

**NCERT Exemplar Solutions of Class 11 Biology – Chapter 9: Biomolecules****MULTIPLE CHOICE QUESTIONS**

**1. It is said that the 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 the correct answer from among the following:**

**Options:** 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

**Solution: Option (c) is the answer.**

**Enhanced Explanation:** While both living organisms and inanimate objects contain the same major elements, the key difference lies in their relative proportions. Living organisms are primarily composed of organic compounds rich in carbon, hydrogen, and oxygen (like carbohydrates, proteins, lipids, and nucleic acids), making these elements much more abundant per unit mass compared to the earth's crust, which is predominantly composed of silicon and aluminum compounds.

**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?**

**Options:** a. Silicon b. Magnesium c. Iron d. Sodium

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** Silicon is not typically found in living organisms, except in trace amounts in some plants and diatoms. Magnesium is essential for chlorophyll, iron for hemoglobin and cytochromes, and sodium for nerve impulse transmission and osmotic balance.

**3. Amino acids have both an amino group and a carboxyl group in their structure. Which one of the following is an amino acid?**

**Options:** a. Formic acid b. Glycerol c. Glycolic Acid d. Glycine

**Solution: Option (d) is the answer.**

**Enhanced Explanation:** Glycine ( $\text{NH}_2\text{-CH}_2\text{-COOH}$ ) is the simplest amino acid containing both amino ( $-\text{NH}_2$ ) and carboxyl ( $-\text{COOH}$ ) groups. Formic acid ( $\text{HCOOH}$ ) has only a carboxyl group, glycerol ( $\text{C}_3\text{H}_8\text{O}_3$ ) is a trihydric alcohol, and glycolic acid ( $\text{C}_2\text{H}_4\text{O}_3$ ) has only a carboxyl group.

**4. An amino acid under certain conditions has both positive and negative charges simultaneously in the same molecule. Such a form of amino acid is called:**

**Options:** a. Acidic form b. Basic form c. Aromatic form d. Zwitterionic form

**Solution: Option (d) is the answer.**

**Enhanced Explanation:** The zwitterionic form occurs at the isoelectric point (pI) where the amino acid exists as  $\text{H}_3\text{N}^+\text{-CHR-COO}^-$ , with the amino group protonated (positive charge) and the carboxyl group deprotonated (negative charge), resulting in a net charge of zero.

**5. Sugars are technically called carbohydrates, referring to the fact that their formulae are only multiple of  $\text{C}(\text{H}_2\text{O})$ . Hexoses, therefore, have six carbons, twelve hydrogens and six oxygen atoms. Glucose is a hexose. Choose from among the following another hexose:**

**Options:** a. Fructose b. Erythrose c. Ribulose d. Ribose

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** Fructose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) is a hexose sugar with the same molecular formula as glucose. Erythrose ( $\text{C}_4\text{H}_8\text{O}_4$ ) is a tetrose, ribulose ( $\text{C}_5\text{H}_{10}\text{O}_5$ ) is a pentose, and ribose ( $\text{C}_5\text{H}_{10}\text{O}_5$ ) is also a pentose.

**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 amino acids, nucleosides, small sugars etc. When one adds a phosphate group to a nucleoside, one gets another acid-soluble biomolecule called:**

**Options:** a. Nitrogen base b. Adenine c. Sugar phosphate d. Nucleotide

**Solution: Option (d) is the answer.**

**Enhanced Explanation:** A nucleotide is formed when a phosphate group is added to a nucleoside. The structure is: Nucleotide = Nitrogenous base + Sugar + Phosphate group, while Nucleoside = Nitrogenous base + Sugar.

**7. When we homogenise any tissue in acid, the acid-soluble pool represents:**

**Options:** a. Cytoplasm b. Cell membrane c. Nucleus d. Mitochondria

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** The cytoplasm contains most of the small, acid-soluble biomolecules like amino acids, sugars, nucleotides, and ions. The cell membrane, nucleus, and mitochondria contain larger macromolecules that are acid-insoluble.

**8. The most abundant component of living organisms is:**

**Options:** a. Protein b. Water c. Sugar d. Nucleic acid

**Solution: Option (b) is the answer.**

**Enhanced Explanation:** Water typically constitutes 65-70% of the body weight in most living organisms, making it the most abundant component. It serves as a solvent, transport medium, and participates in many biochemical reactions.

**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:**

**Options:** a. 20 types of monomers b. 40 types of monomers c. 30 types of monomers d. Only one type of monomer

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** Proteins are heteropolymers composed of 20 standard amino acids (monomers) linked by peptide bonds. These 20 amino acids can be arranged in countless combinations to form different proteins with unique structures and functions.

**10. Proteins perform many physiological functions. For example, some function as enzymes. Which of the following represents an additional function that some proteins discharge?**

**Options:** a. Antibiotics b. Pigment conferring colour to skin c. Pigments making colours of flowers d. Hormones

**Solution: Option (d) is the answer.**

**Enhanced Explanation:** Many hormones are proteins, such as insulin, growth hormone, and glucagon. These protein hormones regulate various physiological processes. Antibiotics are typically small molecules or secondary metabolites, not proteins.

**11. Glycogen is a homopolymer made of:**

**Options:** a. Glucose units b. Galactose units c. Ribose units d. Amino acids

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** Glycogen is a branched homopolymer composed entirely of glucose units connected by  $\alpha(1\rightarrow4)$  glycosidic bonds in the linear chains and  $\alpha(1\rightarrow6)$  glycosidic bonds at branch points.

**12. The number of 'ends' in a glycogen molecule would be:**

**Options:** 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

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** In glycogen's branched structure, each branch point creates an additional end. If there are 'n' branch points, there will be (n+1) ends - one original reducing end plus one new end for each branch.

**13. The primary structure of a protein molecule has:**

**Options:** a. Two ends b. One end c. Three ends d. No ends

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** The primary structure of a protein is a linear sequence of amino acids connected by peptide bonds, creating a polypeptide chain with two distinct ends: the N-terminus (amino end) and the C-terminus (carboxyl end).

**14. Enzymes are biocatalysts. They catalyse biochemical reactions. In general, they reduce the activation energy of reactions. Many physico-chemical processes are enzyme-mediated. Which of the following reactions is not enzyme-mediated in the biological system?**

**Options:** a. Dissolving CO<sub>2</sub> in water b. Untwining the two strands of DNA c. Hydrolysis of sucrose d. Formation of peptide bond

**Solution: Option (a) is the answer.**

**Enhanced Explanation:** Dissolving CO<sub>2</sub> in water is a simple physical process that occurs spontaneously without enzymatic catalysis. However, the conversion of CO<sub>2</sub> and water to carbonic acid is catalyzed by carbonic anhydrase. The other processes require specific enzymes: helicases for DNA unwinding, sucrase for sucrose hydrolysis, and peptidyl transferase for peptide bond formation.

