पु॰ना International School

Shree Swaminarayan Gurukul, Zundal

Class -IX

Science(Chemistry)

Specimen Copy

Year- 2022-23

INDEX

Matter in our Surrounding

Matter:
→ Anything that occupies space and has mass is called matter.

→ It exists in the form of five basic elements, the Panch tatva – air, earth, fire , sky and water.

→ For example: Chair, bed, river, mountain, dog, tree, building, etc.

Characteristics of matter:
→ Matter is made up of small particles called atoms.

→ These particles are too small to be observed with naked eye.

→ These particles are constantly moving constantly.

→ These particles have spaces between them.

→ Particles of matter attract each other because of the force of attraction.

Diffusion:
Particles of matter intermix on their own with each other. They do so by getting into the spaces between the particles. This intermixing of particles of two different types of matter on their own is called diffusion.

Dissolving a solid in a liquid:
→ When a crystal of potassium permanganate is placed in a beaker of water, the water slowly turns purple on its own, even without stirring.

→ Both potassium permanganate crystal and water are made up of tiny particles.

→ When the potassium permanganate crystal is put in water, the purple colored particles of potassium permanganate spread throughout water making the whole water look purple.

→ Actually, on dissolving, the particles of potassium permanganate get into the spaces between the particles of water.

→ This shows that the particles have spaces between them and are continuously moving on their own.

Mixing of two gases:
→ Fragrance of an incense stick (agarbatti) lightened in one corner of a room, spreads in the whole room quickly.

→ The particles of gases (or vapours) produced by burning the incense stick move rapidly in all directions and mix with the moving particles of air in the room

→ This also shows that the partices of matter are constantly moving.

Brownian motion of particles (By Robert Brown):
→ The random or zig-zag movement of microscopic particles in a fluid, as a result of continuous bombardment from molecules of the surrounding medium, is known as Brownian motion.

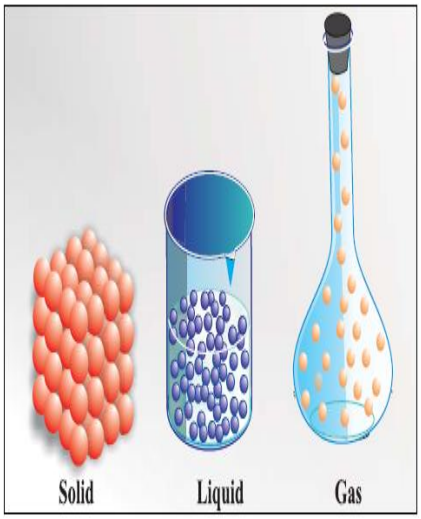
→ For example, dust moves randomly because the random moving particles of air collide with dust particles.

Basis of Classification of Matter:
→ Based upon particle arrangement

→ Based upon energy of particles

→ Based upon distance between particles

Three States of Matter:



Solid	Liquid	Gas
Constituent particles are very closely packed.	Constituent particles are less closely packed.	Constituent particles are far apart from each other.
Force of attraction between particles is very strong.	Force of attraction between particles is less strong.	Force of attraction between particles is negligible.
Force of attraction between particles is very strong.	Kinetic energy between particles is more than that in solids.	Particles have maximum kinetic energy.
Have definite shape and volume.	Do not have definite shape but definite volume.	Neither have definite shape nor definite volume.
Have high density and and can not be diffused.	Density is lower than solids and can diffuse.	Density is least and can easily diffuse.

Try the following questions:

Q1. What are the conditions for something to be called matter?
Q2. Why do gases neither have fixed volume nor fixed shape?
Q3. How does the smell of food being cooked in the kitchen reaches us even from a considerable distance?
Q4. Explain why does diffusion occurs more quickly in gases than in liquids?

Temperature: Common and SI units

→ Common unit: Degree Celsius (^oC)
→ SI unit: Kelvin (K)

→ Relation between common unit and SI unit of temperature:

$$0\,^oC = 273K$$

Change of State of Matter:

Physical states of matter can be interconverted into each other by following two ways:
1. By changing the temperature

2. By changing the pressure

1. Effect of Change of Temperature:

Solid to liquid:

→ On increasing the temperature of solids, the kinetic energy of the particles increases which overcomes the forces of attraction between the particles thereby solid gets converted to a liquid.

