

Chapter – 1 Matter in Our Surroundings

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Q1. Which of the following are matter?

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

Answer:

- Matter has mass and occupies space.
 1. Chair.
 2. Air.
 3. Almonds.
 4. Cold drinks.
 5. Smell of perfume.
- Smell of perfume is a matter due to the presence of some volatile substances in air which occupy space and have mass.

Q2. Give reasons for the following observations:

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

Answer:

- The higher the temperature of a substance, the more is kinetic energy and hence the faster it will travel.
- The smell of food is due to the process of diffusion of gases into the air.
- The rate of diffusion of hot gases into the air is faster than that of cold gases.
- The smell of hot sizzling food reaches us quickly because the rate of diffusion of hot gases is faster than the rate of diffusion of cold gases.

Q3. A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?

Answer:

- Water is a liquid form of matter.
- The diver is able to cut through water in a swimming pool shows that there is a strong force of attraction between the particles of a liquid but the force is not strong enough to hold the particles of the liquid in fixed position.

- So, by applying force, a diver is able to overcome the forces of attraction among the particles of water and hence cut through water in the swimming pool.

Q4. What are the characteristics of the particles of matter?

Answer: The important characteristics of the particles of matter (atoms or molecules) are the following:

- The particles of matter are very small.
- The particles of matter have spaces between them.
- The particles of matter are moving in random motion.
- The particles of matter attract each other.

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Q1. The mass per unit volume of a substance is called density. (density = mass/volume). Arrange the following in order of increasing density:

Air, exhaust from chimneys, honey, water, chalk, cotton, and iron.

Answer: Density of solid > Density of liquid > Density of gas.

- Hence, the order of densities is as follows:

Air < Exhaust from chimneys < Cotton < Water < Honey < Chalk < Iron

Q2. a) Tabulate the difference in the characteristics of states of matter.

b) Comment upon the following:

rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy density.

Answer:

- a) The difference between the characteristics of solid, gas and liquid are:

S/No	Solids	Liquids	Gases
1.	Solids have fixed shape and volume.	Liquids have fixed volume but they do not have fixed shape.	Gases do not have fixed shape and volume.
2.	Solids cannot be compressed.	Liquids cannot be compressed.	Gases can be compressed easily in smaller volumes.
3.	Solids have high densities.	Liquids have moderate to high densities.	Gases have very low densities.

		densities.	
4.	Solids are heavy in weight.	Liquids are less usually less heavy compared to solid.	Gases are very very light than same volume of a solid or a liquid.

b) Comments –

- i. Rigidity: - it is the property of a solid to resist change in its shape, when force is applied. Solids have high rigidity, liquids and gases are not rigid because the particles have no fixed position.
- ii. Compressibility: - it is the property of fluid due to which its volume decreases when pressure is applied. Solids and liquids do not have much compressibility, whereas gases have high compressibility rate.
- iii. Fluidity: - The property of flowing easily is called fluidity. Gases and liquid have the property of fluidity as there is large space in the particles of gases with less force of attraction, so gases can flow very easily.
- iv. Filling a gas container: - A gas can fill the container completely, as there is less attraction and large space in interspace particles, the gas particles can move with high speeds in all directions and occupy all the space in the container.
- v. Shape – The external shape of a substance is called its shape. A solid has a fixed shape due to strong force of attraction between particles. The liquid and gases do not have fixed shape.
- vi. Kinetic energy: - Due to the motion of its particles, the energy possessed by a material is called kinetic energy. Gases have high kinetic energy at a particular temperature, but liquids have lesser kinetic energy compared to gas and solids have the least kinetic energy at a given temperature.
- vii. Density: - it is defined as the mass per unit volume of a material. Solids have higher density; liquids have lower density compared to solids and gases have lowest densities.

Q3. Give reasons:

- a) A gas fills completely 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) The molecules of a gas are moving with a high speed in all the directions because they have a high kinetic speed and very less force of attraction.
- b) When the gas molecules are moving fast it hits the walls of container because of high kinetic energy and less force of attraction, so when the pressure is exerted by the gas due to the constant collision of fast-moving gaseous molecules .
- c) A wooden table has a fixed shape and volume so it is rigid object, and is called as solid.
- d) Air is a mixture of various gases whose molecules are far apart with weak force of attraction between them. Due to this weak force between the molecules of air we can easily move our hand in air.

