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# TOPIC 2.1: KINETIC PARTICLE THEORY

THE ABOUT

# CHAPTER ANALYSIS



TIME

- Straight forward chapter
- 1 **key** concepts



EXAM

- Usually tested in MCQs



WEIGHTAGE

- Light overall weightage
- Constitute to **2%** of marks for past 5 year papers
- Less commonly tested in recent years

MUST KNOW

# BASICS

Solid	Liquid	Gas
<ul style="list-style-type: none"><li>• Fixed volume</li><li>• Fixed shape</li><li>• Cannot be compressed</li><li>• Does not flow</li></ul>	<ul style="list-style-type: none"><li>• Fixed volume</li><li>• No fixed shape</li><li>• Cannot be compressed</li><li>• Flows easily</li></ul>	<ul style="list-style-type: none"><li>• No fixed volume</li><li>• No fixed shape</li><li>• Can be compressed easily</li><li>• Flows in all direction</li></ul>

MUST KNOW

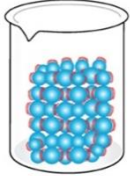
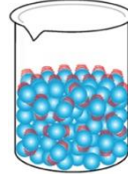
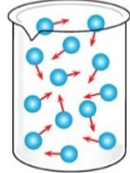

# KINETIC PARTICLE THEORY OF MATTER

The theory states that:

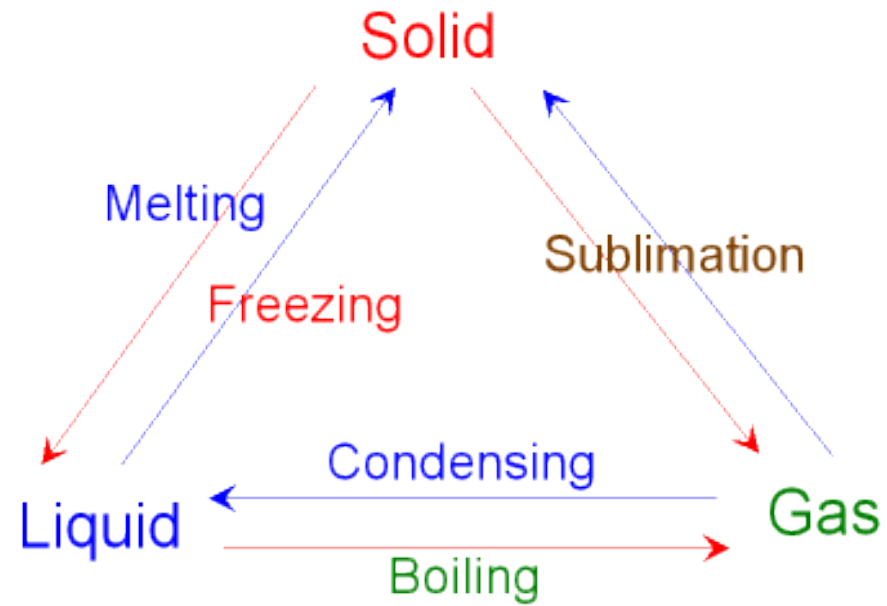
- all matter consist of **particles** that are too small to be directly visible,
- the particles are always in a constant state of **random motion** at varying speeds.

