7 The chemistry and uses of acids, bases and salts

Content

7.1 The characteristic properties of acids and bases

7.2 Preparation of salts

7.3 Properties and uses of ammonia

7.4 Sulfuric acid

Learning outcomes

Candidates should be able to:

7.1 The characteristic properties of acids and bases

(a) describe the meanings of the terms acid and alkali in terms of the ions they contain or produce in aqueous solution and their effects on Universal Indicator paper

(b) describe how to test hydrogen ion concentration and hence relative acidity using Universal Indicator paper and the pH scale

(c) describe the characteristic properties of acids as in reactions with metals, bases and carbonates

(d) describe qualitatively the difference between strong and weak acids in terms of the extent of dissociation

(e) describe neutralisation as a reaction between hydrogen ions and hydroxide ions to produce water, $H^+ + OH^- \rightarrow H_2O$

(f) describe the importance of controlling the pH in soils and how excess acidity can be treated using calcium hydroxide

(g) describe the characteristic properties of bases in reactions with acids and with ammonium salts

(h) classify oxides as acidic, basic or amphoteric, based on metallic/non-metallic character

7.2 Preparation of salts

(a) describe the techniques used in the preparation, separation and purification of salts as examples of some of the techniques specified in Section 1.2(a)

(methods for preparation should include precipitation and titration together with reactions of acids with metals, insoluble bases and insoluble carbonates)

(b) describe the general rules of solubility for common salts to include nitrates, chlorides (including silver and lead), sulfates (including barium, calcium and lead), carbonates, hydroxides, Group I cations and ammonium salts

(c) suggest a method of preparing a given salt from suitable starting materials, given appropriate information

(d) describe the meanings of the terms hydrated, anhydrous and water of crystallisation

7.3 Properties and uses of ammonia

(a) describe the use of nitrogen, from air, and hydrogen, from cracking hydrocarbons, in the manufacture of ammonia

(b) state that some chemical reactions are reversible (e.g. manufacture of ammonia)

(c) describe and explain the essential conditions for the manufacture of ammonia by the Haber process

(d) describe the use of nitrogenous fertilisers in promoting plant growth and crop yield

(e) compare nitrogen content of salts used for fertilisers by calculating percentage masses

(f) describe eutrophication and water pollution problems caused by nitrates leaching from farm land and explain why the high solubility of nitrates increases these problems

(g) describe the displacement of ammonia from its salts and explain why adding calcium hydroxide to soil can cause the loss of nitrogen from added nitrogenous fertiliser

The Following Notes cover in Much Detail of the topic :-

Acid Bases & Salts !

I hope these set of notes help out !

Made by :-

DACKIFY @ insta

(Ahmed Afzal)

Ultimate credit goes to Sir Rizwan Khan

≈ Acid Bases & Salts ≈

≈ Acids ≈

What is an Acid? / Define Acid.

Substances which produce H^+ ions are called Acid

① HydroChloric Acid (HCl)

$HCl \xrightarrow{H_2O} Cl^- + H^+$ → Basicity

② Nitric Acid (HNO_3)

$HNO_3 \xrightarrow{H_2O} NO^{3-} + H^+$ → Mono Basic

③ Sulfuric Acid (H_2SO_4)

$H_2SO_4 \xrightarrow{H_2O} SO_4^{2-} + 2H^+$ → Di Basic

④ Phosphoric Acid (H_3PO_4)

$H_3PO_4 \xrightarrow{H_2O} PO_4^{3-} + 3H^+$ → Tri Basic

★ Number of H^+ ions of Acid molecule → Basicity of the Acid

✓ H^+ ions responsible for Acidic Properties

The Process of formation of H^+ ions is called "Dissociation"

