

1. Which of the following are matter?

Chair, air, love, smell, hate, almonds, thought, cold, lemon water, smell of perfume.

Answer: Matter is anything that has mass and occupies space. Based on this definition, the following items from the list are considered matter:

- Chair
- Air
- Almonds
- Lemon water

The other items, such as love, smell, hate, thought, cold, and smell of perfume, are not considered matter because they do not have mass and do not occupy space. These are either emotions, sensations, or states, which do not qualify as matter.

2. Give reasons for the following observation:

The smell of hot sizzling food reaches you several metres away, but to get the smell from cold food you have to go close.

Answer:

- (i) When food is sizzling hot, it releases vapours of its contents.
- (ii) Because on increasing the temperature of food, the kinetic energy of the particles increases, hence, they diffuse at a faster speed and reach us even at some distance.
- (iii) However, no such vapours are released when the food is cold.
- (iv) Therefore, we have to go close to it in order to get its smell.

3. A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?

Answer: This shows that in water which represents the liquid state of matter, there are sufficient inter particle spaces. That is why, a diver is able to cut through water. He might not do the same had these spaces been very small, e.g. in solid state.

4. What are the characteristics of the particles of matter?

Answer: (1) Particles of matter have space between them.
When we make tea, coffee or lemonade (nimbu paani), particles of one type of matter get into the spaces between particles of the other. This shows that there is enough space between particles of matter. Similarly, particles of sugar, salt, dettol, or potassium permanganate get evenly distributed in water.

(2) Particles of matter are continuously moving.
Particles of matter are continuously moving, that is, they possess what we call the kinetic energy. As the temperature rises, particles move faster. So, we can say that with increase in temperature, the kinetic energy of the particles also increases.

(3) Particles of matter attract each other.
Particles of matter have force acting between them. This force keeps the particles together. The strength of this force of attraction varies from one kind of matter to another.

- The mass per unit volume of a substance is called density. (Density = Mass/Volume). Arrange the following in the order of increasing density – air, exhaust from the chimneys, honey, water, chalk, cotton, and iron.

Answer:

The following substances are arranged in increasing density:

- Air
- Exhaust from chimney
- Cotton
- Water
- Honey
- Chalk
- Iron

- Tabulate the differences in the characteristics of states of matter. OR Comment upon the following: rigidity, compressibility, fluidity, filling a container, shape, kinetic energy, and density.

Answer:

Property	Solids	Liquids	Gases
Mass	Definite mass	Definite mass	Definite mass
Shape	Definite shape	No definite shape	No definite shape
Volume	Definite volume	Definite volume	No Definite volume
Density	Highest	Lower than solids, higher than gases	Lowest
Rigidity	Highly rigid	Less rigid than solids	Not rigid
Fluidity	Do not flow	From higher level to low level	In all directions
Compressibility	Very low or cannot be compressed easily	Low	Very high
Free Surface	Infinite	One (upper surface)	No free surface
Diffusion	Cannot diffuse	Few diffuse immediately	Diffuse rapidly
Thermal Expansion	Low and Linear	Higher than solids	Highest
Packing of particles	Tightly packed	Loosely packed	Very loosely packed

Spaces between particles	Very less	Greater space as compared to solids	Greatest
Forces of Attraction	Very strong	Less than solids	Least

3. Give reasons:

- (a) A gas completely fills the vessel in which it is kept.
- (b) A gas exerts pressure on the walls of the container.
- (c) A wooden table should be called a solid.
- (d) We can easily move our hand in air but to do the same through a solid block of wood we need a karate expert.

- Answer:**
- (a) A gas completely fills the vessel in which it is kept because due to high kinetic energy and negligible forces of attraction, the molecules of a gas are moving with high speed in all directions.
 - (b) The kinetic energy of the particles in the gaseous state is maximum. Particles move about randomly at high speed. Due to random movement, the particles hit each other and also the walls of the container.
The pressure exerted by the gas is because of the force exerted by the gas particles per unit area on the walls of the container.
 - (c) A wooden table should be called a solid because (i) it is rigid and cannot be compressed easily (ii) it has a definite volume and definite shape.
 - (d) It is because the intermolecular forces in wood (solid) are the strongest and negligible in air (gas).

1. Convert the following temperatures to celsius scale:

(a) 300 K (b) 573 K.

Answer: Temperature on Kelvin scale = Temperature on Celsius scale + 273
(a) 300 = Temperature on Celsius scale + 273
or Temperature of Celsius scale = 300 - 273 = 27°C

(b) 573 = Temperature on Celsius scale + 273
or Temperature on Celsius scale = 573 - 273 = 300°C

2. What is the physical state of water at?

a. 250°C b. 100°C?

Answer: (a) At 250°C – Gaseous state since it is beyond its boiling point.

(b) At 100°C – It is at the transition state as the water is at its boiling point. Hence it would be present in both liquid and gaseous states.

3. For any substance, why does the temperature remain constant during the change of state?

Answer: It is due to the latent heat as the heat supplied to increase the temperature of the substance is used up to transform the state of matter of the substance; hence, the temperature stays constant.

