

F4 C4

Periodic table

Antoine Lavoisier = divided the substances into four groups(Classification is not quite correct ,heat and light were grouped as gases.)

J.W.Dobereiner = triads

Lothar Meyer = plotted graph | elements relatively similar points of the curve are grouped in the same chemical family

John Newlands = arranged in ascending order of atomic mass(Law of octave)

Dmitri Mendeleev = atomic mass

Henry Moseley = proton number

Group number determined by the number of electrons in the outermost shells

Period number indicates the number of electron-filled shells

Group 1(alkali metals)very reactive=stored under paraffin oil

-Soft metal

-comparatively相对 boiling point and melting point(compare to other metals)

-shiny ,silvery solid(room temperature)

-low density(less than water)

-good conductors of heat and electricity

-Going down the group ,atomic radius increase

~the melting point and boiling points decrease : size of atom increases->attraction force between the atoms become weaker->less heat energy is needed to overcome these weak forces

~density increase : increase in atomic mass is bigger than increases in volume

~reactivity increase / electropositivity increase : atomic size increase->valence electron is further away from the nucleus->attraction force between nucleus and atom is weaker->easier to lose electron to form positive ions

Reaction:

With water=hydroxides + H<sub>2</sub> ( $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$ )

With air(burning)=solid metal oxide ( $4\text{Na} + \text{O}_2 \rightarrow 2\text{Na}_2\text{O}$ )

With non-metals(halogens)=halides salts ( $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ )

Group 2(Alkali earth metals)

Group 3-12(Transition metals)

-form coloured compound

Copper(II) ion,  $\text{Cu}^{2+}$ =blue

Iron(II) ion,  $\text{Fe}^{2+}$ =Pale green

Iron(III) ion,  $\text{Fe}^{3+}$ =Brown

Chromium(III) ion,  $\text{Cr}^{3+}$ =Green

Cobalt(II) ion,  $\text{Co}^{2+}$ =pink

-variable oxidation states(have more than one oxidation number)

-active catalyst

Iron = Haber process(making ammonia)

Vanadium(5) oxide=Contact process(making of sulphuric acid)

Platinum=Ostwald process(making nitric acid)

Nicker=Hydrogenation(making of margarine)

-form complex ion(complex ion is a poly atomic cation/anion consisting of a central metal ion with other groups bounded to it,sap:( $\text{CoCl}_4$ )<sup>2-</sup>

-high melting point and boiling point

-high densities

-good conductor of electricity and heat

-strong ,hard ,ductile拉伸 and malleable塑造

### Group 17(halogens | diatomic)

-low melting and boiling point

~halogen consists of small molecules->attraction force between molecules are weak->less heat energy is needed to overcome these weak attraction force

-low density

-poor conductors of heat and cannot conduct electricity

-soluble in organic solvents (Tetrachloromethane)

-coloured intensity increase down the group

Fluorine=pale yellow gas

Chlorine=Greenish yellow gas

Bromine=Reddish-brown liquid

Iodine=Shiny purplish-black solid

### Going down the group

~Melting point and boiling point increase : molecules get larger->attraction force between molecules become stronger->More heat energy is needed to overcome these stronger attractive force

~reactivity decrease : atoms become bigger->distance between nucleus and valence electron become further->attraction force between valence electron and the nucleus become weaker->more difficult to attract an electron to form negative ions.

### Reaction:

With metals=ionic compound ( $2\text{Fe}+3\text{Cl}_2\rightarrow 2\text{FeCl}_3$ )

With non-metal=covalent compound ( $\text{H}_2+\text{Cl}_2\rightarrow 2\text{HCl}$ )

With water=acid

With sodium hydroxide=water+salt

### Group 18(noble gases | monoatomic)

Noble gases=chemically inert : electron arrangement are very stable/have a stable octet/dupe(Helium) electron arrangement | atom will not lose ,gain and share electron with other atoms

-low melting and boiling point

~increase when going down the group : Size of atoms increase—>attractive force between the neighbouring atoms increase—>more heat energy is required to overcome these stronger forces of attraction between atoms while melting or boiling

-low density

~density increase when going down the Group 18 : increase in atomic mass is bigger compared to the increase in volume

-poor conductors of heat and electricity

-insoluble in water

Example:

Neon = advertising lights

Argon = to fill electric bulbs

### Elements in period 3

When going across period 3:

-the number of protons in nucleus increases

-the attractive forces between the nucleus and electrons become stronger

-decrease in atomic size(electron are pulled closer toward the nucleus of the atom)

-increase in electronegativity

~atomic size become bigger->number of protons in the nucleus increases->attraction force between nucleus and electrons become stronger->the atoms have higher tendency to attract electrons to form an negative ions.

-melting point increases (sodium(group 1) to aluminium(group 13))

-melting point decrease (silicon(group14) to argon(group18))

-melting point of silicon is the highest(Strong three dimensional covalent bonds)

### Chemical properties

$\text{Na}_2\text{O}$   $\text{MgO}$  |  $\text{Al}_2\text{O}_3$  |  $\text{SiO}_2$   $\text{P}_4\text{O}_{10}$   $\text{SO}_3$   $\text{Cl}_2\text{O}_7$

Basic. |Amphoteric| Acidic  
 Basic oxide+water—>alkaline solutions(PH>7)  
 ~react with acid  
 Acidic oxide+water—>acid(PH<7)  
 ~react with alkali/base

Amphoteric oxide(PH=7) have properties of a basic oxide and an acidic oxide(reacts both with acid and bases)

**Metalloid(semi-metals)**

have properties of metals and non-metals  
 Use:

- Chips for electronic devices
- solar cell(Silicon)
- Lasers ,for compact disc player(Silicon)
- light metals ,for camera(Silicon)

PERIODIC TABLE of the ELEMENTS

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 Chemical Technology Department  
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