Matter In Our Surroundings: In-text Questions

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Q.1 Which of the following are matter?

Chair, air, love, smell, hate, almonds, thought, cold, cold-drink, smell of perfume.

Sol. Chair, air, almonds, and cold-drink are matters.

Reason: objects that have mass, volume and occupy space are called matter. All these objects occupy some space and have some mass, so these are matter.

Q.2 Give reasons for the following observation: The smell of hot sizzling food reaches you several meters away, but to get the smell from cold food you have to go close.

Sol. The smell of hot sizzling food reaches you several meters away. This happens because of higher kinetic energy of food particles due to higher temperature. Due to high kinetic energy, food particles collide faster with each other and go to long distances.

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

Sol. As we know that particles of matter have space between them. But in case of fluids, the space between particles is large enough and due to this a diver is able to cut through water in a swimming pool. This shows that particles of matter have intermolecular space between them.

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

Sol. Characteristics of the particles of matter are:

- The particles of matter are very small.
- The particles of matter have intermolecular space between them.
- The particles of matter do random motion.
- The particles of matter have attract between them.

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Q.1 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.

Sol. Arrangement of substances according to increasing order:

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

Q.2

(a) - Tabulate the differences in the characteristics of states of matter.

Sol.

characteristics	Solid	Liquid	Gas
Shape	Fixed	Not fixed	Not fixed
Volume	Fixed	Fixed	Not Fixed
Rigidity	Rigid	Not Rigid	Not Rigid
Attraction force between particles	Maximum	Less than solids and more than gas	Very less
Compressible	Negligible	Less compressible	Highly compressible
Inter molecular space	Very less	More than solids	Maximum
Kinetic energy	Very less	More than solids	Maximum

(b) - Comment upon the following: rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy and density

Sol. **Rigidity:** Rigidity is the unique property of solids due to the greatest force of attraction between particles and close packing of particles. Because of rigidity, a solid can maintain or retain their shape from any outside force. Due to rigidity a solid has definite shape and volume. Rigidity is negligible in fluid and gas.

Compressibility: As we know that matter has intermolecular space between the particles. These space can be reduced by the external force and these particles come closer to each other. This property is called compressibility. Gas can be compressed easily. But liquid and solid cannot be compressed because of the least space between their particles.

Fluidity: The ability to flow of the particles is called fluidity. Gases and liquids have the less force of attraction and more space between particles. Due this reason liquid and gas can flow.

Filling of a gas container: Due random motion of gas particles in all the directions, gases fill the gas container completely in which it is kept. While liquids and solids do not fill a gas container completely.

Shape: Solid have high intermolecular attraction force between the particles due to this solids have a fixed shape. While Liquid and gas have less force of attraction and more kinetic energy between particles. That's why solids and liquids take the shape of the container in which they are kept.

Kinetic energy: Kinetic energy is the energy possessed by particles due to their random motion. So, the particles of solid have minimum kinetic energy because they only vibrate at their fixed position. While the kinetic energy of particles of liquid and gas are more than that of solid.

Density: Density is defined as the mass per unit volume of a substance. So, solids have higher density than liquids and gases.

Q.3 Give reasons

(a) A gas fills completely the vessel in which it is kept.

Sol. *As we know that* attraction force between particles of gas is very less. Due to this, particles of gas move in all directions and do random motion and fill the vessel completely in which it is kept.

(b) A gas exerts pressure on the walls of the container.

Sol. *T*he particles of gas have the highest kinetic energy due to very less force of attraction between particles of gas. These properties enable these particles to do random motion in all directions and collide with the walls of container from all the sides. Due to this reason a gas exerts pressure on the walls of the container in which it is kept.

(c) A wooden table should be called a solid.

Sol. A wooden table has fixed shape, fixed volume and cannot be compressed. These are the main characteristics of solid. Thus 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.

Sol. As we know that, air is gas and its particles are loosely packed and have the negligible force of attraction between them. Because of this reason, we can easily move our hand in the air.

While wood is a solid and it has the highest force of attraction between its particles. Therefore these particles of wooden block are closely packed. Due to this reason, we cannot move our hand through a solid block of wood. However a karate expert can exert high required pressure on wooden block to break the great force of attraction of the particles.

Q.4 Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why.

Sol. During freezing of water, the molecules of ice make the cage-like structure in which some vacant space with air between the particles of water. This makes the density of ice, lower than that of water. That's why ice floats on water.

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Q.1 Convert the following temperature to Celsius scale.

a) 300 K
b) 573 K

Sol. Temperature on Kelvin scale = Temperature on Celsius scale + 273 Therefore, Temperature on Celsius scale = Temperature of Kelvin scale – 273

(a) Temperature on Celsius scale = 300K – 273 = 27^0C
(b) Temperature on Celsius scale = 573K – 273 = 300^0C

Q.2 What is the physical state of water at

(a) 250^0C
(b) 100^0C

Sol. (a) Water is in gaseous state at 250^0C.
(b) Water is in transition phase, i.e. in both liquid and gaseous states.

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

Sol. Because during the change of state of any substance, supplied or released heat is used to overcome the force of attraction between the particles. This heat is called latent heat. So, the temperature of any substance remains constant during the change of state.

Q.4 Suggest a method to liquefy atmospheric gas.

Sol. Atmospheric gases are stored in cylinder with piston then it is liquefied by increasing pressure and decreasing temperature.

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

Sol. A desert cooler cools better on a hot dry day. Because it works on the basis of evaporation. In hot and dry days the moisture is very low in atmosphere which increases the rate of evaporation. Due to faster evaporation, cooler works well.

Q.2 How does the water kept in an earthen pot (matka) become cool during summer?

Sol. In summer, the moisture level in the atmosphere is very low which increases the rate of evaporation. Water evaporates continuously from the porous wall of the earthen pot. Due to the cooling effect of evaporation decrease temperature of water kept in the earthen pot.

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

Sol. Our palm feel cold when we put some acetone or petrol or perfume on it. Because these are volatile liquids. So, it evaporates quickly. Due to cooling effect of evaporation, it decreases temperature of palm and our palm feels cold.

Q.4 Why are we able to sip hot tea or milk faster from a saucer rather than a cup?

Sol. When hot tea or milk is kept in a saucer, the more liquid is exposed over a larger surface area as compared to hot liquid in a cup. Due to the larger surface area enables the faster cooling. Due to this reason we are able to sip hot tea or milk faster from a saucer rather than from a cup.