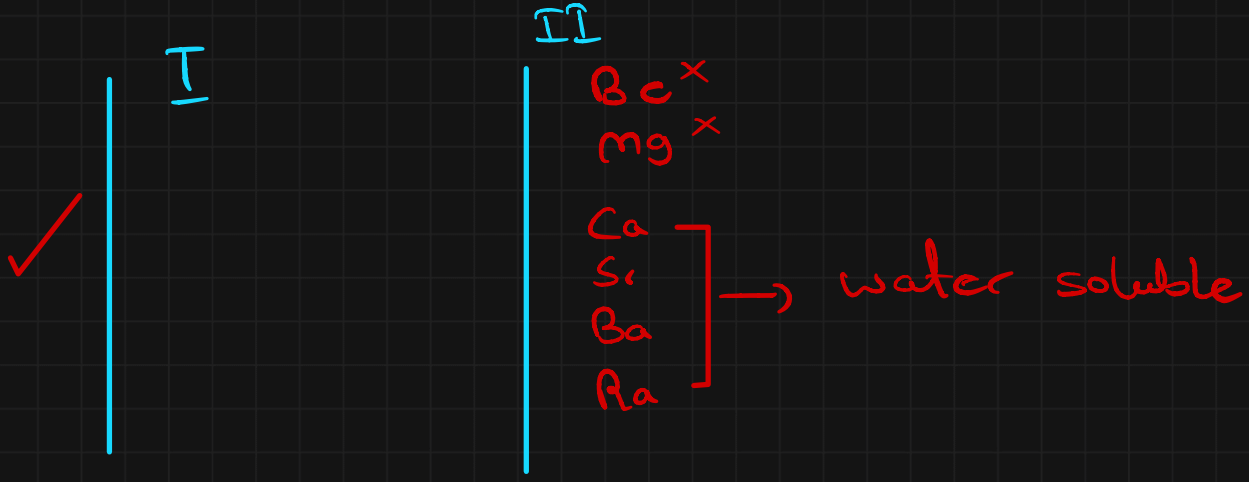
≈ Bases ≈

Bases are substances which Neutralize Acid

$$\underset{\text{Base}}{CuO} + H_2SO_4 \longrightarrow \underset{\text{Salt}}{CuSO_4} + H_2O$$

$$\underset{\text{Base}}{Na_2O} + H_2SO_4 \longrightarrow \underset{\text{Salt}}{Na_2SO_4} + H_2O$$

o) All metal oxides are Base.



So, What is Alkali?

(next page)

≈ Alkali ≈

A water soluble Base is called Alkali OR

Substances which Produce Hydroxide (OH^-) ions in Aq. sol.

All Group I & Group II Calcium to Barium metal Oxides or Metal Hydroxides are water soluble base.

$LiO \rightarrow$ Base ✓

$\searrow$ Alkali ✓

$K_2O \rightarrow$ Base ✓

$\searrow$ Alkali ✓

$FeO \rightarrow$ Base ✓

$\searrow$ Alkali ✗

$ZnO \rightarrow$ Base ✓

$\searrow$ Alkali ✗

All Alkali's are bases but all Bases are not Alkali's

≈ Strengths of Acids & Alkalis ≈

① Strong Acids :

Acid which ionizes completely in Aq. Sol.

② Weak Acid :

Acid which incompletely ionizes in Aq. Sol.

