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AMC/AFNS/NUMS Chemistry-2 Test Preparation

Chemical Bonding and States of Matter

1. Chemical bond is defined as:

- A. Force of attraction between atoms
- B. Force of repulsion between atoms
- C. Breaking of atoms only
- D. Movement of electrons only

Correct Answer: A. Force of attraction between atoms

Explanation: A chemical bond is the attractive force that holds atoms together in a molecule or compound. Atoms form bonds to become more stable by completing their outermost electron shell. Chemical bonding explains the formation of substances such as water, sodium chloride, oxygen gas, and many organic compounds.

2. Atoms form chemical bonds to achieve:

- A. Unstable configuration
- B. Noble gas configuration
- C. Lower atomic number
- D. Higher nuclear charge

Correct Answer: B. Noble gas configuration

Explanation: Atoms form chemical bonds to attain a stable electronic configuration similar to noble gases. Noble gases have complete valence shells, making them chemically stable. Other atoms gain, lose, or share electrons to complete their outermost shell.

3. The outermost shell electrons are called:

- A. Core electrons
- B. Valence electrons
- C. Nuclear electrons
- D. Free protons

Correct Answer: B. Valence electrons

Explanation: Valence electrons are the electrons present in the outermost shell of an atom. These electrons are responsible for chemical bonding and chemical reactivity. The number of valence electrons helps determine whether an atom will gain, lose, or share electrons.

4. Ionic bond is formed by:

- A. Sharing of electrons
- B. Transfer of electrons
- C. Sharing of protons
- D. Transfer of neutrons

Correct Answer: B. Transfer of electrons

Explanation: An ionic bond is formed when one atom transfers electrons to another atom. The

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atom that loses electrons becomes a positive ion, while the atom that gains electrons becomes a negative ion. The electrostatic attraction between these oppositely charged ions forms an ionic bond.

5. Ionic bond is usually formed between:

- A. Two metals
- B. Two non-metals
- C. Metal and non-metal
- D. Noble gases only

Correct Answer: C. Metal and non-metal

Explanation: Ionic bonding usually occurs between metals and non-metals. Metals tend to lose electrons and form positive ions, while non-metals tend to gain electrons and form negative ions. Sodium chloride is a common example of an ionic compound.

6. Sodium chloride contains:

- A. Covalent bond
- B. Ionic bond
- C. Metallic bond only
- D. Hydrogen bond only

Correct Answer: B. Ionic bond

Explanation: Sodium chloride is formed when sodium loses one electron to become Na^+ and chlorine gains that electron to become Cl^- . The strong electrostatic attraction between Na^+ and Cl^- forms an ionic bond. This is why NaCl exists as a crystal lattice rather than separate molecules.

7. Covalent bond is formed by:

- A. Complete transfer of electrons
- B. Sharing of electrons
- C. Transfer of protons
- D. Loss of neutrons

Correct Answer: B. Sharing of electrons

Explanation: A covalent bond is formed when two atoms share one or more pairs of electrons. This type of bond usually occurs between non-metal atoms. Sharing electrons allows each atom to complete its valence shell and become more stable.

8. Covalent bond is usually formed between:

- A. Two non-metals
- B. Metal and non-metal
- C. Metal and metal
- D. Ion and proton

Correct Answer: A. Two non-metals

Explanation: Covalent bonding usually occurs between non-metal atoms because non-metals

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tend to gain or share electrons rather than lose them. Examples of covalent molecules include H_2 , O_2 , Cl_2 , H_2O , CO_2 , and CH_4 .

9. A single covalent bond involves sharing of:

- A. One electron
- B. One pair of electrons
- C. Two pairs of electrons
- D. Three pairs of electrons

Correct Answer: B. One pair of electrons

Explanation: A single covalent bond is formed when two atoms share one pair of electrons. For example, in a hydrogen molecule, two hydrogen atoms share one pair of electrons to form H_2 . Single bonds are usually represented by one line between atoms.