→ **Melting:** Change of solid state of a substance into liquid is called melting.
→ **Melting point:** The temperature at which a solid melts to become a liquid at the atmospheric pressure is called its melting point.
→ Melting point of ice is 0^oc.

(a) Liquid to gas:

→ On heating a liquid like water, the kinetic energy of its particles increases as high as in a gas, thus causing the liquid to change to a gas.

→ **Boiling:** The change of a liquid substance into gas on heating is called boiling.
→ **Boiling point:** The temperature at which a liquid boils and changes rapidly into a gas at the atmospheric pressure is called its boiling point.
→ Boiling point if water is 100^oC.

(b) Gas to liquid:

→ On cooling a gas like steam (or water vapour), the kinetic energy of its particles is lowered down, causing them to move slowly and bringing them closer, forming a liquid.

→ **Condensation:** The process, in which a gas, on cooling, turns into a liquid at a specific temperature is called condensation or liquefaction.

(c) Liquid to solid:

→ When a liquid is cooled down by lowering its temperature, its particles lose the kinetic energy and come to a stationary position, causing the liquid to turn to soilid.

Freezing: The change of a liquid substance into soilid by lowering its temperature is called freezing.
Freezing point: The temperature at which the state of a substance changes from a liquid to a solid is called the freezing point of that substance.
Fusion: The process of melting, that is, change of solid state into liquid state is also known as fusion.
Latent heat: The heat energy that is required to change the state of a substance without causing any ruse in the temperature of the substance is called latent heat. Since, the heat energy is hidden in the bulk of the matter, it is called latent heat.
Latent heat of fusion: The heat energy required to convert 1 kilogram of a solid into liquid at atmospheric pressure, at its melting point, is known as the latent heat of fusion
Latent heat of vaporisation: The heat energy required to convert 1 kilogram of liquid into gas, at atmospheric pressure, at its boiling point, is known as the latent heat of vaporisation
Note: *Water vapour at 373 K have more energy than water at the same temperature because particles in steam have absorbed extra energy in the form of latent heat of vaporisation.*
Sublimation: The change of state of a substance directly from a solid to gas or gas to solid, without changing into the liquid state, is called sublimation.

2. Effect of change of pressure

→ **Gas to liquid:** Gases can be liquefied by applying pressure and reducing the temperature. When a high pressure is applied to a gas, it gets compressed and if the temperature is lowered, the gas is liquefied.
→ Solid CO_2 gets converted directly to gaseous state on decrease of pressure to 1 atmosphere without coming into liquid state. This is the reason that solid carbon dioxide is also known as dry ice.

Evaporation:

The process of conversion of a substance from the liquid state to the gaseous state at any temperature below its boiling point is called evaporation or vaporisation.

Factors affecting the rate of evaporation:

→ Surface area: The rate of evaporation increases on increasing the surface area of the liquid.

→ Temperature: The rate of evaporation increases with an increase in temperature.

→ Humidity: Decrease in the humidity increases the rate of evaporation.

→ Wind speed: An increase in the wind speed increases the rate of evaporation.

Evaporation causes cooling:
During the process of evaporation, the particles of liquid absorb energy or latent heat of vaporisation from the surrounding to get converted to gaseous state. This absorption of energy from the surroundings make the surroundings cold.

For example: The perspiration or sweating in our body keep the body temperature constant by taking away the extra heat from body as the latent heat of vaporisation.

Some important physical quantities and their SI units:

Quantity	Unit	Symbol
Temperature	kelvin	K
Length	metre	m
Mass	kilogram	kg
Weight	newton	N
Volume	cubic metre	m^3
Density	kilogram per cubic metre	$kg\ m^{-3}$
Pressure	pascal	Pa

Try the following questions:

Q1. What is the common name of solid carbon dioxide?
Q2. What is meant by saying that the latent heat of ice is 3.34×10^5 J/kg?
Q3. State two conditions necessary to liquefy a gas.
Q4. Why does temperature remain constant during the boiling of water even though heat is being supplied continuously?
Q5. Why does desert cooler cool better on a hot, dry day?
Q6. Why does the naphthalene balls kept in stored clothes in our home disappear over a period of time?