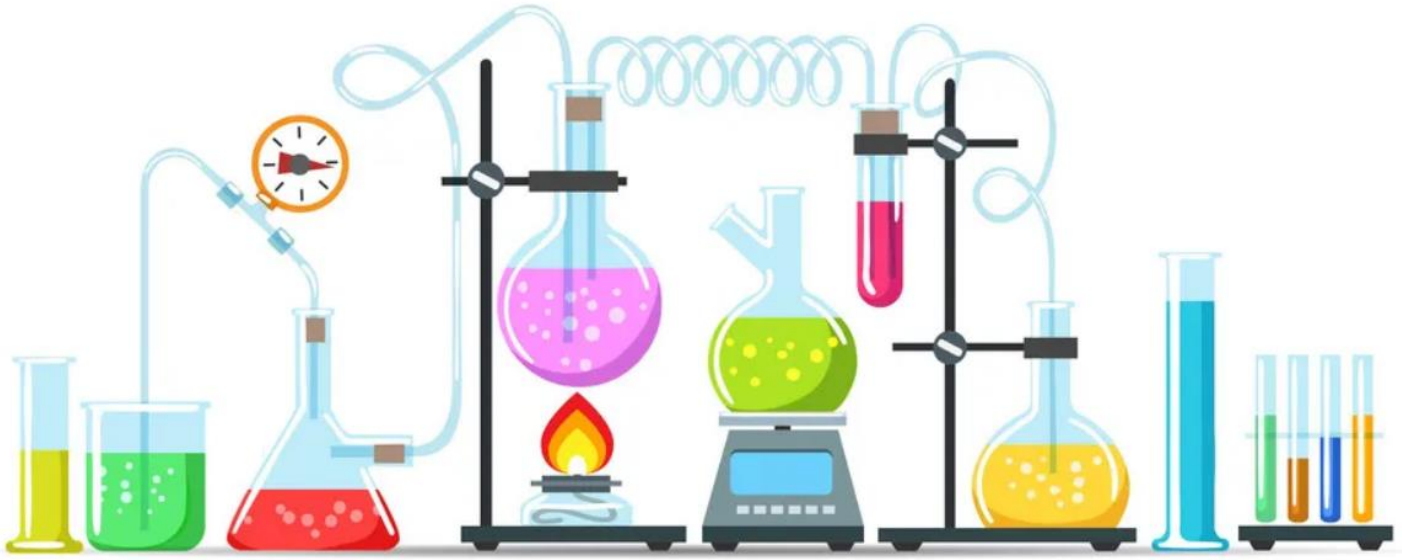
CHEMISTRY

Chapter 1: Matter in Our Surroundings



Matter in Our Surroundings

Matter

- All things which we see around us and use in our everyday life together constitute matter.
- Anything which occupies space and has mass is called matter.
- Matter is made up of particles.

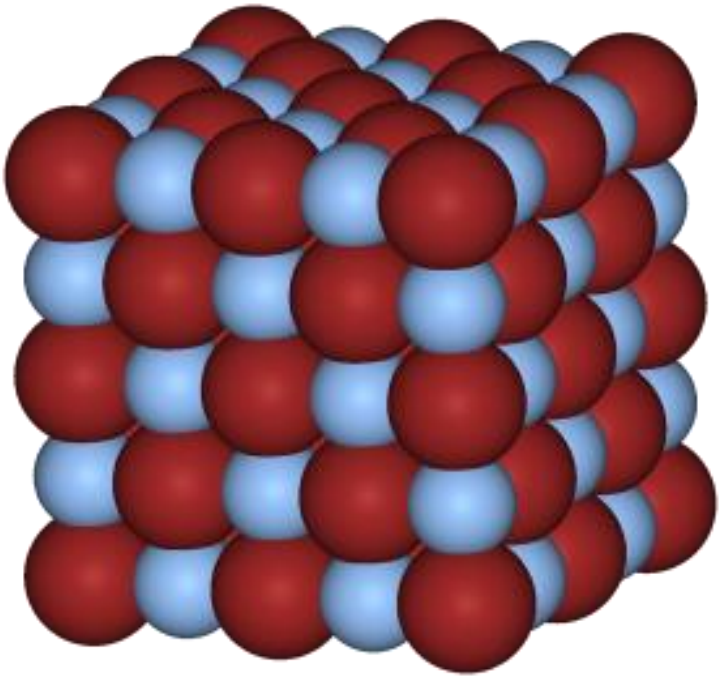
States of Matter

- Matter can be classified as solid, liquid and gas on the basis of interparticle forces and the arrangement of particles.
- These three forms of matter are interconvertible by increasing or decreasing pressure and temperature. For example, ice can be converted from solid to a liquid by increasing the temperature.

