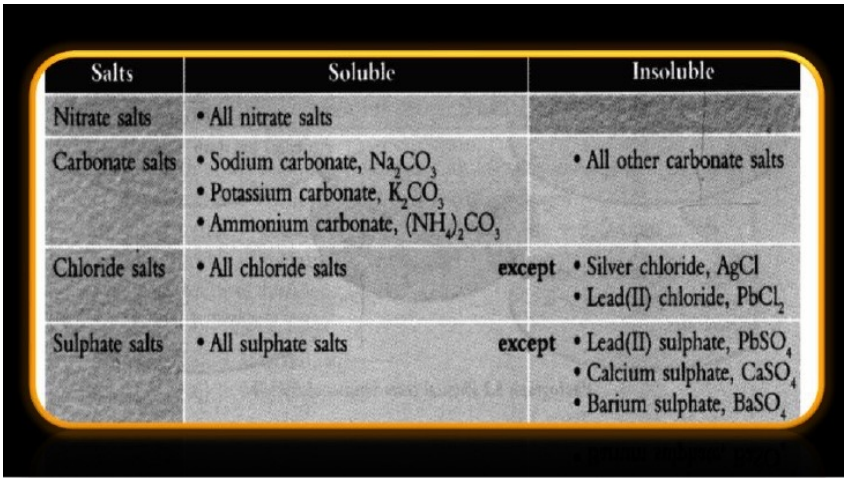
F4 C8
Salt=formed by the replacement of hydrogen ions ,H+ ,in an acid by metallic ions or ammonium ions.



Salts	Soluble		Insoluble
Nitrate salts	• All nitrate salts		
Carbonate salts	• Sodium carbonate, Na_2CO_3 • Potassium carbonate, K_2CO_3 • Ammonium carbonate, $(NH_4)_2CO_3$		• All other carbonate salts
Chloride salts	• All chloride salts	except	• Silver chloride, AgCl • Lead(II) chloride, $PbCl_2$
Sulphate salts	• All sulphate salts	except	• Lead(II) sulphate, $PbSO_4$ • Calcium sulphate, $CaSO_4$ • Barium sulphate, $BaSO_4$

Sodium,potassium,ammonium salts
All soluble
Carbonate salt
NaK
Chloride salt
PabA
Sulphate salt
PabCaBa

Methods of salt preparation
-Soluble salt
-acid with alkalis(soluble metallic oxides)
-acid with insoluble metallic oxides/hydroxides
-acid with more electropositive metals(than hydrogen)electropositive在H下面的都能用
-acid with metallic carbonates
-Insoluble salt
-precipitation method(double decomposition reaction)

SUMMARIES OF REACTION

Method/Reaction	Reason	Type of Salts (Metal)
Neutralisation (Titration method) **Alkali + Acid → Salts + Water**	Most salts of sodium, potassium, and ammonium ions are soluble.	**Na^+** **K^+** **NH_4^+**
Metal Displacement **Metal + Acid → Salts + Hydrogen**	More electropositive metal can be displaced hydrogen ion from acid.	**Ca^{2+}** **Mg^{2+}** **Al^{3+}** **Zn^{2+}**
Metal oxide + Acid → Salts + Hydrogen	Less electropositive metal not be displaced hydrogen ion from acid.	Mostly **Cu^{2+}/Pb^{2+} /Ag^+**
Metal carbonate + Acid → Salts + Water + Carbon dioxide	metal carbonate is a solid that cannot dissolves in water, in reaction that solid must be added excessively	**All above** except $Na^+/K^+/NH_4^+$

Why?
Na和K太reactive，加多少都会溶解所以要用NaOH, KOH

Qualitative analysis of salt=identify the cations and anions ini an unknown salt

Colour of salt
Copper(II) ion ,Cu2+ = Blue
Copper(II) carbonate ,CuCO3 = Pale green
Copper(II) oxide ,CuO=Black
Iron(II) ion ,Fe2+ = Pale green
Iron(III) ion ,Fe3+ = Brown
Lead(II) oxide ,PbO =Brown(hot) ,yellow(cold)
Zinc oxide ,ZnO =yellow(hot ,white(cold)

Gas

Carbon dioxide ,CO_2 = Colourless and odourless gas无臭

~When gas is bubbled through the lime water ,lime water turn milky.

