

Kinetic Particle Theory

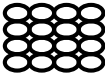
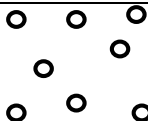
Learning Outcomes:

(a) describe the solid, liquid and gaseous states of matter and explain their interconversion in terms of the kinetic particle theory and of the energy changes involved.

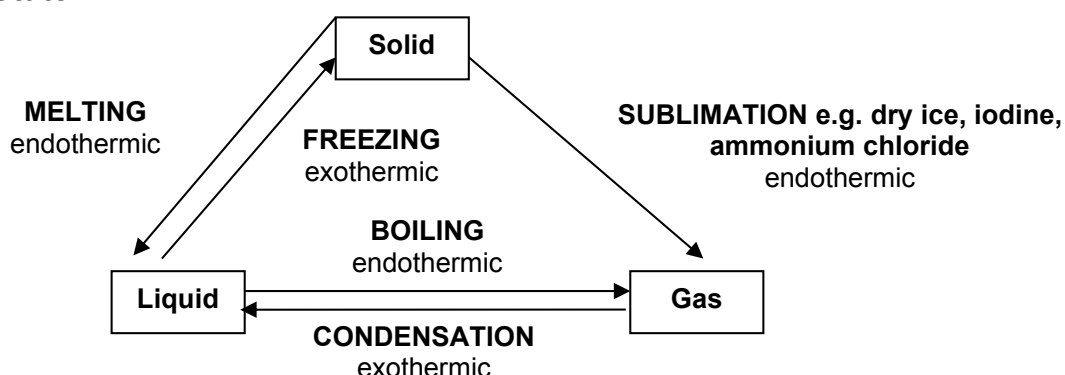
(A) The Kinetic Particle Theory states that:

- All matter is made up of tiny discrete particles
- The particles are in constant motion

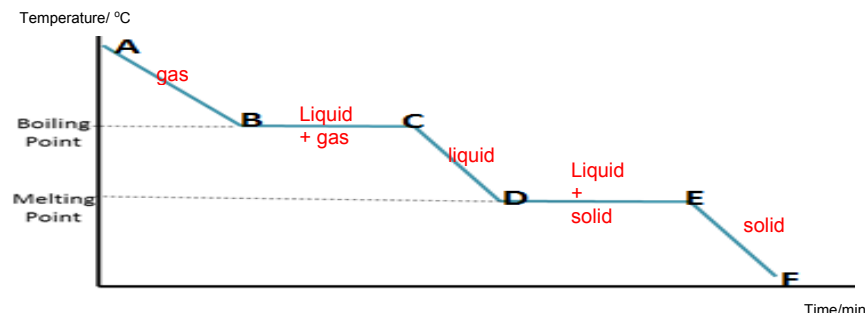
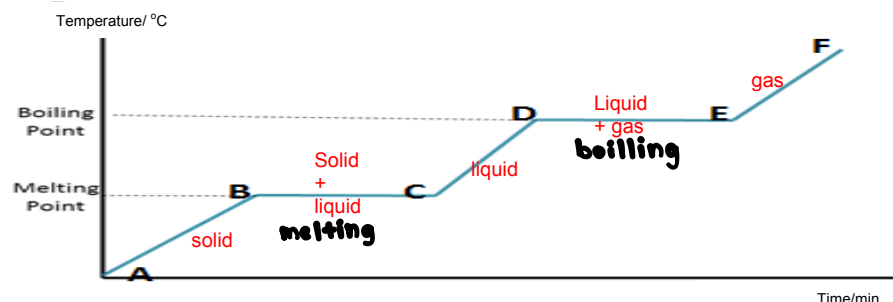
(B) State of Matter

	Solid	Liquid	Gas
Movement	Particles vibrate in fixed position	Particles slide over each other.	Particles move rapidly and in all direction
Arrangement	Particles are very closely packed. Particles are arranged in an orderly manner.	Particles are closely packed. Particles are not in orderly arrangement.	Particles are far apart. Particles are not in orderly arrangement.
Energy	Energy is low	Energy is low	Energy is high
Forces of attraction	strong	weak	Very weak
Diagram			

(C) Change of State



(D) Heating/Cooling Curve



MELTING

A – B

As the solid is heated, the particles **gain** kinetic energy and start to **vibrate faster**.

B – C

- A mixture of **solid and liquid** exists here.
- During the melting process, the temperature of the substance **remains constant**.
[All the heat energy taken in by the particles is used to **overcome the forces of attraction** between particles.]

C – D

The particles move freely and **slide over** one another. The substance becomes **liquid**.

BOILING

C – D

As the liquid is heated, the particles **gain** kinetic energy and start to **move faster**.

D – E

- A mixture of **liquid and gas** exists here.
- During the boiling process, the temperature of the substance **remains constant**.
[All the heat energy taken in by the particles is used to **overcome the forces of attraction** between particles.]

E – F

They spread far apart and **move rapidly** in all directions. The substance is now a **gas**.

CONDENSATION

A – B

As the gas is cooled, the particles **lose** kinetic energy and start to **move slower**.

B – C

- A mixture of **liquid and gas** exists here.
- When the temperature is low enough, the particles **do not have enough energy**, particles start to move closer till they are **closely packed**.

C – D

The particles become closer and **slide over** one another. The substance becomes **liquid**.

FREEZING

C – D

As the liquid is cooled, the particles **lose** kinetic energy and start to **move slower**.

D – E

- A mixture of **solid and liquid** exists here.
- When the temperature is low enough, the particles **do not have enough energy**, the particles start to move closer till they are **held in fixed position**.

E – F

The particles become closer and **vibrate about fixed position** one another. The substance becomes **solid**.