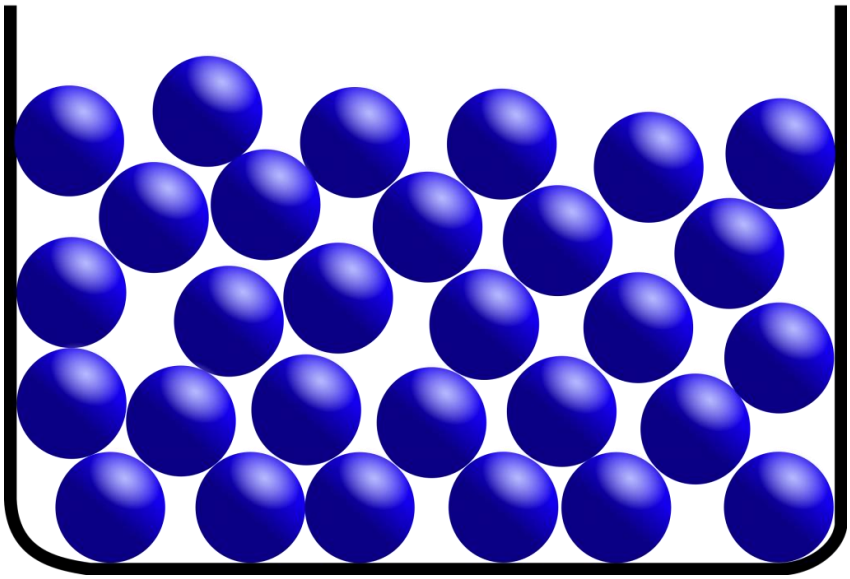
Property	Solid	Liquid	Gas
Shape and volume	Fixed shape and volume	No fixed shape but has volume	Neither definite shape nor volume
Energy	Lowest	Medium	Highest
Compressibility	Difficult	Nearly difficult	Easy
Arrangement of molecules	Regular and closely arranged	Random and little sparsely arranged	Random and more sparsely arranged
Fluidity	Cannot flow	Flows from higher to lower level	Flows in all directions
Movement	Negligible	Depends on interparticle attraction	Free, constant and random
Interparticle space	Very less	More	Large
Interparticle attraction	Maximum	Medium	Minimum
Density	Maximum	Medium	Minimum

Rate of diffusion	Negligible	It depends on interparticle attraction.	Maximum

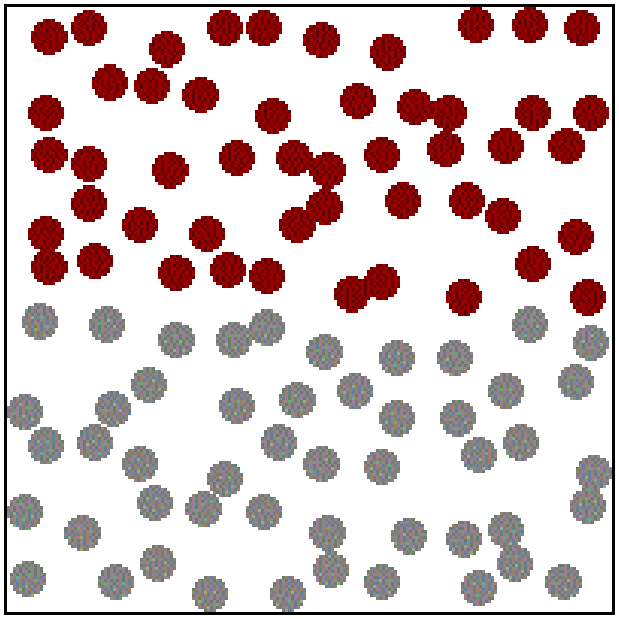
Atomic view of the three states of matter



Solid



Liquid



Gas

Evaporation

The phenomenon by which molecules in liquid state undergo a spontaneous transition to the gaseous phase at any temperature below its boiling point is called evaporation.

For example, the gradual drying of damp clothes is caused by the evaporation of water to water vapour.

Factors affecting evaporation

- **Temperature:** The rate of evaporation increases with an increase in temperature.
- **Surface area:** The rate of evaporation increases with an increase in surface area.
- **Humidity:** The rate of evaporation decreases with an increase in humidity.
- **Wind speed:** The rate of evaporation increases with an increase in wind speed.

Cooling due to evaporation

During evaporation, the particles of a liquid absorb energy from the surroundings to overcome the inter-particle forces of attraction and undergo the phase change. The absorption of heat from the surrounding makes the surrounding cool.

For example, sweating cools down our body.

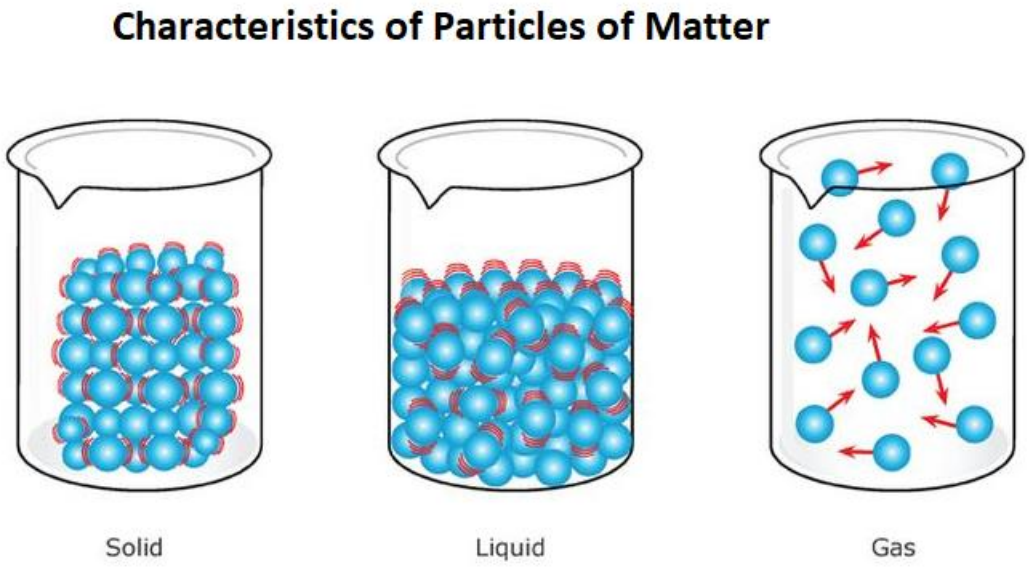
Physical Nature of Matter

A physical property is that aspect of the matter that can be observed or measured without changing its nature or composition.