## KEY CONCEPT

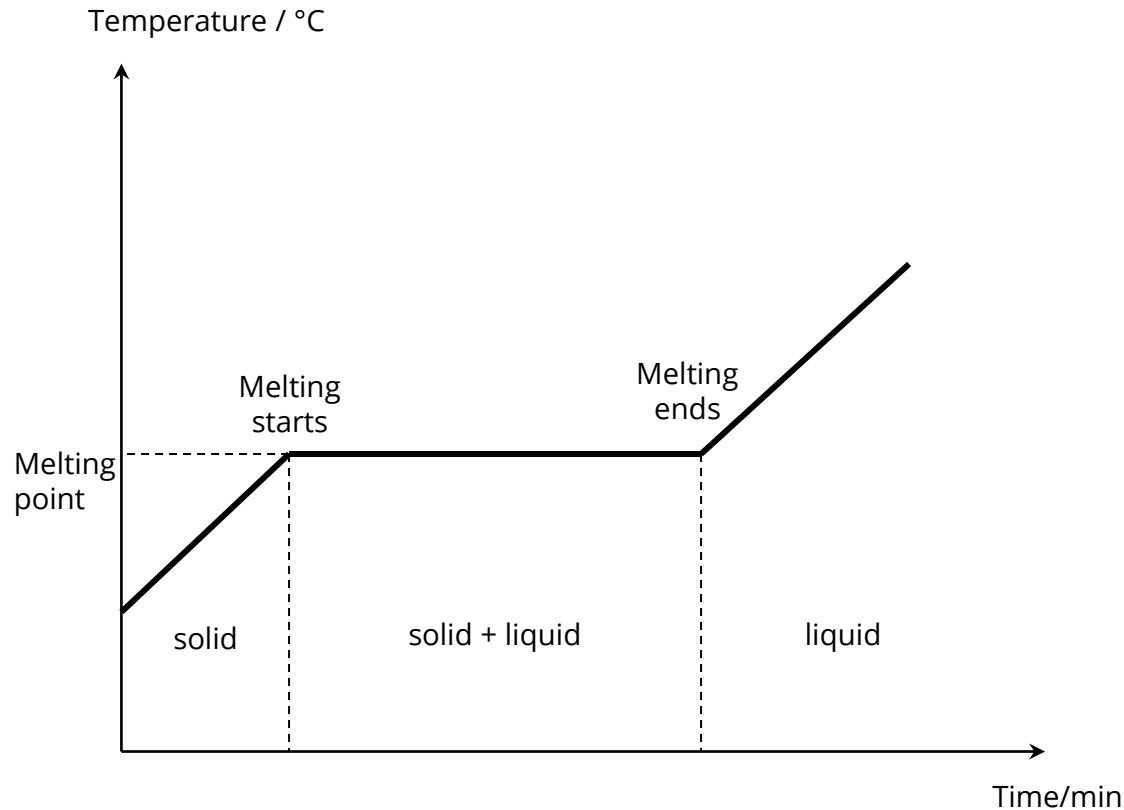
# KINETIC PARTICLE THEORY OF MATTER

Physical Properties	Solid	Liquid	Gas
<b>Particulate model of matter</b>			
<b>Arrangement</b>	Closely packed in an orderly arrangement	Loosely packed in a disorderly arrangement	Far apart & random arrangement
<b>Forces of attraction</b>	Very strong attractive force	Strong attractive force	Weak attractive force
<b>Density</b>	Very high density	High density	Low density
<b>Movement</b>	Vibrate about its fixed position	Particles sliding over one another freely	Move about at high speeds randomly
<b>Energy</b>	Increasing energy 		

# CHANGE IN STATE



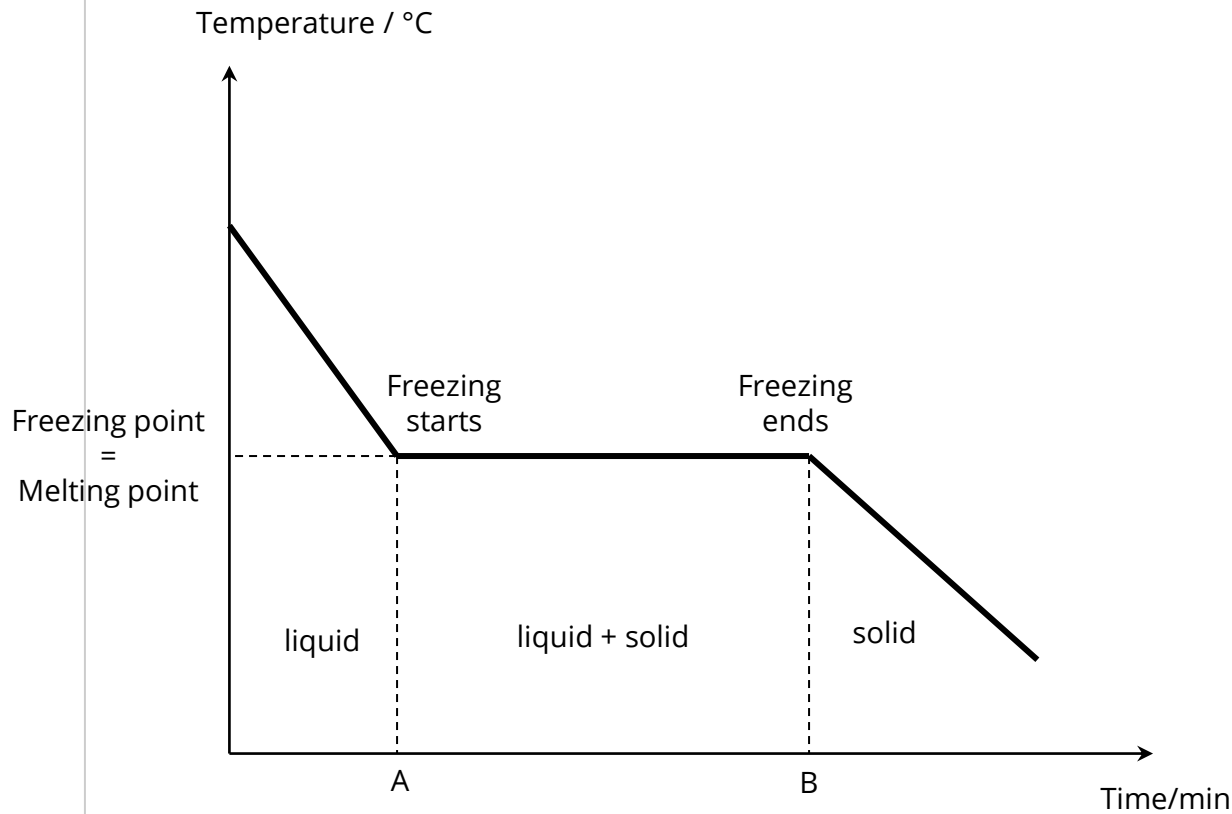
# MELTING (SOLID TO LIQUID)