10. A double covalent bond involves sharing of:

- A. One pair of electrons
- B. Two pairs of electrons
- C. Three pairs of electrons
- D. Four pairs of electrons

Correct Answer: B. Two pairs of electrons

Explanation: A double covalent bond is formed when two atoms share two pairs of electrons. For example, oxygen gas, O_2 , contains a double bond between two oxygen atoms. Double bonds are stronger and shorter than single bonds.

11. A triple covalent bond involves sharing of:

- A. One pair of electrons
- B. Two pairs of electrons
- C. Three pairs of electrons
- D. Five pairs of electrons

Correct Answer: C. Three pairs of electrons

Explanation: A triple covalent bond involves sharing of three pairs of electrons between two atoms. Nitrogen gas, N_2 , contains a triple bond. Triple bonds are generally stronger and shorter than single and double bonds.

12. Metallic bond is found in:

- A. Sodium chloride
- B. Water
- C. Copper
- D. Carbon dioxide

Correct Answer: C. Copper

Explanation: Metallic bonding occurs in metals such as copper, iron, aluminum, and sodium. In metallic bonding, positive metal ions are surrounded by a sea of delocalized electrons. These free electrons explain the electrical and thermal conductivity of metals.

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13. Metals are good conductors of electricity because they have:

- A. Fixed electrons
- B. Delocalized electrons
- C. No electrons
- D. Only neutrons

Correct Answer: B. Delocalized electrons

Explanation: Metals conduct electricity because they contain delocalized electrons that can move freely throughout the metallic lattice. When a potential difference is applied, these electrons flow and carry electric current.

14. Hydrogen bond is strongest when hydrogen is bonded to:

- A. Carbon, sodium, or potassium
- B. Nitrogen, oxygen, or fluorine
- C. Calcium, magnesium, or zinc
- D. Chlorine, bromine, or iodine only

Correct Answer: B. Nitrogen, oxygen, or fluorine

Explanation: Hydrogen bonding occurs when hydrogen is covalently bonded to highly electronegative atoms such as nitrogen, oxygen, or fluorine. These atoms strongly attract electrons, producing a partial positive charge on hydrogen. Hydrogen bonding is important in water, proteins, and DNA structure.

15. The bond present between water molecules is:

- A. Ionic bond
- B. Metallic bond
- C. Hydrogen bond
- D. Triple covalent bond

Correct Answer: C. Hydrogen bond

Explanation: Water molecules are held together by hydrogen bonds between the partially positive hydrogen atom of one water molecule and the partially negative oxygen atom of another water molecule. These hydrogen bonds give water its high boiling point, surface tension, and unique properties.

16. The three common states of matter are:

- A. Solid, liquid, and gas
- B. Metal, non-metal, and metalloid
- C. Acid, base, and salt
- D. Atom, ion, and molecule

Correct Answer: A. Solid, liquid, and gas

Explanation: Matter commonly exists in three states: solid, liquid, and gas. These states differ in particle arrangement, intermolecular forces, shape, volume, and movement of particles. Plasma and Bose-Einstein condensate are also states of matter but are less commonly discussed at basic level.

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17. In solids, particles are:

- A. Far apart and moving freely
- B. Closely packed and vibrate at fixed positions
- C. Completely motionless
- D. Present only as ions

Correct Answer: B. Closely packed and vibrate at fixed positions

Explanation: In solids, particles are closely packed due to strong intermolecular forces. They cannot move freely from place to place but vibrate around fixed positions. This arrangement gives solids a fixed shape and fixed volume.

18. Solids have:

- A. Fixed shape and fixed volume
- B. Fixed shape but no fixed volume
- C. No fixed shape but fixed volume
- D. No fixed shape and no fixed volume

Correct Answer: A. Fixed shape and fixed volume

Explanation: Solids have a definite shape and definite volume because their particles are tightly packed and held by strong forces of attraction. They are generally incompressible and do not flow easily.