It is independent of the amount of matter present.

Physical properties include appearance, colour, odour, density, texture, melting point, boiling point, solubility, etc.

Characteristics of Particles of Matter



Matter

- Matter is anything that has mass and occupies space.
- Everything that we can touch, see, hear, taste and also smell is matter.
- It is made up of really tiny particles which cannot be seen through the eye.

The particles of which the matter is comprised influence its state and properties (physical and chemical).

Particles of matter have spaces between them

This characteristic is one of the concepts behind the solubility of a substance in other substances. For example, on dissolving sugar in water, there is no rise in water level because the particles of sugar get into the interparticle spaces between the water particles.

Particles of matter are always in motion

Particles of the matter show continuous random movements due to the kinetic energy they possess.

A rise in temperature increases the kinetic energy of the particles, making them move more vigorously.

Particles of matter attract each other

In every substance, there is an interparticle force of attraction acting between the particles. To break a substance, we need to overcome this force. The strength of the force differs from one substance to another.

Diffusion

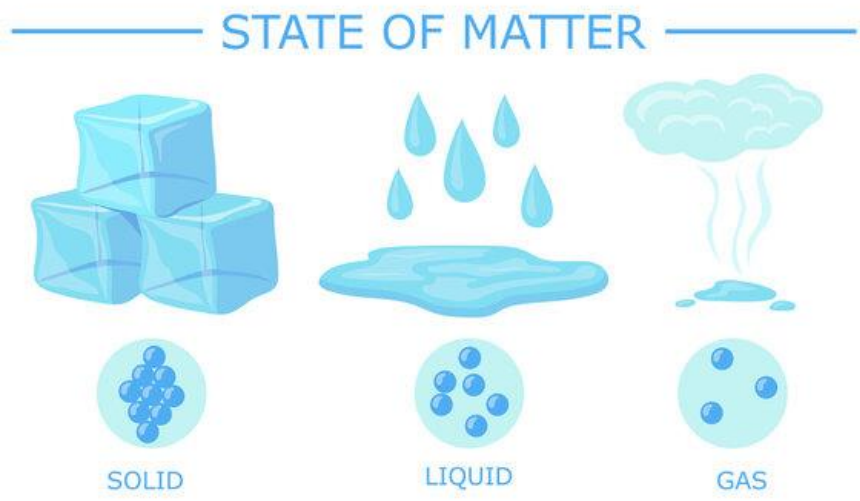
When the particles of matter intermix on their own with each other, the phenomenon is called

diffusion. For example, spreading of ink in water.

During diffusion, the particles occupy the interparticle spaces.

The rate of diffusion increases with increase in the temperature, due to increase in kinetic energy of the particles.

Effect of change of temperature on state of matter



On increasing temperature, the kinetic energy of the particles of the matter increases and they begin to vibrate with a higher energy. Therefore, the interparticle force of attraction between the particles reduces and particles get detached from their position and begin to move freely.

As a result, the state of matter begins to change.

Solids undergo a phase change to form liquids.

Similarly, liquids also undergo a phase change to form gases.

Melting point

The melting point of a solid is defined as the temperature at which solid melts to become liquid at the atmospheric pressure.

At melting point, these two phases, i.e., solid and liquid are in equilibrium, i.e., at this point both solid state and liquid state exist simultaneously.

Boiling point

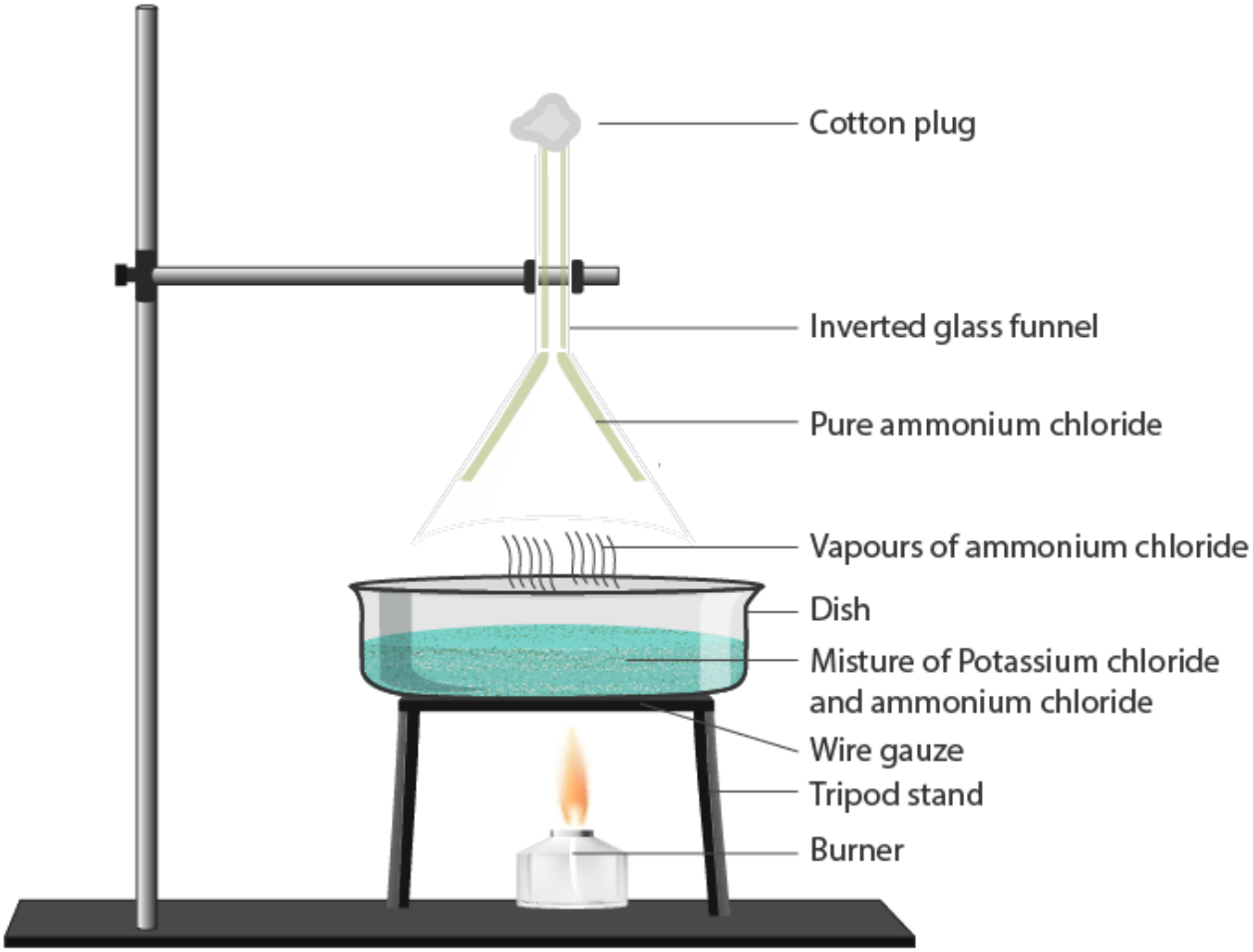
The boiling point of a liquid is defined as the temperature at which the vapour pressure of the liquid is equal to the atmospheric pressure.