4. Suggest a method to liquify atmospheric gases.

Answer: It can be achieved by either increasing the pressure or decreasing the temperature, which ultimately leads to the reduction of spaces between molecules.

1. Why does a desert cooler cool better on a hot dry day?

Answer:

- (i) The cooling in a desert room cooler is caused by the evaporation of water.
- (ii) A desert cooler cools better on a hot and dry day because the higher temperature on a hot day increases the rate of evaporation of water and the dryness of air (low humidity of air) also increases the rate of evaporation of water.
- (iii) Due to the increased rate of evaporation of water, a desert cooler cools better on a hot and dry day.

2. Why do people wear cotton clothes in summer?

Answer: We sweat more in summer. As the sweat evaporates it takes energy from our body surface and keeps our body cool. Cotton can absorb the sweat easily and exposes it to the atmosphere causing evaporation to take place easily. This, in turn, keeps us cool on summer days.

3. Why does our palm feel cold when we put on some acetone or petrol, or perfume on it?

Answer: Acetone, petrol, and perfume are volatile substances that evaporate when they come in contact with air. Evaporation is facilitated as it uses energy from the palm, hence leaving a cooling effect on our palms.

4. How does the water kept in an earthen pot becomes cool during summer?

Answer: There are many small pores in an earthen pot. Through these pores, the water kept inside the pot evaporates. It takes the latent heat required for vaporization from the earthen pot and the remaining water in the earthen pot. Hence water loses heat making the water inside the pot cool.

5. What type of clothes should we wear in summer?

Answer: In summer, it is preferred to wear light-colored cotton clothes because light color reflects heat and cotton materials have pores that absorb sweat, facilitating evaporation, and hence causing a cooling effect on the skin.

Chapter Exercise:**1. Convert the following temperature to Celsius scale.**

(a) 293 K (b) 470 K

Answer: $0^{\circ}\text{C} = 273 \text{ K}$

$$(a) 293 \text{ K} = (293 - 273)^{\circ}\text{C} = 20^{\circ}\text{C}$$

$$(b) 470 \text{ K} = (470 - 273)^{\circ}\text{C} = 197^{\circ}\text{C}$$

2. Convert the following temperatures to the Kelvin scale.

(a) 25°C (b) 373°C

Answer: $0^{\circ}\text{C} = 273 \text{ K}$

(a) $25^{\circ}\text{C} = (25+273) \text{ K} = 298 \text{ K}$

(b) $373^{\circ}\text{C} = (373+273) \text{ K} = 646 \text{ K}$

3. Give reasons:

(a) Naphthalene balls disappear with time without leaving any solid substance.

(b) We can get the smell of perfume sitting several metres away.

Answer: (a) Naphthalene balls disappear without leaving any solid substance because they sublime. They change directly from solid to gas without changing into a liquid state.

(b) We can get the smell of perfume sitting several metres away. The particles of perfume mix with the particles of air around us and spread out. Due to this spreading of particles, we are able to get the smell even sitting several metres away.

4. Arrange the following in increasing order of forces of attraction between the particles – water, sugar, oxygen.

Answer: Oxygen (gas) < water (liquid) < sugar (solid)

5. What is the physical state of water at?

(a) 25°C (b) 0°C (c) 100°C

Answer: (a) At 25°C, the water will be in liquid form (normal room temperature).

(b) At 0°C, the water is at its freezing point, hence both solid and liquid phases are observed.

(c) At 100°C, the water is at its boiling point, hence both liquid and gaseous states of water (water vapour) are observed.

6. Give two reasons to justify –

(a) Water at room temperature is a liquid.

(b) An iron almirah is a solid at room temperature.

Answer: (a) Water persists as a liquid at room temperature since its melting point is lower than room temperature and its boiling point (100°C) is higher.

Similarly,

(i) A fixed volume is occupied by a fixed mass of water.

(ii) At room temperature, water does not have a fixed shape and flows to fit the container's shape.

As a result, water is a liquid at room temperature.

(b) Because its melting and boiling points are above room temperature, an iron almirah is a solid at room temperature.

In the same way,

(i) An iron almirah is rigid and has a predetermined shape.

(ii) Metals have a relatively high density.

As a result, at room temperature, an iron almirah is a solid.

7. Why is ice at 273K more effective in cooling than water at the same temperature?

Answer: At 273 K, ice will absorb heat energy or latent heat from the medium to overcome fusion and transform into water. As a result, ice has a greater cooling impact than water at the same temperature since water does not absorb the excess heat from the medium.

8. What produces more severe burns, boiling water or steam?

Answer: Steam produces severe burns. It is because it is an exothermic reaction that releases a high amount of heat which it had consumed during vaporization.

9. Name A, B, C, D, E, and F in the following diagram showing a change in its state.

Answer: Interconversion of three states of matter: Using temperature or pressure, any state of matter can be turned into another.

(A) Solid to Liquid → Melting (or) fusion (or) liquefaction

(B) Liquid to Gas → Evaporation (or) vaporization

(C) Gas to liquid → Condensation

(D) Liquid to Solid → Solidification

(E) Solid to Gas → Sublimation

(F) Gas to Solid → Solidification