19. Liquids have:

- A. Fixed shape and fixed volume
- B. No fixed shape but fixed volume
- C. Fixed shape but no fixed volume
- D. No fixed shape and no fixed volume

Correct Answer: B. No fixed shape but fixed volume

Explanation: Liquids have a definite volume but no definite shape. Their particles are close together but can slide past one another, allowing liquids to flow and take the shape of their container.

20. Gases have:

- A. Fixed shape and fixed volume
- B. Fixed volume only
- C. No fixed shape and no fixed volume
- D. Fixed shape only

Correct Answer: C. No fixed shape and no fixed volume

Explanation: Gases have neither fixed shape nor fixed volume. Their particles are far apart and move freely in all directions. Therefore, gases expand to fill the entire space available to them.

21. The force of attraction between gas particles is:

- A. Very strong
- B. Moderate
- C. Very weak

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D. Infinite

Correct Answer: C. Very weak

Explanation: Gas particles are far apart from each other, so the intermolecular forces between them are very weak. This is why gases are highly compressible and can spread quickly throughout a container.

22. The process of changing solid into liquid is called:

- A. Freezing
- B. Melting
- C. Condensation
- D. Sublimation

Correct Answer: B. Melting

Explanation: Melting is the process in which a solid changes into a liquid when heat is supplied. During melting, particles gain kinetic energy and overcome some of the forces holding them in fixed positions.

23. The process of changing liquid into gas is called:

- A. Evaporation
- B. Freezing
- C. Condensation
- D. Deposition

Correct Answer: A. Evaporation

Explanation: Evaporation is the process by which liquid changes into gas from its surface. It can occur at temperatures below the boiling point. Faster particles escape from the surface, leaving the remaining liquid cooler.

24. The process of changing gas into liquid is called:

- A. Melting
- B. Freezing
- C. Condensation
- D. Sublimation

Correct Answer: C. Condensation

Explanation: Condensation is the change of gas into liquid when gas particles lose energy. As particles lose kinetic energy, they come closer together and form liquid. Formation of water droplets on a cold glass is an example of condensation.

25. The process of changing liquid into solid is called:

- A. Melting
- B. Freezing
- C. Evaporation
- D. Boiling

Correct Answer: B. Freezing

Explanation: Freezing is the process in which a liquid changes into a solid by losing heat

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energy. During freezing, particles slow down and become arranged in fixed positions due to stronger intermolecular forces.

26. Sublimation is the direct change of:

- A. Solid into gas
- B. Gas into liquid
- C. Liquid into solid
- D. Liquid into plasma

Correct Answer: A. Solid into gas

Explanation: Sublimation is the process in which a solid changes directly into gas without passing through the liquid state. Common examples include iodine, ammonium chloride, camphor, and dry ice.

27. Boiling occurs:

- A. Only at the surface of liquid
- B. Throughout the liquid
- C. Only in solids
- D. Only at room temperature

Correct Answer: B. Throughout the liquid

Explanation: Boiling is the rapid conversion of liquid into gas that occurs throughout the liquid at a fixed temperature called boiling point. Unlike evaporation, boiling occurs in the entire liquid and produces bubbles.

28. Evaporation causes cooling because:

- A. Slow particles escape first
- B. Fast particles escape from the surface
- C. Particles become heavier
- D. Heat is produced continuously

Correct Answer: B. Fast particles escape from the surface

Explanation: During evaporation, faster and higher-energy particles escape from the surface of a liquid. The remaining particles have lower average kinetic energy, so the temperature of the liquid decreases. This causes cooling.

29. Compressibility is highest in:

- A. Solids
- B. Liquids
- C. Gases
- D. Metals only

Correct Answer: C. Gases

Explanation: Gases are highly compressible because their particles are far apart and have large empty spaces between them. When pressure is applied, gas particles can be forced closer together, reducing volume.

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30. Diffusion is fastest in:

- A. Solids
- B. Liquids
- C. Gases
- D. Crystals only

Correct Answer: C. Gases

Explanation: Diffusion is the movement of particles from a region of higher concentration to a region of lower concentration. It is fastest in gases because gas particles move freely and have weak intermolecular forces.

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