Latent heat of vaporisation

It is the amount of heat energy that is required to change 1 kg of a liquid into gas at atmospheric pressure at its boiling point.

Sublimation

The transition of a substance directly from its solid phase to gaseous phase without changing into the liquid phase (or vice versa) is called sublimation.



Sublimation – Solid to Gas Phase Transformation

Sublimation (Solid $\rightleftharpoons$ Gas)

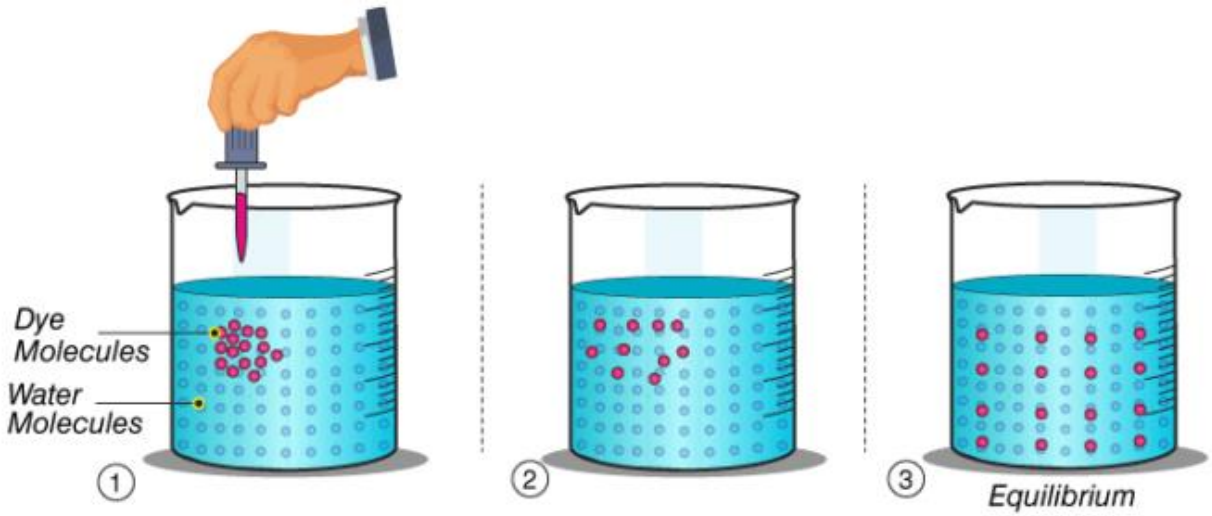
- The change of state of a substance directly from a solid to gas, without changing into the liquid state (or vice versa) is called sublimation.
- The common substances which undergo sublimation are camphor, naphthalene, ammonium chloride, solid carbon dioxide and iodine.

Types of Matter

There are two ways in which matter can be classified-

1. On the basis of its physical nature (physical state).
2. On the basis of its chemical constitution.

Characteristics of Particles of Matter



The particles of matter—

- are very small.
- have spaces between them.
- are continuously moving.
- attract each other.

Diffusion

- Intermixing of particles of two different types of matter on their own is called diffusion.
- The rate of diffusion increases on increasing the temperature of the diffusing substance (by heating).

Examples of diffusion in gases:

- The aroma of food being cooked in the kitchen reaches us even from a considerable distance due to diffusion.
- The fragrance of a burning incense stick spreads all around due to diffusion.
- The fragrance of a perfume spreads due to the diffusion of the perfume particles into air.

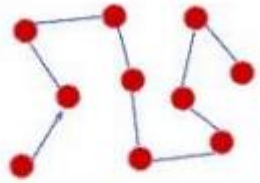
Examples of diffusion in liquids:

- Colour of potassium permanganate is acquired by water, on its own, due to the diffusion of potassium permanganate particles in water.
- The spreading of ink in water, on its own, is due to the diffusion of ink particles in the water.

