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1. BIOCHEMISTRY-NUMBER OF QUESTION ASKED IN MH-SET (2011-2024)

	Topics	2024	2023	2021	2020	2019	2018	2017	2016	2015	2013- Dec	2013- Jan	2011
1	Structure of atoms, molecules and chemical bonds	1	-	-	-	1	1	-	-	2	-	-	2
2	Biomolecules	1	-	-	1	3	2	3	1	2	2	3	1
3	Stabilization Interaction	-	1	-	-	-	1	-	2	-	-	-	-
4	Biophysical Chemistry	2	1	1	2	3	2	3	2	1	1	1	-
5	Bienergetics	-	2	3	1	-	-	-	3	5	4	3	-
6	Principles of Catalysis	1	1	4	4	2	1	2	4	2	3	3	5
7	Conformation of proteins	-	-	1	2	1	1	-	-	-	-	-	1
8	Conformation of nucleic acids	1	-	1	-	-	1	1	1	1	-	1	-
9	Stability of Protein and Nucleic acids	2	-	1	1	1	2	-	1	-	-	2	1
10	Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins	4	3	3	3	2	3	2	2	1	2	4	5

CHAPTER-1

MOLECULES AND THEIR INTERACTION RELEVANT TO BIOLOGY

Unit-1.1: Structure of Atoms, Molecules & Chemical Bonds

[MH-2011-AUG]

1. Which of the following properties of water makes it a universal solvent?
- (A) Hydrophobic bonds formed between water and fatty acids
 - (B) Strong covalent bonds formed between water and salts
 - (C) High dielectric constant of water
 - (D) Hydrogen bonds formed between water and biochemical molecules

[MH-2011-AUG]

2. Osmotolerant yeasts are able to grow at high salt concentrations because their cytoplasm contains high concentration of:

- (A) Divalent cations
- (B) Lipids
- (C) Amino acids
- (D) Polyalcohols

[MH-2015]

3. Water is effective in screening the electrostatic interactions between dissolved ions because it has

- (A) a high dielectric constant
- (B) a high fluidity property
- (C) a high electrical conductivity
- (D) a neutral pH value

[MH-2015]

4. When two uncharged atoms are brought very close together, the two nuclei are said to be in van der Waals contact, when the net:

- (A) attraction is maximum
- (B) repulsion is maximum
- (C) attraction is equal to repulsion
- (D) attraction is minimum

[MH-2018]

5. Carbon-14 undergoes beta decay upon which it is converted into a new element having:

- (A) Increased atomic number
- (B) Decreased atomic number
- (C) Increased mass number
- (D) Decreased mass number

[MH-2019]

6. By what process does Thorium-230 decay to radium-226?

- (A) Gamma emission
- (B) Alpha emission
- (C) Beta emission
- (D) Electron capture

[MH-2024]

7. Hydrogen bonds are present in water structure. Presence of hydrogen bonds gives a characteristic property to water, which is:

- (A) High melting and high boiling points
- (B) High melting and low boiling points
- (C) Low melting and high boiling points
- (D) Low melting and low boiling points

ANSWER KEY

1	2	3	4	5	6	7
D	D	A	C	A	B	A

EXPLANATIONS

1. **Correct Answer is (D):-** Hydrogen bonds formed between water and biochemical molecules. Water is often referred to as the universal solvent because it has the ability to dissolve a wide variety of solutes. This is primarily due to the hydrogen bonding that occurs between water molecules and other substances.
2. **Correct Answer is (D):-** Osmotolerant yeasts are able to grow in high salt concentrations because their cytoplasm contains high concentrations of polyalcohols, which help them balance osmotic pressure and maintain their cellular integrity in such environments. Divalent cations, amino acids, and lipids also play roles in various cellular processes, but they are not the primary contributors to osmotolerance in yeasts.
3. **Correct Answer is (A):-** Water has a high dielectric constant, which means it has the ability to reduce the strength of electrostatic interactions between dissolved ions. It does this by surrounding the ions with its polar molecules, effectively shielding the electrostatic charges and weakening the interactions. This property of water is crucial for various biological and chemical processes.

4. **Correct Answer is (C):-** When two uncharged atoms are brought very close together, they reach a point called van der Waals contact. At this distance, the attractive London dispersion forces (van der Waals forces) and the repulsive electron-electron repulsion are approximately equal. This balance results in a stable equilibrium, where the net effect of attraction and repulsion is minimized. This point is not where the attraction is maximum, but rather where the two opposing forces are in equilibrium.
5. **Correct Answer is (A):-** In beta decay, a nucleus emits a beta particle (an electron or a positron) to achieve a more stable configuration. The decay can be represented as:
Carbon-14 (6 protons, 8 neutrons) $\rightarrow$ Nitrogen-14 (7 protons, 7 neutrons) + beta particle
The beta particle is emitted from the carbon-14 nucleus, and a neutron is converted into a proton, increasing the atomic number by 1. As a result, the new element formed after the beta decay of carbon-14 is nitrogen-14, which has an increased atomic number.
6. **Correct Answer is (B):-** Alpha emission. Thorium-230 decays to radium-226 through alpha decay. In alpha decay, the nucleus emits an alpha particle, which consists of two protons and two neutrons
7. **Correct Answer is (A):-** Hydrogen bonds make water molecules attract each other, leading to unusually high melting and boiling points for such a small molecule, compared to other liquids.