

Chp 2.1 - How are solids, liquids and gases different

1. Matter is anything that has mass and occupy volume
2. Kinetic Particle Theory (KPT) states that all matter is made of tiny, constantly moving particles
3. Arrangement and movement of particles

Solid	Liquid	Gas
Closely packed in orderly manner	Closely packed in disorderly manner	Far apart in disorderly manner
Held by strong intermolecular forces of attraction	Held by strong intermolecular forces of attraction but weaker than solid	Held by forces of attraction weaker than solid
Enough KE to vibrate and rotate about their fixed position	Greater KE than solid and vibrate faster and slide over one another	Greatest KE and hence move rapidly and randomly in a disorder manner

4. Changes in state

Depends on temperature and pressure of surrounding

Reversible

When heated, heat energy is taken in, KE increase, particles move faster and vice versa

Almost all substance can exist in the 3 states at different temperatures

(During change of state, temperature remains constant until substance has fully changed)

Solid to liquid (Melting)

- Closely packed in an orderly manner, vibrating and rotating about their fixed position.
- Particles gain energy and vibrate faster
- At mp, particles have enough energy to overcome the forces of attraction **between them**
- Becomes closely packed in a disorderly manner and slide over one another

Liquid to Gas (Boiling/Evaporation)

For Boiling

- Closely packed in a disorderly manner and slide over one another
- Particles gain energy and move faster
- At bp, particles have enough energy to overcome the forces of attraction **holding them**
- Becomes far apart in a disorderly manner and moves randomly

For Evaporation

- Liquid to Gas at **room temperature**
- At surface of liquid
- Some particles have sufficient energy to become gas at room temperature

Gas to Liquid (Condensation)

- Far apart in a disorderly manner and moves randomly
- Particles lose energy and vibrate slower
- At condensation point, particles lose energy and slow down, FOA pull them close together
- Becomes closely packed in a disorderly manner and slide over one another

Liquid to Solid (Freezing)

- Closely packed in a disorderly manner and slide over one another
- Particles lose energy and vibrate slower
- At freezing point, particles lose energy and slow down, FOA pull them close together
- Closely packed in an orderly manner, vibrating and rotating about their fixed position

Solid to Gas (Sublimation)

- Gain energy and vibrate vigorously until it overcomes FOA between particles
- Break from orderly arrangement and escape from surface to gas

2.2 - How do particles move

Diffusion - Net movement of particles from region of higher concentration to lower concentration
Occurs due to constant random motion of gas and liquid particles

1. Diffusion in everyday life

- Perfume
- Food aroma
- Mixing of tea/coffee in water

2. Factors affecting rate of diffusion

- M_r/A_r - Smaller molecular mass = Faster particle diffusion
- Temperature - Higher temperature, higher KE, particles move faster