Examples of diffusion in solids:

- If two metal blocks are bound together tightly and kept undisturbed for a few years, then the particles of one metal are found to have diffused into the other metal.
- If we write something on a blackboard and leave it undisturbed for atleast 10 to 15 days,

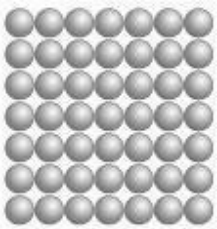
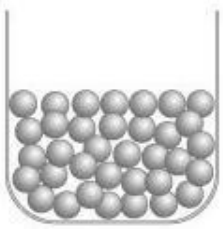
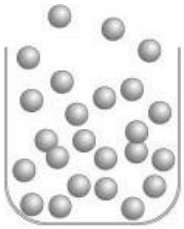
we will find that it becomes quite difficult to clean the blackboard afterwards. This is due to the fact that some of the particles of chalk have diffused into the surface of the blackboard.



Brownian Movement of a Particle

Brownian movement
The random motion of particles suspended in a fluid (liquid or gas) results from their bombardment by the fast-moving atoms or molecules of the fluid (liquid or gas). This haphazard motion of the particles is known as Brownian motion.

States of Matter

Solid State	Liquid State	Gaseous State
		
The space between the particles is very less.	The space between the particles is slightly more as compared to solids, but still very less as compared to gases. The particles of a liquid can slip and slide over each other.	The particles are much farther apart from one another as compared to solids and liquids. They have a very disorderly arrangement of particles compared to the solids and liquids.

The force of attraction between the particles is strong. Thus, particles in a solid are closely packed.	The force of attraction between the particles is strong enough to hold the particles together but not strong enough to hold the particles in a fixed position.	The force of attraction between the particles is negligible, hence particles of a gas move freely in all the directions. Gases thus can mix or diffuse into other gases.
The kinetic energy of the particles is very less and so solids have an orderly arrangement of the particles. Therefore, solids have a fixed shape and volume.	The kinetic energy of the particles is more than that of solids. Thus, liquids have a disorderly arrangement of particles compared to solids.	The particles of a gas have maximum kinetic energy. They move with high speed in all directions and can exert pressure on the walls of its container.

Solids maintain their shape even when they are subjected to external force i.e. they are rigid.	Liquids do not have a fixed shape but have a fixed volume. Liquids take up the shape of the container in which they are poured.	Gases neither have a definite shape nor a definite volume. They fill up the container completely.
Solids cannot be compressed.	Liquids cannot be compressed much. The compressibility of liquids is almost negligible.	Gases can be compressed easily. Example: the LPG cylinders used at home and the CNG cylinders used in vehicles.

The relation between Kelvin scale and Celsius scale of temperature

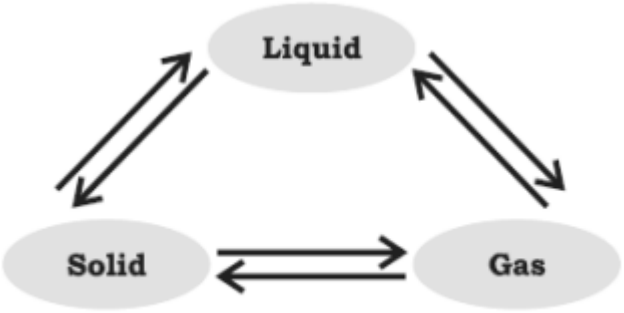
Temperature on Kelvin scale = Temperature on Celcius scale + 273

Thus, a temperature of 25°C on the Celsius scale is equal to 298 K on the Kelvin scale.

Change of State of Matter (Phase transition)

Interconversion of States of Matter

The phenomenon of change from one state of matter to another, and then back to the original state is called the interconversion of states of matter.



Interconversion of States of Matter

Change of state is affected by changes in conditions such as—

1. Changes in temperature.
2. Increasing or decreasing pressure.
3. Changes in both, the temperature and pressure.

Melting point (Solid → Liquid)

- The temperature at which a solid melts to become a liquid, at atmospheric pressure, is called its melting point.
- Melting point is the characteristic property of a substance. For example, melting point of ice is 0°C (273 K).
- The process, in which a liquid changes to its solid form, on cooling at a specific temperature, is called freezing or solidification.

Latent heat: The hidden heat which breaks the force of attraction between the molecules is known as the latent heat. Since, the heat energy is hidden in the bulk of the matter, it is called latent heat.

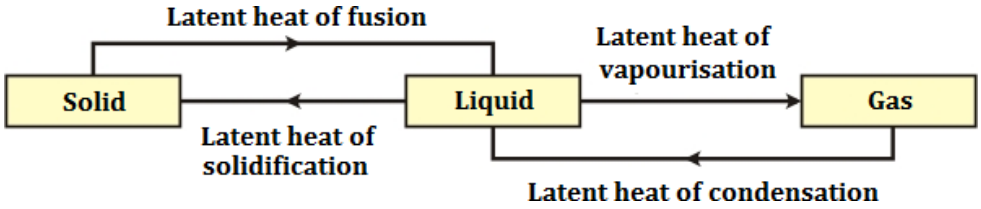
Latent heat of fusion: The heat energy required to convert 1 kilogram of a solid into liquid at atmospheric pressure, at its melting point, is known as the latent heat of fusion.

- When we supply heat energy to water, the particles start moving faster.
- At a certain temperature, a point is reached when the particles have enough energy to break free from the forces of attraction of each other.
- At this temperature, the liquid starts changing into a gas.

Boiling Point: (Liquid → Gas)

- The temperature at which a liquid starts boiling, at atmospheric pressure, is called its boiling point.
- Boiling is a bulk phenomenon.

