cysteine residues.
    b. Hydrogen bonding between c=o and N-H groups of peptide bonds.
    c. Peptide bond between amino acids.
    d. Salt bridges between charged side chains of amino acids.

13. The rate determining step of Michaelis-Menten kinetics is:
    a. The complex dissociation step to produce products.
    b. The complex formation step.
    c. The product formation step.
    d. None of the above.

14. Which of the following statements about the mechanism of allosteric control of enzyme activity is correct?
    a. Allosteric enzymes are typically single-subunit enzymes.
    b. Allosteric enzymes show greater sensitivity to changes in substrate concentration compared to classical type enzymes with hyperbolic kinetics.
    c. Allosteric enzymes show Michaelis menten Kinetics.
    d. Allosteric enzymes show reduced sensitivity to changes in substrate concentration compared to classical type enzymes with hyperbolic kinetics.

15. The first step in the payoff phase of glycolysis is:
    a. Reduction of 1, 3-bisphosphoglycerate to glyceraldehyde 3-phosphate.
    b. Oxidation of glyceraldehyde 3-phosphate to 1, 3-bisphosphoglycerate.
    c. Reversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate.
    d. Irreversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate.

16. Dihydroxyacetone phosphate is rapidly and reversibly converted to:
    a. Glyceraldehyde 3-phosphate   b. 1, 3-bis-phosphoglycerate
    c. Fructose 1, 6-bisphosphate   d. Fructose 6-phosphate

17. If energy releases excessively in environment, having less energy products than reactants, resulting reaction is called:
    a. Redox reaction   b. Thermodynamics
    c. Exergonic reaction   d. Endergonic reaction

18. RUBISCO enzyme is also called as.................
    a. Carboxytetra mutase   b. Carboxydimutase
    c. Carboxytrimutase   d. Carboxyunimutase

19. Which of the statement is true regarding Km?
    a. It is the measure of stability of enzyme substrate complex.
    b. It is the measure of the stability of the affinity of an enzyme for its substrate.
    c. A high Km indicates weak substrate binding.
    d. All of these.

20. Which of the following molecules is a typical fatty acid?
    a. A molecule that has an even number of carbon atoms in a branched chain.
    b. An amphipathic dicarboxylic acid with unconjugated double bonds.
    c. A molecule that has one cis double bond in a linear carbon chain.
    d. A polar hydrocarbon with that reacts with NaOH to form a salt.

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[**PART-B : Descriptive**]

Time : 2 hrs. 40 min.   Marks : 50

[**Answer question no.1 & any four (4) from the rest**]

1. Define Enzymes and derive Michaelis–Menten equation for enzyme substrate reaction.   10

2. a. Write short note on zwitter ions.   5+5=10
    b. Write short note on peptide bonds.

3. a. Write a note on activation energy.   4+6=10
    b. Explain the role of allosteric modulators in enzyme substrate reaction.

4. a. What are lipids how are they classified?   6+4=10
    b. Write the reaction involved when fatty acid is reacted with alkali.

5. a. Define carbohydrates and how are they classified?   5+5=10
    b. Explain the glycolytic pathway.

6. a. What is photosynthesis? Describe in brief the phases of photosynthesis.   4+6=10
    b. Describe the dark reaction of photosynthesis elaborately.

7. a. Throw a light on the concept of p H and p K of acid and base.   5+5=10
    b. Derive the equation of Henderson-Hasselback for acid and base.

8. a. Define proteins and how are they classified based on their organization?   6+4=10
    b. Write a note on Ramachandran plot.

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