

Chap 2 : Kinetic Particle Theory

Classification of matter

- Matter takes up space and has mass.

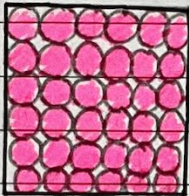
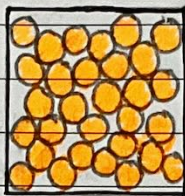
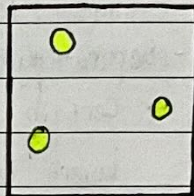
- Matter can exist in three different physical states, **solid**, **liquid** and **gas**.

★ - The kinetic particle theory states that :

→ Matter is made up of tiny particles

→ Particles have kinetic energy and hence, are in constant and random motion.

- The particulate model of matter :

	Solid	Liquid	Gas
			
Motion	Vibrates about fixed positions	Slides over one another	Moves freely in all directions
Attractive force	Very strong	Moderate	Weak
Arrangement	Regular pattern and fixed positions	Closer together but irregular pattern	Irregular and random
Distance	Very close together	Close together	Very far apart

- We can also use particulate model of matter to explain some common properties and characteristics of matter. (Explanation in purple)

- **Solid**

→ **Fixed volume and shape**

• The particles are arranged in a fixed position and a regular pattern

• The strong attractive force prevents the particles from breaking away from their fixed positions.

→ **Not compressible**

• The particles are closely packed together, so there are little spaces to squeeze them.

→ **Unable to flow**

• The particles can only vibrate at their fixed positions.

- Liquid

→ Fixed volume but not fixed shape

- The moderately strong attractive force prevents them from escaping from their positions.
- However, the particles can move about and slide past each other freely.

→ Able to flow easily

- The particles are able to move about and slide past each other freely.

→ Not compressible

- The particles are arranged quite closely together, so there are less spaces between them.

→ Take the shape of the container

- The particles are able to move about within confined spaces

- Gas

→ No fixed volume and shape

- The particles can move freely and randomly in all the available spaces.
- The negligible attractive force is not able to hold them in confined spaces.

→ Compressible

- The particles are far apart from each other, so there are more spaces between them.

→ Flow easily

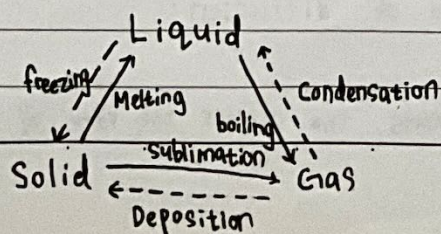
- The particles move freely at high speeds

→ Take the shape and volume of container

- The particles are able to move freely in all directions to occupy every corner of the container.

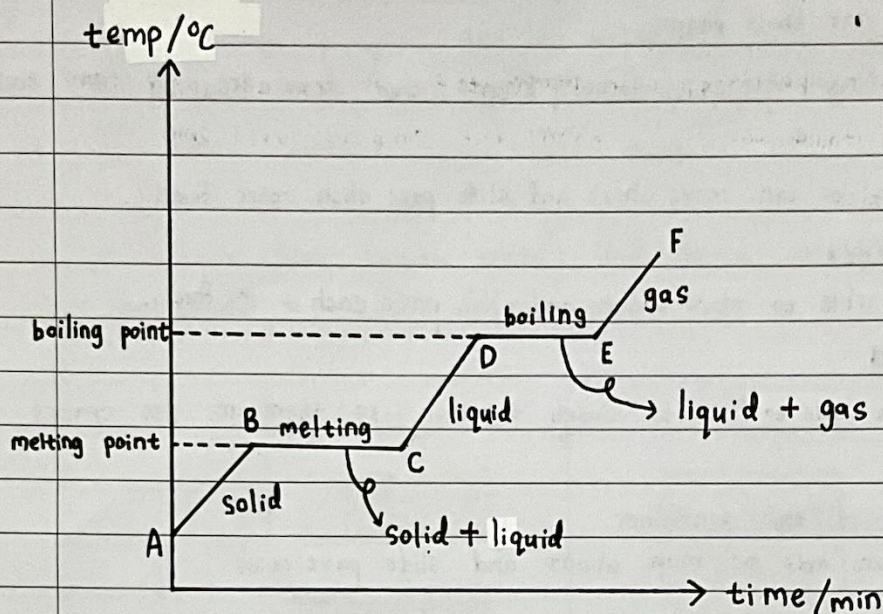
Energy changes during interconversion of physical states

- A change in the physical state does not produce new substances. It is called a physical change only.
- When a substance undergoes changes in physical states, thermal energy is either given out to the surroundings or taken in from the surroundings.
- Energy changes during interconversion of physical states in substances:

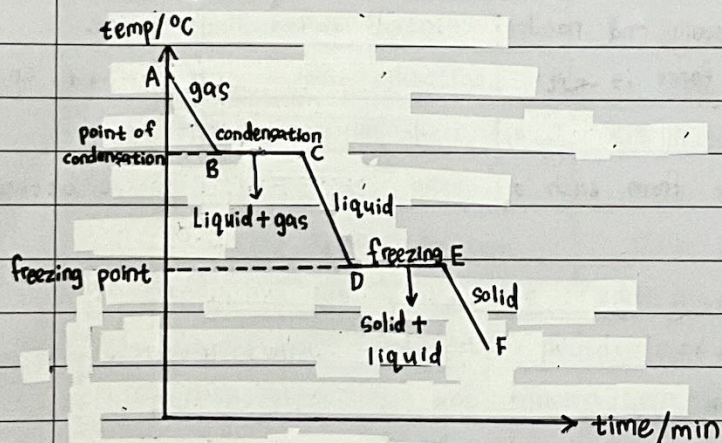


Key:
→ endothermic
--→ exothermic

→ Heat curve:



- Cooling curve:



- Sublimation is when a substance directly changes from solid to gas
- Deposition is when a substance directly changes from gas to solid

Evidence of movement of particles

- Diffusion is the movement of substances from a region of higher concentration to lower concentration
- Diffusion is evidence of movement of substances as it proves that particles are in constant and random motion
- Factors affecting the rate of diffusion:
 - **Molecular mass**
 - The larger the molecular mass, the slower the rate of diffusion

- The smaller the molecular mass, the faster the rate of diffusion

→ **Temperature**

- The higher the temperature, the faster the rate of diffusion
- The lower the temperature, the slower the rate of diffusion