- Particles from the bulk of the liquid gain energy to change into the gaseous state.
- For example, boiling point of water is 100^0C. (Or 100^0C = 273 + 100 = 373 K)



Latent heat of vapourisation: 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 vapourisation.

Condensation (Gas → Liquid)

- The process, in which a gas, on cooling, turns into a liquid at a specific temperature is called condensation or liquefaction.
- Formation of clouds is due to the condensation of water vapour from the Earth's surface.
- The heat removed from the surface through evaporation is released into the atmosphere by the formation of clouds. This process cools the Earth's climate.

Freezing point (Liquid → Solid)

The temperature at which the state of a substance changes from a liquid to a solid is called the freezing point of that substance.

Effect of Change of Pressure

- 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.

Evaporation (Liquid Gas)

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 **vapourisation**.

Evaporation is a surface phenomenon.

Factors Affecting Evaporation

- The rate of evaporation increases on increasing the surface area of the liquid.
- The rate of evaporation increases with an increase in temperature.
- Decrease in the humidity increases the rate of evaporation.
- An increase in the wind speed increases the rate of evaporation.

Difference between Evaporation and Boiling

Evaporation	Boiling
• It is a surface phenomenon.	• It is a bulk phenomenon.
• It is a slow process.	• It is a rapid process.
• It takes place at all temperatures but below the boiling point.	• It takes place at a definite and constant temperature.

More to Know

Lately, scientists are talking about five states of matter or five phases of matter. These are - solids, liquids, gases, plasmas and the Bose–Einstein condensate.

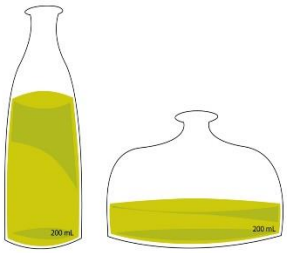
Plasma

The state consists of super energetic and super excited particles. These particles are in the form of ionised gases. The fluorescent tube and neon sign bulbs consist of plasma.

Bose - Einstein Condensate

Indian physicist Satyendra Nath Bose made a study regarding the fifth state of matter. Based on his study, Albert Einstein predicted a fifth state of matter called the Bose-Einstein Condensate. The Bose-Einstein Condensate or BEC is formed by cooling a gas of extremely low density to super low temperatures.

Class : 9th Science
Chapter- 1: Matter in Our Surroundings



Matter in Our Surroundings

Liquids
- Less dense than solids Molecules can move within the container
- Take shape of the container as it has no definite shape
  - as it has no definite shape
  - as it has definite volume
- Less compressible
- Example: Milk, water
- Condensation cool-down
- Evaporation-add heat
- Freeze-cool down
- melt

Gases
- Low density have molecules spread out
- Occupy the shape of container
- compressed easily
- Example: Air, hydrogen

Solids
- Have high density Molecules are closely packed solid
- Definite shape and volume
- Hard to compress
- Example: ice, wood

Can be
Can be
Can be

less commonly known
- Plasma
  - Example: fluorescent lights in stars
  - gas carrying electrical charge
  - particles in excited state give of light
    - Example: lightning, Plasma Tvs

less commonly known
- Bose Einstein Condensates
  - Form just above absolute zero (-273°C)

Important Questions

➢ Multiple Choice Questions:

1. In which of the following conditions, the distance between the molecules of hydrogen gas would increase?

(i) Increasing pressure on hydrogen contained in a closed container

(ii) Some hydrogen gas leaking out of the container

(iii) Increasing the volume of the container of hydrogen gas

(iv) Adding more hydrogen gas to the container without increasing the volume of the container

(a) (i) and (iii)

(b) (i) and (iv)

(c) (ii) and (iii)

(d) (ii) and (iv)

2. When a gas jar full of air is placed upside down on a gas jar full of bromine vapours, the red-brown vapours of bromine from the lower jar go upward into the jar containing air. In this experiment:

(a) Air is heavier than bromine

(b) Both air and bromine have the same density

(c) Bromine is heavier than air

(d) Bromine cannot be heavier than air because it is going upwards against gravity

3. A form of matter has no fixed shape but it has a fixed volume. An example of this form of matter is

(a) Krypton

(b) Kerosene

(c) Carbon steel

(d) Carbon dioxide

4. Which one of the following statements is not true?

(a) The molecules in a solid vibrate about a fixed position

(b) The molecules in a liquid are arranged in a regular pattern

(c) The molecules in a gas exert negligibly small forces on each other, except during collisions

(d) The molecules of a gas occupy all the space available

5. The correct procedure of heating iron-sulphur mixture to prepare iron sulphide is:

(a) Heat the powder mixture at the base of the test tube using a blue flame throughout.

(b) Heat the iron filings and sulphur mixture in the middle of the test tube using yellow flame throughout.

(c) Heat the powder mixture at the top of the test tube using an orange flame throughout.

(d) Heat the iron filings-sulphur mixture at 3/4 quarters of the test tube using a red flame throughout.

