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Atomic Energy Education Society

Session-2023-24

Class: IX **Subject: Science(Chemistry)**

WORKSHEET NO-2 (Answer Key)

Name of the Chapter: Matter in our surroundings

Name of the Topic : Matter in our surroundings

I.Choose the correct option from the following . **1x10=10**

1. C) Gas
2. C) Sublimation
3. B) Liquid
4. C) Gas
5. C) Sublimation
6. C) Freezing
7. D) Vaporization point
8. C)Camphor
9. D) Deposition
10. A) They have fixed positions and vibrate around them

II. Fill in the blanks with suitable word/s. **1x10=10**

1. Evaporation
2. Melting
3. Freezing
4. Solid
5. Sublimation
6. Gas
7. Condensation
8. Boiling
9. Miscibility
10. Solution

III. Answer the following questions. **2x10=20**

1. Kinetic energy of particles refers to the energy of particles due to their motion. In gases, particles have the highest kinetic energy.

2. The arrangement of particles in solids is closely packed, in liquids they are close but not fixed, and in gases, they are widely spaced.

3. Evaporation is the process of the gradual conversion of a liquid into a vapor at temperatures below its boiling point. It differs from boiling as it occurs only on the surface and doesn't involve the entire liquid.

4. Substances expand when heated because their particles gain energy and move farther apart. Conversely, cooling causes particles to lose energy and move closer together.

5. Solids have a fixed shape and volume, while liquids have a fixed volume but no fixed shape. Gases have neither a fixed shape nor volume.

6. Sublimation is the direct change of a substance from a solid to a gas without passing through the liquid phase. An example is dry ice (solid carbon dioxide).

7. Solids have strong intermolecular forces, while gases have weak forces. Solids have closely packed particles, and gases have widely spaced particles.

8. Deposition is the process of a gas changing directly into a solid. An example is frost forming on a cold surface.

9. A gas exerts pressure on the walls of its container due to the constant motion and collision of gas particles .

10. The temperature remains constant during a phase change as the energy supplied is used to overcome intermolecular forces, not increase temperature.

IV. Answer the following questions. 3x5=15

1. Boiling and evaporation are both processes by which a liquid changes into a gas, but they differ in some key aspects:
   Boiling:Boiling occurs at a specific temperature called the boiling point.
   It takes place throughout the liquid. Boiling involves a change in the state of the entire liquid.
   Evaporation: Evaporation can occur at any temperature, not just at the boiling point. It occurs only at the surface of the liquid.Evaporation involves a change in the state of only the liquid's surface molecules.
2. Solids have particles arranged in a regular pattern, liquids have particles loosely arranged, and gases have particles widely spaced and moving rapidly. Intermolecular forces are strongest in solids and weakest in gases. Kinetic energy is highest in gases. Solids are least compressible, gases are most compressible.
3. Factors affecting the rate of evaporation include temperature, surface area, humidity, and wind speed. Higher temperature, larger surface area, lower humidity, and higher wind speed increase evaporation.
4. The phenomenon of the surface of a liquid in an open container gradually decreasing over time is known as "evaporation." Evaporation is the process by which molecules at the liquid's surface gain enough energy to escape into the gaseous phase, leading to a gradual reduction in the liquid's volume and the lowering of the liquid's surface level.
5. Latent Heat of Fusion: The latent heat of fusion is the amount of heat energy required to change a unit mass of a substance from the solid state to the liquid state at its melting point without a change in temperature. During fusion (melting), the energy is used to overcome the intermolecular forces holding the particles together.