- During melting, the particles gain energy from the surroundings and vibrate vigorously about their fixed positions until they have sufficient energy to overcome and **break free from the attractive forces**.
- The **temperature remains constant** during the melting process as the heat energy absorbed is used to overcome the forces of attraction.
- A **mixture of solid and liquid** is present during this stage.

The temperature of the matter (solid) is a measure of the average kinetic energy the matter possesses.

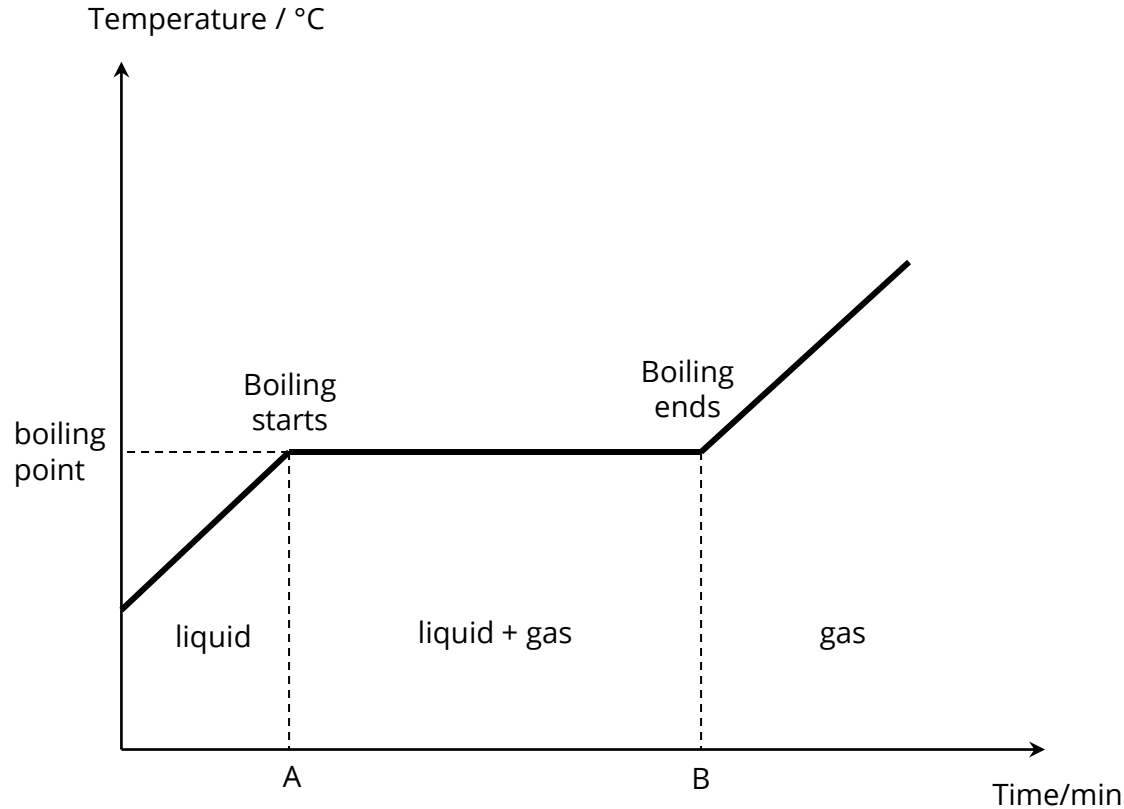
# FREEZING (LIQUID TO SOLID)



- At A, the particles have lost enough kinetic energy and freezing starts.
- The particles after losing most of their kinetic energy, **no longer have enough energy to overcome the forces of attraction** between themselves and would **return to their fixed position**.
- Between A and B, the freezing process is ongoing. The **temperature remains constant** because **heat energy is being released to the surroundings**. The release of heat energy negates the cooling effect resulting in the temperature remaining is constant.
- A mixture of solid and liquid is present during this stage.