6. When water at 0°C freezes to form ice at the same temperature of 0°C, then it:

(a) Absorbs some heat

(b) Releases some heat

(c) Neither absorbs nor releases heat

(d) Absorbs exactly 3.34 x 105J/kg of heat

7. When heat is constantly supplied by a burner to boiling water, then the temperature of water during vaporisation :

(a) Rises very slowly

(b) Rises rapidly until steam is produced

(c) First rises and then becomes constant

(d) Does not rise at all

8. Which one of the following set of phenomena would increase on raising the temperature?

(a) Diffusion, evaporation, compression of gases

(b) Evaporation, compression of gases, solubility

(c) Evaporation, diffusion, expansion of gases

(d) Evaporation, solubility, diffusion, compression of gases

9. On converting 308 K, 329 K and 391 K to Celsius scale, the correct sequence of temperatures will be:

(a) 33°C, 56°C and 118°C

(b) 35°C, 56°C and 119°C

(c) 35°C, 56°C and 118°C

(d) 56°, 119°C and 35° C

10. Four students took separately the mixture of sand, common salt and ammonium chloride in beakers, added water, stirred the mixture well and then filtered. They reported their observations as shown below

Student	As residue	In the filtrate
I	Ammonium chloride	Sand, Common salt
II	Common salt, Sand	Ammonium chloride
III	Sand, Ammonium chloride	Common salt
IV	Sand	Ammonium chloride, Common salt

Who reported the observations in the correct order of the components as residue and in the filtrate?

(a) I

(b) IV

(c) III

(d) II

11. Which of the following phenomena always results in the cooling effect?

(a) Condensation

(b) Evaporation

(c) Sublimation

(d) None of these

12. Which of the following cannot be considered a form of matter?

(a) Atom

(b) Water

(c) Humidity

(d) Electron

13. Which of the following causes the temperature of a substance to remain constant while it is undergoing a change in its state?

(a) Latent heat

(b) Lattice energy

(c) Loss of heat

(d) None of these

14. Which of the following statement is correct?

(a) Materials existing as liquids at room temperature have their melting and boiling points lower than that of room temperature.

(b) The phenomenon involving the transition of a substance from solid to liquid state is called sublimation.

(c) To convert a temperature on the Celsius scale to Kelvin scale, subtract 273 from the given temperature

(d) The density of ice is less than that of water.

15. Which of the following statement is not true regarding the characteristic of matter?

(a) Particles of a matter are randomly moving in all directions.

(b) Kinetic energy of the particles increases with a rise in temperature

(c) Kinetic energy of the particles of all maters remains the same at a particular temperature.

(d) Particles of matter diffuse into each other on their own.

➢ Very Short Question:

1. Define matter.

2. State different states of matter with an example.

3. What is diffusion?

4. What happen to the rate of diffusion if the temperature is increased?

5. Name the state of matter that have the tendency to maintain their shape when subjected to outside force.

6. Define melting point.

7. Define boiling point.

8. Define latent heat of vaporization.

9. Define latent heat of fusion.

10. Define sublimation.

➢ Short Questions:

1. Why do we see water droplets collected on the outer surface of a glass container, containing ice?

2. Explain why solids have fixed shape but liquids and gases do not have fixed shape.

3. Liquids and gases can be compressed but it is difficult to compress solids. Why?

4. A balloon when kept in sun, bursts after some time. Why?

5. Why do people perspire a lot on a hot humid day?

6. Why is it advisable to use pressure cooker at higher altitudes?

7. What are fluids?

8. 1 kg cotton and 1 kg sand, which is more denser? Why?

➢ Long Questions:

1. Pressure and temperature determine the state of a substance. Ex-plane this in detail.
2. Explain giving examples the various factors on which rate of evaporation depends.

➢ Assertion Reason Questions:

1. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
   a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.
   b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.
   c. Assertion is true but Reason is false.
   d. Both Assertion and Reason are false.

   Assertion: Sugar and Salt both are easily dissolved in water.

   Reason: Sugar and Salt are solid hence it is easily dissolved in water.
2. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
   a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.
   b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.
   c. Assertion is true but Reason is false.
   d. Both Assertion and Reason are false.

   Assertion: When sugar pour in water, then taste of water became a sweet.

   Reason: sugar completely dissolved in water with giving its own character.

➢ Case Study Question:

1. In an experimental activity, crushed ice was taken in a beaker. A thermometer is fitted in such a way that its bulb was thoroughly surrounded by ice. The beaker is now slowly heated and temperature was regularly noted. Temperature rises gradually as the heating is continued and becomes constant when ice starts changing into liquid.

   Select the correct answers for the following questions:

i) What name is associated with conversion of ice into water?

a) Evaporation

b) Sublimation

c) Freezing

d) Fusion of Solid

ii) What specific name is given to the constant temperature?

a) latent heat of fusion

b) Boiling Point

c) Melting Point

d) Condensation point

iii) The heat added to the system at constant temperature is called

a) specific heat

b) latent heat

c) residual heat

d) none of the above

iv) Where does the heat energy go when the temperature does not rise?

a) It makes the molecular motion of the liquid faster

b) It raises the temperature of the beaker only.

c) It is utilised for bringing out the complete change of state

d) It slows down the molecular motion

2. A hot air balloon has three major parts: the basket, the burner, and the envelope. The basket is where passengers ride. The basket is usually made of wicker. This ensures that it will be comfortable and add little extra weight. The burner is positioned above the passenger's heads. The envelope is the colourful fabric balloon that holds the hot air. The pilot can control the up-and-down movements of the hot air balloon.

1. What keeps a hot air balloon flying?

2. How the balloon’s pilot can control the balloon’s altitude?

3. Using the passage as a guide, it can be inferred that which of the following statements is not true?

(a) Air goes up and out the top of a chimney when you light a fire.

(b) Cool air collects about the ceiling when you open a refrigerator.

(c) Smoke from a candle rises after you blow out the flame.