Oxygen ,O_2 = Colourless and odourless gas

~A glowing splinter is rekindled when it is placed in the gas.

Nitrogen dioxide ,NO_2 = Brown and pungent gas

~damp blue litmus paper turns red

Ammonia ,NH_3 = colourless and pungent gas

~damp red litmus paper turn blue. When contact with a glass rod that dipped into some concentrated hydrochloric acid ,produces dense white fumes.($HCl + NH_4 \rightarrow NH_4Cl$)

Hydrogen ,H_2 = colourless and odourless gas

~lighted wooden splinter extinguishes with a 'pop' sound when it is placed near the gas

Effect of heating salt

-Carbonate salts

~Potassium ,Sodium carbonate does not decompose

$CaCO_3 \rightarrow CaO + CO_2$

~Why limewater($Ca(OH)_2$) turn milky

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

-Nitrate salts

~Potassium ,Sodium nitrate

$KNO_3 \rightarrow 2KNO_2 + O_2$

~Others

(Brown)

$2Ca(NO_3)_2 \rightarrow 2CaO + 4NO_2 + O_2$

-Sulphate ,Chlorides and Ammonium salts

~most metallic sulphate are usually quite stable when heated

~Chlorides usually do not decomposed on heating except ammonium chloride

$NH_4Cl \rightleftharpoons NH_3 + HCl$

~Ammonium salts usually decomposed into ammonium gas on heating

$(NH_4)_2SO_4 \rightleftharpoons 2NH_3 + H_2SO_4$

Confirmation test for:

Anions(-)

(observation)

-Chloride ion ,Cl^- = white precipitated formed

~2 cm^3 of nitric acid and a few drops of silver nitrate solution are added to 2 cm^3 of aqueous chloride solution

-Nitrate ion ,NO_3^- = brown ring is formed

~2 cm^3 dilute sulphuric acid and aqueous iron(II) sulphate solution is added to 2 cm^3 nitrate solution. Mixture is stirred well ,concentrated sulphuric acid added slowly down the side of the tilted斜 test tube.

-Carbonate ion ,CO_3^{2-} = lime water turns milky

~2 cm^3 of dilute nitric acid is added to solid carbonate salt

-Sulphate ion ,SO_4^{2-} = white precipitate is formed $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$

~2 cm^3 dilute ..nitric acid/hydrochloric acid /barium nitrate.. and a few drops of aqueous barium chloride solution are added to 2 cm^3 of aqueous sulphate solution.

Cations(+)

-Fe 2+ = dark blue precipitate is formed

~potassium hexacyanoferrate(III) solution added to 2 cm^3 of aqueous iron(II) sulphate solution.

-Fe 3+ = dark blue precipitate is formed

~A few drop of ..potassium hexacyanoferrate(II) solution/potassium thiocyanate solution.. are added to 2 cm^3 of aqueous iron(III) sulphate solution.

-Pb 2+ = yellow precipitate formed

~potassium iodide solution are added to 2 cm^3 of aqueous lead(II) nitrate solution

-Ca 2+ = white precipitate

~ 2 cm^3 of sulphuric acid are added to 2 cm^3 of aqueous calcium nitrate solution

-NH4 + = yellow brown precipitate

~A few drop of Nessler reagent are added to 2 cm^3 of aqueous ammonium sulphate solution.

Identify cation in a salt through reaction with aqueous alkali solutions
*Ammonium solution cannot test ammonium salt

	Reaction with aqueous sodium hydroxide		Reaction with aqueous ammonia solution	
Cation	A little(precipitate)	Excess	A little	Excess
Ca 2+	White precipitate	Insoluble	—	—
Mg 2+	White precipitate	Insoluble	White precipitate	Insoluble
Al 3+	White precipitate	Soluble	White precipitate	Insoluble
Zn 2+	White precipitate	Soluble	White precipitate	Soluble
Pb 2+	White precipitate	Soluble	White precipitate	Insoluble
Fe 2+	Dirty green	Insoluble	Dirty green	Insoluble
Fe 3+	Reddish-brown	Insoluble	Reddish-brown	Insoluble
Cu 2+	Blue	Insoluble	Blue	Insoluble
NH4 +	No precipitate formed ,ammonia gas produce.	—		—