IV. Answer the following questions. **5x5=25**

1. Sublimation is the process in which a substance changes directly from a solid state to a gaseous state without passing through the liquid state. This occurs when the vapor pressure of the solid is greater than its melting point. Some common examples of sublimation are camphor, dry ice (solid carbon dioxide), naphthalene (used in mothballs), and iodine crystals.
2. The term "latent heat of fusion" refers to the amount of heat energy required to change a substance from its solid state to its liquid state at its melting point, without changing its temperature. During the process of fusion (melting), the heat energy supplied is used to weaken the intermolecular forces between the particles of the substance, allowing them to move from their fixed positions and transition into the liquid state. The term "latent" implies that this heat energy is hidden within the substance and is not reflected in a change in temperature.
3. Molecular Arrangement:
   Solids: In solids, particles are closely packed and arranged in a regular pattern or lattice structure. The arrangement is fixed, and particles vibrate around their equilibrium positions.
   Liquids: In liquids, particles are less closely packed compared to solids. They are more randomly arranged and can move past each other, but they are still relatively close.
   Gases: In gases, particles are widely spaced and have a random arrangement. They move freely and independently, with large distances between particles.

   Intermolecular Forces:
   Solids: In solids, intermolecular forces are strong. These forces hold particles tightly together in their positions within the lattice structure.
   Liquids: In liquids, intermolecular forces are weaker than in solids but stronger than in gases. These forces allow particles to move past each other but still maintain some degree of attraction.
   Gases: In gases, intermolecular forces are very weak. The forces are usually negligible compared to the kinetic energy of particles, allowing them to move independently.

   Kinetic Energy:
   Solids: In solids, particles have the least amount of kinetic energy. They vibrate around fixed positions but have limited translational motion.
   Liquids: In liquids, particles have more kinetic energy compared to solids. They move with greater freedom, allowing them to flow and take the shape of their container.
   Gases: In gases, particles have the highest kinetic energy. They move rapidly and randomly, colliding with each other and the walls of the container.

   Compressibility:
   Solids: Solids are usually incompressible. Their tightly packed arrangement and strong intermolecular forces prevent significant changes in volume when pressure is applied.
   Liquids: Liquids are also nearly incompressible. Although their intermolecular forces are weaker than in solids, the particles are still close enough to resist compression.
   Gases: Gases are highly compressible. The large distances between gas particles and their weak intermolecular forces allow them to be easily compressed or expanded under changes in pressure.

When water freezes to form ice, the water molecules arrange themselves in a hexagonal lattice structure due to hydrogen bonding. This arrangement leads to an increase in the space between the water molecules in the ice compared to the more compact arrangement in liquid water. As a result, ice is less dense than water. This is why ice floats on water surfaces rather than sinking.
When surface water cools down, it loses heat to the surroundings and freezes. Since ice is less dense, it forms a layer on the surface of bodies of water. This layer of ice acts as an insulating barrier between the cold air and the water beneath. It helps prevent further heat loss from the water below and maintains relatively warmer temperatures for aquatic organisms.

Diffusion plays a significant role in various aspects of our daily life. It is the process by which particles move from an area of higher concentration to an area of lower concentration due to random motion. This natural tendency of particles to spread out and mix has several important applications:

1. Smell and Aroma Dispersal:
Diffusion is responsible for the spreading of smells and aromas. When you cook a delicious meal, the aroma diffuses in the air, reaching distant parts of your home. Similarly, the scent of a flower or perfume spreads due to diffusion, allowing us to experience pleasant fragrances.

2. Respiratory System:
In our respiratory system, oxygen from the air diffuses into our bloodstream through the thin walls of the alveoli in our lungs. Simultaneously, carbon dioxide diffuses out of the bloodstream into the alveoli to be exhaled. This process ensures the exchange of gases essential for our survival.

3. Osmosis in Cells:
In biological systems, osmosis is a specific type of diffusion involving the movement of water molecules through a selectively permeable membrane. This process is crucial for maintaining the balance of water and solutes within cells and across cell membranes.

4. Food Digestion and Nutrient Absorption:
During digestion, nutrients from digested food diffuse across the walls of the digestive tract and into the bloodstream, providing the body with essential nutrients. Similarly, waste products and excess substances diffuse out of the bloodstream and into the digestive tract for elimination.

5. Plants and Water Absorption:
In plants, diffusion is vital for water and nutrient absorption through the roots. Nutrients dissolved in the soil water diffuse into root cells, and water moves from areas of higher concentration (the soil) to areas of lower concentration (inside the roots) through osmosis.

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