(d) Cold air coming from an air conditioning vent settles about the floor

4. According to the author, wicker is

I. Comfortable

II. light weight

III. Durable

a) I only

b) I and II only

c) II and III only

d) I , II and III

✓ Answer Key-

➢ Multiple Choice Answers:

1. (c) (ii) and (iii)
2. (c) Bromine is heavier than air
3. (b) Kerosene
4. (b) The molecules in a liquid are arranged in a regular pattern
5. (a) Heat the powder mixture at the base of the test tube using a blue flame throughout.
6. (b) Releases some heat
7. (d) Does not rise at all
8. (c) Evaporation, diffusion, expansion of gases
9. (c) 35°C, 56°C and 118°C
10. (b) IV
11. (b) Evaporation
12. (c) Humidity
13. (a) Latent heat
14. (d) The density of ice is less than that of water.
15. (c) Kinetic energy of the particles of all maters remains the same at a particular temperature.

➢ Very Short Answers:

1. Answer: Anything that occupies space and has mass is called matter.
2. Answer: Matter has 3 different states
3. Answer. The intermingling of molecules of one substance with that of the other is called diffusion.
4. Answer: With increased temperature, the rate of diffusion also increases as the particles gain energy and vibrate more.
5. Answer: Solid.
6. Answer: The temperature at which a solid melts to become liquid at the atmospheric pressure is called its melting point.
7. Answer: The temperature at which a liquid starts boiling at the atmospheric pressure is known as its boiling point.
8. Answer: Latent heat of vaporization is the heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point.
9. Answer: Latent heat of fusion is the amount of heat energy required to change 1 kg of solid into liquid at its melting point.
10. Answer: Sublimation is the change of gaseous state directly to solid state without going through liquid state and vice-versa.

➢ Short Answer:

Answer: The water vapour present in air, comes in contact with the cold outer surface of the container thereby condensing it to form water droplets.

Answer: Solids have fixed shape due to strong intermolecular force of attraction between them. The liquids and gases have molecules with less intermolecular force of attraction and hence they can flow and take shape of the container.

Answer: Liquids and gases have intermolecular space, on applying pressure externally on them the molecules can come closer thereby minimizing the space between them. But in case of solids there is no intermolecular space to do so.

Answer: The balloon has air filled in it. The balloon when kept in sun gets heated and the air inside it also gets heated. The molecules of air get energy, and vibrate faster thereby exerting large force on the walls of the balloon. Due to this expansion of gases the balloon bursts.

Answer: On a hot, humid day, due to the heat our body starts sweating for the cooling mechanism i.e., by evaporation and gets cooling effect. But the air cannot hold any more water on a humid day and therefore the sweat or perspiration is seen.

Answer: At higher altitudes, the atmospheric pressure is low and the water boils very fast and evaporates at faster rate therefore the pressure is required to increase the cooking

process and this is done by using pressure cooker which increases the pressure inside the container and cooks food faster.

Answer: The states of matter that can flow due to less intermolecular force of attraction, are liquids and gases and are called as fluids.

Answer: One kg sand is more denser than 1 kg cotton because density = mass/volume.

The volume required by cotton is more than the sand and density and volume are inversely proportional.

➢ Long Answer:

1. Answer:

- Any matter i.e., solid, liquid or gas when experiences an increase in temperature then they change their state.

Example: Solid (Ice) $\xrightarrow{\text{heat}}$ Liquid (Water) $\xrightarrow{\text{heat}}$ Gas (Steam)

Take ice cubes in a beaker or heat them slowly, the temperature increases and the ice melts to form liquid. Heat this liquid further it will become steam.

- On lowering down the temperature of any matter, show change in their state.

Example: Gas (Steam) $\xrightarrow{\text{cool}}$ Liquid (Water) $\xrightarrow{\text{cool}}$ Solid (Ice)

Take the steam that is coming out of a boiling water and allow it to cool down, it condenses to form water and on further cooling of this water we get ice.

- On applying pressure and reducing temperature we can liquefy gases or change them into solid.

Example: Take carbon-dioxide gas, reduce its temperature and apply lot of pressure on it so that it changes into solid carbon dioxide, called diy ice, which is used as refrigerant for cooling.

If the pressure on it is decreased, it directly changes into gas.

In LPG cylinders, the petroleum gas is cooled and with lot of pressure changes it into liquid state.

While using this LPG, we release the pressure exerted on it and hence it comes out in the form of gas.

2. Answer: The rate of evaporation depends on the following factors:

- Surface area: If the surface area is increased the rate of evaporation also increases.

(a) To dry the clothes we spread them to dry faster.

(b) Tea in saucer cools faster than in a cup.

- Temperature: If the temperature is increased the rate of evaporation also increases. Due to increase in temperature the particles gain more kinetic energy and change their phase from liquid to gaseous. Water will evaporate faster in sun than in shade.
- Humidity: It is the amount of water vapour present in air. The air can hold definite amount of water vapour, at a given temperature. If the amount of water vapour is high in the air then the rate of evaporation decreases. On hot and humid day, desert coolers are not effective as the air cannot hold any more moisture to get the cooling effect.
- Wind speed: With the increase in wind speed, the rate of evaporation increases. The particles of water vapour move away with the wind, decreasing the amount of water vapour in the surrounding.

➢ Assertion Reason Answer:

1. (c) Assertion is true but Reason is false.
2. (a) Both Assertion and Reason are correct, and reason is the correct explanation for assertion.

➢ Case Study Answer:

1. **Answer:**

   i) d) Fusion of Solid

   ii) c) Melting Point

   iii) b) latent heat

   iv) d) It slows down the molecular motion

2. **Answer:**

   i) The Envelope colourful fabric keeps the hot air balloon flying.

   ii) Through the envelope that holds hot air the pilot can control the balloon aptitude.

   iii) (b) Cool air collects about the ceiling when you open a refrigerator.

   "Hot air rises and cold air falls." Therefore, the cool air inside a refrigerator would fall to the floor when you open the door, not collect about the ceiling. This means (B) is not true

   iv) a) I only