Q4. Convert the following temperature to Celsius scale:

- a) 300 K
- b) 573 K

Answer: Formula used for converting Kelvin to Celsius scale is:

$$\text{Temperature on Kelvin scale} = \text{Temperature on Celsius scale} + 273$$

- a) 300 K

$$\begin{aligned}300 &= \text{Temperature on Celsius scale} + 273 \\ \text{Temperature on Celsius scale} &= 300 - 273 \\ &= 27^\circ C\end{aligned}$$

- b) 573 K

$$\begin{aligned}573 &= \text{Temperature on Celsius scale} + 273 \\ \text{Temperature on Celsius scale} &= 573 - 273 \\ &= 300^\circ C\end{aligned}$$

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Q1. Why does a desert cooler cool better on a hot dry day?

Answer:

The desert cooler cool better because of the evaporation of water. The higher temperature on a hot dry day and the dryness of air, increases the rate of

evaporation of water. Due to increase in the rate of evaporation of water, a desert room cooler cools better on a hot dry day.

Q2. How does the water kept in an earthen pot (matka) become cool during summer?

Answer:

There are small pores in the walls of earthen pot (matka). Water which is kept in the earthen pot will keep seeping out through these pores, and this water evaporates due to latent heat of vaporization from the earthen pot and the remaining water. So, in this manner the earthen pot and the remaining water lose heat and get cooled.

Q3. Why does our palm feel cold when we put some acetone or petrol or perfume on it?

Answer:

The volatile liquids which change into vapours are acetone, petrol and perfume. When we put it on our palm it gets evaporated rapidly, so our palm feels cold. This is because of latent heat of vaporization taking place when the change in state is taking place from liquid to vapour. When acetone, petrol or perfume take this latent heat of vaporization from our palm it loses heat and makes it feel cold.

Q4. Why are we able to sip hot tea or milk faster from a saucer than a cup?

Answer:

The surface area of cup is small. Because of this smaller area, when we take hot tea or milk in it, the vaporization in the cup is slow and the cooling caused is also less. So, the hot tea or milk remains hot for a longer period of time. When we take the hot tea or milk in a saucer, it has a larger surface area, due to which the evaporation is faster, which will cool down the hot milk or tea in the saucer more quickly, making it convenient to sip it.

Q5. What type of clothes should we wear in summer?

Answer:

Cotton clothes are preferred to wear in the hot summer to keep us cool and comfortable, because in summer our human body sweats and cotton clothes are good absorber of sweat.

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Q1. Convert the following temperatures to the Celsius scale.

- a) 293 K
- b) 470 K

Answer: The formula for converting the Kelvin scale into Celsius scale is:

$$\text{Temperature on Kelvin scale} = \text{Temperature on Celsius scale} + 273$$

- a) Now, we will substitute the value 293 K of temperature in Kelvin scale into the above formula.

$$293 = \text{Temperature on Celsius scale} + 273$$

$$\text{Temperature on Celsius scale} = 293 - 273$$

$$\boxed{\text{Temperature on Celsius scale} = 20^\circ\text{C}}$$

A temperature of 293 K on Kelvin scale is equal to 20°C on Celsius scale.

- b) Now, we will substitute the value 470 K of temperature in Kelvin scale into the above formula.

$$470 = \text{Temperature on Celsius scale} + 273$$

$$\text{Temperature on Celsius scale} = 470 - 273$$

$$\boxed{\text{Temperature on Celsius scale} = 197^\circ\text{C}}$$

A temperature of 470 K on Kelvin scale is equal to 197°C on Celsius scale.

Q2. Convert the following temperatures to the kelvin scale.

- a) 25°C
- b) 373°C

Answer: The formula for converting Celsius scale into Kelvin scale is:

$$\text{Temperature on Kelvin scale} = \text{Temperature on Celsius scale} + 273$$

- a) Now we will substitute the value $25^{\circ}C$ of temperature in Celsius scale in the above formula.

$$\text{Temperature on Kelvin scale} = 25 + 273$$

$$\boxed{\text{Temperature on Kelvin scale} = 298 K}$$

A temperature of $25^{\circ}C$ on Celsius scale is equal to $298 K$ on the Kelvin scale.

