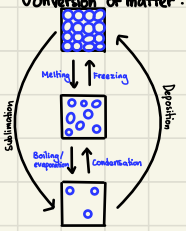
Basic concept of matter

Definition: Something that has mass and occupies space

Conversion of matter :

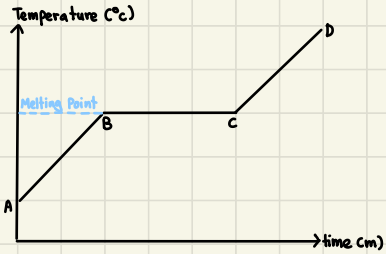


	Soleel	liqueel	gas
Particles	*Closely packed and in orderly manner	*Closely packed but not in orderly manner	*Far away from each other
Kinetic energy	*Low	*High	*Very High
Attraction force	*Strong	*Strong but weaker than solid	*Weak

Matter
- Element (Same type)
  - Atom
    - ↳108 atom
  - Molecules
    - ↳H_2, O_2, Na_2, F_2, Cl_2, Br_2, I_2, At_2, P_4, S_8
- Compound (diff type)
  - Molecules
    - ↳H_2O, CO_2
  - Ion
    - ↳NaCl

Note: lauric acid, $C_{12}H_{24}O_2$ from coconut can replace napthalene

•Heating Curve

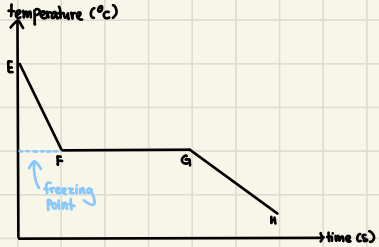


AB
↳Solid state
↳Kinetic energy increase when heated because particle absorb heat

BC
↳Melting occurs
↳No increase in temperature because heat energy absorbed is used to overcome the attraction force between particle

CD
↳liquid state
↳Particles absorb more heat and move faster

•Cooling Curve



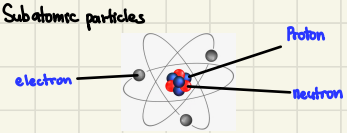
EF
↳In liquid form
↳Particles move slower and release heat due to lost of kinetic energy

FG
↳Freezing occurs
↳Heat energy lost is equal to the heat energy released when particles attract each other

GH
↳In Solid State
↳Particle lost heat and vibrate slower

Development of the atomic model

•Subatomic particles



• Development

John Dalton

↳ Matter is made up of atom

↳ Atom is the smallest that can not be created, destroyed or divided

→

• J.J. Thompson

↳ Discovered electron

↳ Atom is a positively charged sphere with several e⁻ in it

→

• Ernest Rutherford

↳ Nucleus is the centre

↳ Discovered proton

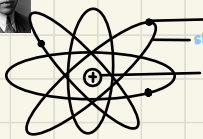
↳ Almost whole atomic mass is in th nucleus.

↳ electron move outside nucleus

↓

• Niels Bohr

↳ Electrons move in shell

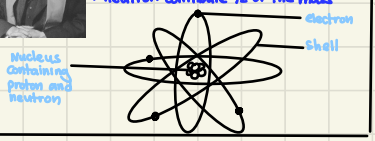


←

• James Chandwick

↳ Discovered neutron

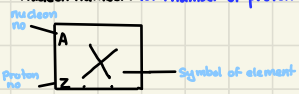
↳ neutron contribute ½ of the mass



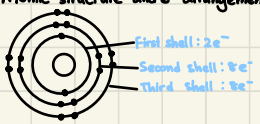
Atomic structure

• Proton number: The total number of proton in the nucleus

• Nucleon number: Total number of proton and neutron



• Atomic structure and e⁻ arrangement



Third shell can fill 18e⁻ if proton number exceed 20

Electron arrangement	Atomic structure
↳ Show the nucleus and electron arrangement	↳ Show proton and neutron number and e⁻ arrangement

Isotopes

Definition: Atom of the same element with same proton number but different number of neutron

Relative atomic mass

↳ Depends on the natural abundance (percentage of isotopes)

$$RAM = \frac{\Sigma(\%\ \text{isotopes} \times \text{mass of isotopes})}{100}$$

Example 3

Chlorine consists of two isotopes, $^{35}_{17}Cl$ and $^{37}_{17}Cl$. The natural abundance of $^{35}_{17}Cl$ is 75% and $^{37}_{17}Cl$ is 25%. Calculate the relative atomic mass of chlorine.

Solution

Relative atomic mass of chlorine $= \frac{(\%\ \text{isotope } ^{35}_{17}Cl \times \text{mass } ^{35}_{17}Cl) + (\%\ \text{isotope } ^{37}_{17}Cl \times \text{mass } ^{37}_{17}Cl)}{100}$

$= \frac{(75 \times 35) + (25 \times 37)}{100}$

$= 35.5$

• Uses

Field	Isotopes	Uses
Medicine	Cobalt-60	·kill cancer cell ·Sterilising surgical tools
	Iodine-131	·Treat thyroid cancer
Agriculture	phosphorus-32	·Study metabolism of plant
Nuclear	uranium-235	·Generate electricity
Archaeology	Carbon-14	·estimate fossil/artifact age
	lead-210	·Determine age of sand
Industry	Hydrogen-3	·Detect sewage and liquid waste
Engineering	Sodium-24	·Detect leakage in underground pipe