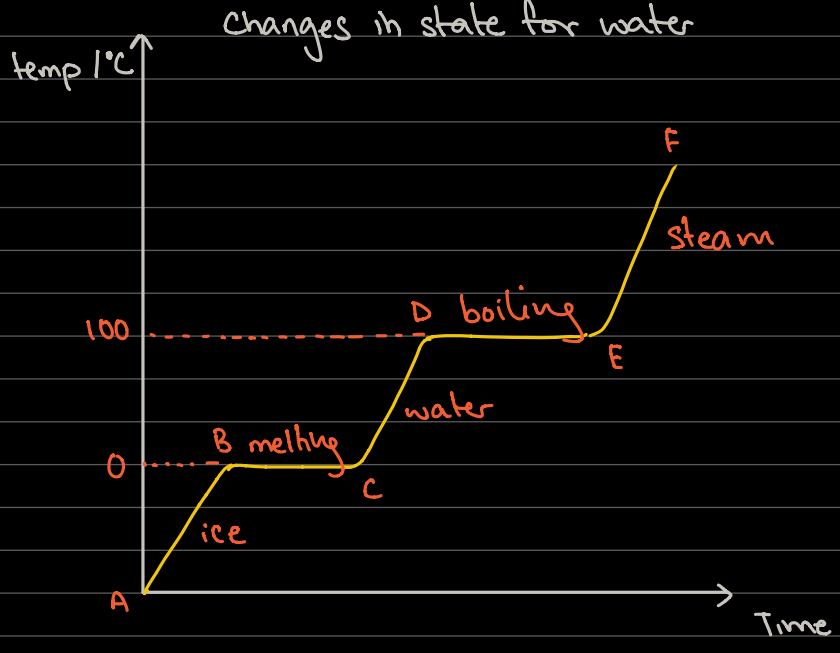
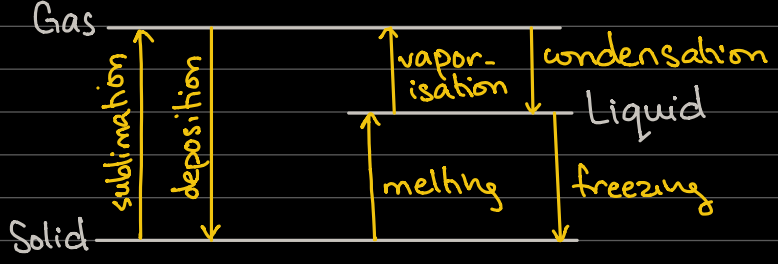
States of Matter : Introduction



The states of matter can be changed by varying the temperature



Melting: A solid melts when sufficient energy is provided to overcome the intermolecular forces of attractions between the particles

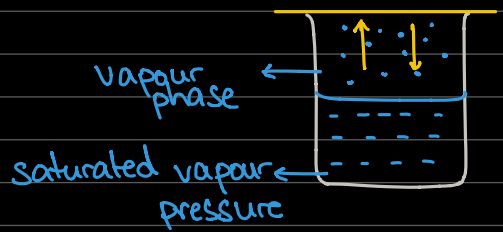
- When heated, the particles gain kinetic energy and vibrate faster and faster.
- They eventually break free from their fixed positions to begin moving around
- Melting point is a good indication of the strength of the intermolecular forces or bonds holding the particles together

Vaporisation: The molecules in a liquid are in constant motion, some of them (usually at the surface) will have sufficient energy to overcome the intermolecular forces of attraction and escape from the liquid into the vapour phase

↳ This process is called vaporisation

- Rate of vaporisation depends on:
  1. Temperature : As temp. increases, rate of vaporisation increases
  2. Surface Area : larger the SA, faster the vaporisation
  3. Pressure : Rate of vaporisation increases with a decrease in pressure

Vapour Pressure: measured in a close system
Is the pressure exerted by those molecules, that escape from the liquid to a separate vapour phase in a closed system.



liquid ⇌ vapour in a closed system

At equilibrium:
Rate of vaporisation = Rate of condensation

Saturated vapour pressure: Maximum pressure exerted by the vapour when it is in equilibrium with its liquid in a closed system

- The magnitude of vapour pressure depends on:

  1. Type of liquid
     and the intermolecular forces holding the particles together in that liquid

  2. Temperature
     As temperature increases, more particles can escape into the vapour phase and vapour pressure increases

  3. Pressure (external / atmospheric)

Atmospheric Pressure = 1 atm at sea level
= 101 kPa

Liquids boil at lower temperatures if the external pressure is lower

Boiling Point: of a liquid; is defined as the temperature at which it's vapour is at equilibrium with it's liquid at 1 atm.

- A liquid boils when it's vapour pressure
  =
  the external atmospheric pressure

Higher the atmospheric pressure → higher the boiling point
Lower the atmospheric pressure → lower the boiling point

Boiling point depends on the strength of the intermolecular forces holding the liquid particles together.

Volatility $\propto \frac{1}{\text{boiling point}}$ → the higher the volatility, the lower the BP

CH_3	gas	As no. of carbons increase
$CH_3(CH_2)_4CH_3$	liquid	· volatility decreases
$CH_3(CH_2)_{20}CH_3$	solid ↓	· ID-ID forces increase

Example Case: Pressure Cooker

High external pressure (provided by the pressure cooker)
↓
BP is higher
↓
Particles at higher temperatures
↓
More K.E, more frequent collisions
↓
Thermal energy is higher
↓
Cooks faster