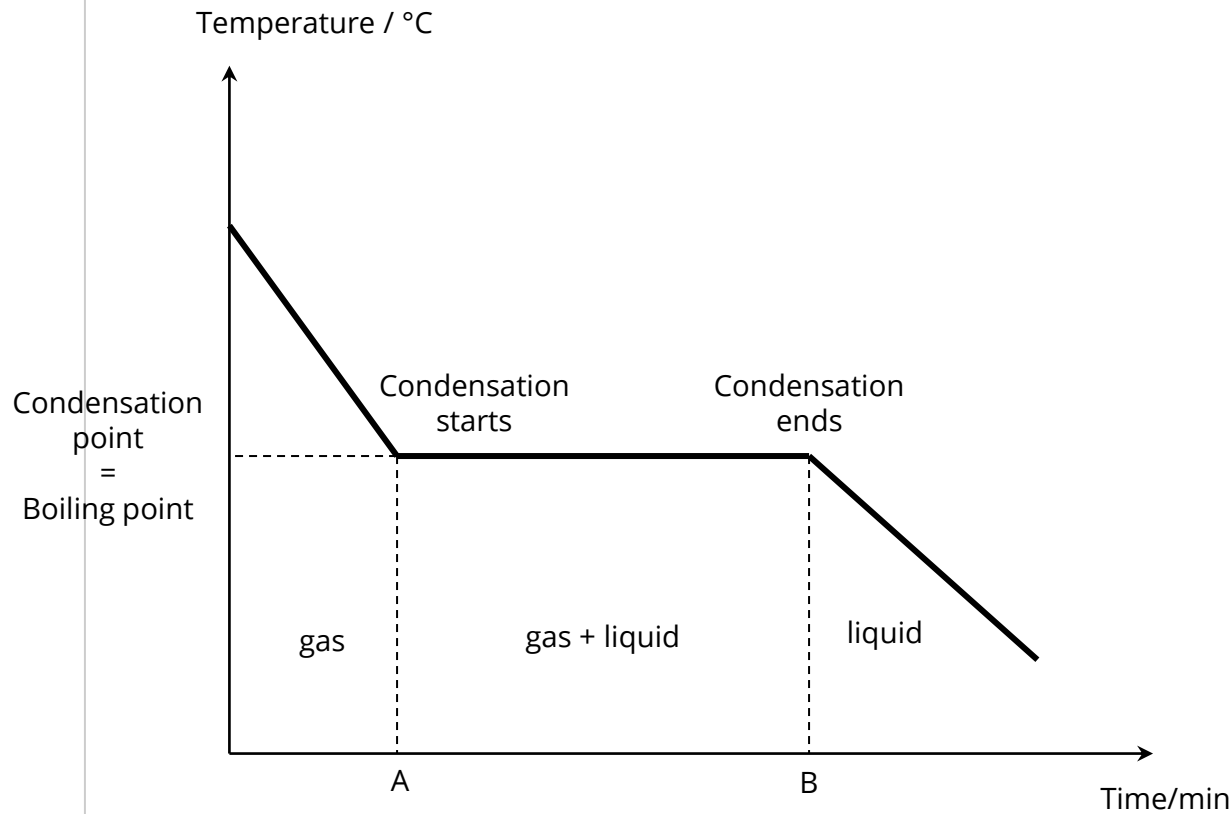


# BOILING (LIQUID TO GAS)



- At A, sufficient heat energy has been absorbed to reach its boiling point.
- During boiling, the particles have **gains the required amount of energy to overcome the forces of attraction** between them to move even further apart.
- Between A and B, the boiling process is ongoing. The **temperature remains constant** as heat energy gained was used to overcome the forces of attraction between particles rather than used to increase the particles' kinetic energy/temperature.
- A mixture of gas and liquid is present at this stage.

# CONDENSATION (GAS TO LIQUID)



- At A, the particles lost much of its kinetic energy and condensation starts.
- During condensation, the particles **loses most of its energy to that was used to overcome the forces of attraction** between themselves resulting in them coming closer together.
- **Heat energy is released** to the surroundings as particles slow down and become more closely packed. The **release of heat energy negates the cooling effect** resulting in the **temperature remaining constant**.
- A mixture of gas and liquid is present during this stage.

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