CHAPTER 9

BIOMOLECULES

MULTIPLE CHOICE QUESTIONS

1. It is said that elemental composition of living organisms and that of inanimate objects (like earth's crust) are similar in the sense that all the major elements are present in both. Then what would be the difference between these two groups? Choose a correct answer from among the following:
   a. Living organisms have more gold in them than inanimate objects
   b. Living organisms have more water in their body than inanimate objects
   c. Living organisms have more carbon, oxygen and hydrogen per unit mass than inanimate objects.
   d. Living organisms have more calcium in them than inanimate objects.

2. Many elements are found in living organisms either free or in the form of compounds. Which of the following is not found in living organisms?
   a. Silicon
   b. Magnesium
   c. Iron
   d. Sodium

3. Aminoacids, have both an amino group and a carboxyl group in their structure. Which one of the following is an amino acid?
   a. Formic acid
   b. Glycerol
   c. Glycolic Acid
   d. Glycine

4. An aminoacid under certain conditions have both positive and negative charges simultaneously in the same molecule. Such a form of aminoacid is called

a. Acidic form
b. Basic form
c. Aromatic form
d. Zwitterionic form

5. Sugars are technically called carbohydrates, referring to the fact that their formulae are only multiple of $C(H_2O)$. Hexoses therefore have six carbons, twelve hydrogens and six oxygen atoms. Glucose is a hexose. Choose from among the following another hexose.
   a. Fructose
   b. Erythrose
   c. Ribulose
   d. Ribose

6. When you take cells or tissue pieces and grind them with an acid in a mortar and pestle, all the small biomolecules dissolve in the acid. Proteins, polysaccharides and nucleic acids are insoluble in mineral acid and get precipitated. The acid soluble compounds include aminoacids, nucleosides, small sugars etc. When one adds a phosphate group to a nucleoside, one gets another acid soluble biomolecule called
   a. Nitrogen base
   b. Adenine
   c. Sugar phosphate
   d. Nucleotide

7. When we homogenise any tissue in an acid the acid soluble pool represents
   a. Cytoplasm
   b. Cell membrane
   c. Nucleus
   d. Mitochondria

8. The most abundant component of living organisms is
   a. Protein
   b. Water
   c. Sugar
   d. Nucleic acid

9. A homopolymer has only one type of building block called monomer repeated 'n' number of times. A heteropolymer has more than one type of monomer. Proteins are heteropolymers usually made of

a. 20 types of monomers
b. 40 types of monomers
c. 30 types of monomers
d. only one type of monomer

10. Proteins perform many physiological functions. For example, some functions as enzymes. Which of the following represents an additional function that some proteins discharge?
a. Antibiotics
b. Pigment conferring colour to skin
c. Pigments making colours of flowers
d. Hormones

11. Glycogen is a homopolymer made of
a. Glucose units
b. Galactose units
c. Ribose units
d. Aminoacids

12. The number of 'ends' in a glycogen molecule would be
a. Equal to the number of branches plus one
b. Equal to the number of branch points
c. One
d. Two, one on the left side and another on the right side

13. The primary structure of a protein molecule has
a. Two ends
b. One end
c. Three ends
d. No ends

14. Enzymes are biocatalysts. They catalyse biochemical reactions. In general they reduce activation energy of reactions. Many physico-chemical processes are enzyme mediated. Which of the following reactions is not engyme-mediated in biological system?
a. Dissolving CO_2 in water
b. Untwining the two strands of DNA
c. Hydrolysis of sucrose
d. Formation of peptide bond

VERY SHORT ANSWER TYPE QUESTIONS

1. Medicines are either man made (i.e., synthetic) or obtained from living organisms like plants, bacteria, animals etc. and hence the latter are called natural products. Sometimes natural products are chemically altered by man to reduce toxicity or side effects. Write against each of the following whether they were initially obtained as a natural product or as a synthetic chemical.
   a. Penicillin _____
   b. Sulfonamide _____
   c. Vitamin C _____
   d. Growth Hormone _____

2. Select an appropriate chemical bond among ester bond, glycosidic bond, peptide bond and hydrogen bond and write against each of the following.
   a. Polysaccharide _____
   b. Protein _____
   c. Fat _____
   d. Water _____

3. Write the name of any one aminoacid, sugar, nucleotide and fatty acid.

4. Reaction given below is catalysed by oxidoreductase between two substrates A and A', complete the reaction.
   A reduced + A' oxidised ⟶

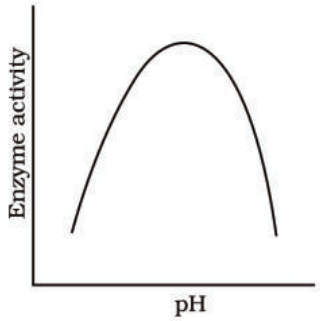
5. How are prosthetic groups different from co-factors?

6. Glycine and Alanine are different with respect to one substituent on the α -carbon. What are the other common substituent groups?

7. Starch, Cellulose, Glycogen, Chitin are polysaccharides found among the following. Choose the one appropriate and write against each.
   Cotton fibre _____
   Exoskeleton of cockroach _____
   Liver _____
   Peeled potato _____

SHORT ANSWER TYPE QUESTIONS

1. Enzymes are proteins. Proteins are long chains of aminoacids linked to each other by peptide bonds. Aminoacids have many functional groups in their structure. These functional groups are, many of them at least, ionisable. As they are weak acids and bases in chemical nature, this ionization is influenced by pH of the solution. For many enzymes, activity is influenced by surrounding pH. This is depicted in the curve below, explain briefly.



2. Is rubber a primary metabolite or a secondary metabolite? Write four sentences about rubber.
3. Schematically represent primary, secondary and tertiary structures of a hypothetical polymer say for example a protein.
4. Nucleic acids exhibit secondary structure, justify with example.
5. Comment on the statement "living state is a non-equilibrium steady-state to be able to perform work".

LONG ANSWER TYPE QUESTIONS

1. Formation of enzyme-substrate complex (ES) is the first step in catalysed reactions. Describe the other steps till the formation of product.
2. What are different classes of enzymes? Explain any two with the type of reaction they catalyse.
3. Nucleic acids exhibit secondary structure. Describe through Wetson-Crick Model.

4. What is the difference between a nucleotide and nucleoside? Give two examples of each with their structure.

5. Describe various forms of lipid with a few examples.