- b) Now we will substitute the value $373^{\circ}C$ of temperature in Celsius scale in the above formula.

$$\text{Temperature on Kelvin scale} = 373 + 273$$

$$\boxed{\text{Temperature on Kelvin scale} = 646 K}$$

A temperature of $373^{\circ}C$ on Celsius scale is equal to $646 K$ on the Kelvin scale.

Q3. Give reason for the following observations.

- Naphthalene balls disappear with time without leaving any solid.
- We can get the smell of perfume sitting several meters away.

Answer:

- Naphthalene balls are made up of coal tar, which is produced by crystallization from the intermediate product of condensed coal tar and from the heavier fraction of cracked petroleum. Thus, naphthalene balls undergo sublimation.
- Perfume contains liquid element which can easily get evaporated in the air and the gaseous molecules possess high speed, it gets diffused very fast. So, when the perfume is sprayed, its smell reaches to our nose even when we are sitting far away from it.

Q4. Arrange the following substances in increasing order of forces of attraction between the particles – water, sugar, oxygen.

Answer:

The force of attraction in different states of matter, in increasing order is as follows:

Gas → Liquid → Solid

Example:

- Water is a liquid at a room temperature.
- Sugar is a solid at a room temperature.
- Oxygen is a gas at a room temperature.

Q5. What is the physical state of water at –

- a) 25°C
- b) 0°C
- c) 100°C

Answer:

- The physical state of water at different temperatures are:
 - i. At 0°C or less – Ice (Solid)
 - ii. From 0°C to 100°C – Water (Liquid)
 - iii. At 100°C or above – Steam (Gaseous)
- So, we can say that the physical state of water at specific temperatures are –
 - a. 25°C – Liquid state
 - b. 0°C – the **freezing point** of water. Hence, at 0°C water exists in both liquid (water) and solid (water vapor) states.
 - c. 100°C – the **boiling of water**. Hence, at 100°C water exists in both liquid (water) and gaseous (water vapor) states.

Q6. 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) The water has a tendency to form a H-bonding between hydrogen and oxygen molecule.

Water at room temperature exists as liquid because its melting point is below room temperature while boiling point (100°C) is above the room temperature. The two main reasons why water at room temperature is a liquid –

- i. A fixed mass of water occupies a fixed volume.
 - ii. Water at room temperature does not have a fixed shape but flows to take the shape of the container.
- b) An iron or iron almirah is solid at room temperature because the melting and boiling point is very high 1538°C and the main properties of iron are: -
- i. The room temperature is 20°C to 25°C .
 - ii. Iron is rigid and has a fixed shape.
 - iii. The density of metals is very high.

Q7. Why is ice at 273 K more effective in cooling than water at the same temperature?

Answer:

The two definite reason, why ice at 273 K temperature is more effective in cooling than water at the same temperature is: -

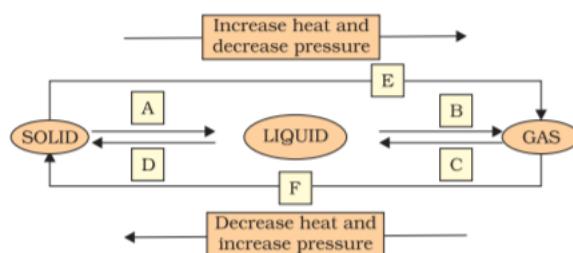
- i. Ice at 273 K is less energetic than water.
- ii. The latent heat of fusion is different for water at the same temperature.

Q8. What produces more severe burns, boiling water or steam?

Answer:

The steam produces more severe burns than boiling water, as steam has more energy than boiling water. Since, it possesses the additional latent heat of vaporization. So, when the steam falls on the skin and condenses to produce water it gives out $22.5 \times 10^5\text{ J/kg}$ more heat than boiling water at the same temperature.

Q9. Name A, B, C, D, E and F in the following diagram showing change in its state.



Answer:

- A is the process which changes solid into liquid.
So, **A is Melting/Fusion.**

- B is the process which changes liquid into gas
So, **B is Boiling/Vaporization.**
- C is the process which changes gas into liquid.
So, **C is Condensation.**
- D is the process which changes liquid into solid.
So, **D is Freezing.**
- E is the process which changes solid into gas, directly without coming in liquid state.
So, **E is Sublimation.**