Dissociation / Ionization

$NaCl \xrightarrow{H_2O} Na^+ + Cl^-$

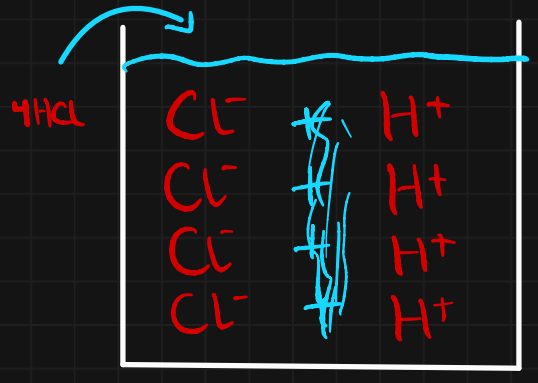
$HCl \xrightarrow{H_2O} H^+ + Cl^-$

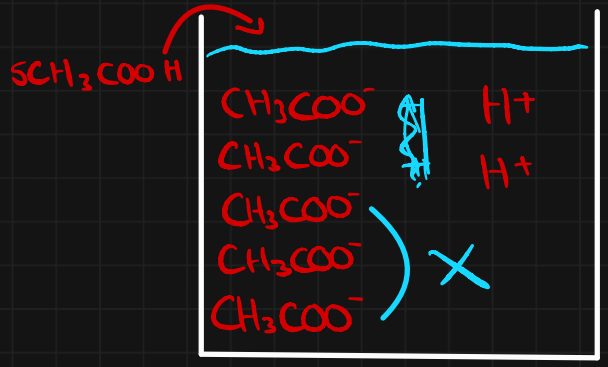
Complete Dissociation → Strong Acid

$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$

Reversible Reaction

Incomplete Dissociation → Weak Acid





Completely ionize

Incompletely ionize

☆ Complete dissociation → Single arrow

☆ Incomplete dissociation ⇌ reversible arrow

Strong Acid :-

$HCl \longrightarrow$ Hydrochloric Acid

$H_2SO_4 \longrightarrow$ Sulfuric Acid

$HNO_3 \longrightarrow$ Nitric Acid

$H_3PO_4 \longrightarrow$ Phosphoric Acid

Weak Acids :-

$H_2CO_3 \longrightarrow$ Carbonic Acid

$CH_3COOH \longrightarrow$ Ethanoic Acid

$CH_3COOH \longrightarrow$ ✓ Mono Basic

✓ incomplete ionization

✓ CH_3COO^- ↓

Acetate ion

or

Ethanoate ion

≈ Strength of Alkali ≈

Strong Alkali :-

Alkali → completely dissociate → Aq. Sol.

Weak Alkali :-

Alkali → incompletly dissociate → Aq. Sol.

o) All Group I and Group II Ca-Ba metal hydroxides are Strong Alkalis.

KOH → Strong Alkali

$NaOH$ → Strong Alkali

$Ca(OH)_2$ → Strong Alkali

$Al(OH)_3$ → Weak Alkali

$Zn(OH)_2$ → Weak Alkali

Salts ...

A substance → all H^+ ions of Acid replaced by Cations

$HCl + Na^+ = NaCl$ (Salt)

$H_2SO_4 + Ca^{2+} = CaSO_4$ (Salt)

$H_3PO_4 + Al^{3+} = AlPO_4$ (Salt)

$H^+ = Na^+$

$2H^+ = 2Na^+$

$2H^+ = Ca^{2+}$

$3H^+ = 3Na^+$

$3H^+ = Al^{3+}$

≈ Indicators ≈

Substances which show different colours at Different PH is called Indicator.

Indicators	Acid	Alkali
Phenophlatein	Colourless	Purple / Pink
Methyl Orange	Red	Yellow
Litmus Solution	Red	Blue

LAR MAR PAC → For Acid!

Universal Indicator :

Mixture of dif. Indicators → dif colors at dif PH

This indicator is not used in Titration.

VIBGYOR

R = Red

O = Orange

Y = Yellow

G = Green

B = Blue

I = Indigo

V = Violet

≈ Preparation of Salt ≈

There are four methods to Prepare salts :-

Method 1 :-

Acid + Base ⟶ Salt + Water

① $2HCl + Na_2O \longrightarrow 2NaCl + H_2O$

② $H_2SO_4 + CaO \longrightarrow CaSO_4 + H_2O$

③ $H_2SO_4 + Al_2O_3 \longrightarrow Al_2(SO_4)_3 + H_2O$

$Al^{3+} \times SO_4^{2-} \rightarrow Al_2(SO_4)_3$

④ $2HNO_3 + CuO \longrightarrow Cu(NO_3)_2 + H_2O$

$Cu^{2+} \times NO_3^{-} \rightarrow Cu(NO_3)_2$

Method 2 :-

Acid + Alkali ⟶ Salt + Water

① $HCl + NaOH \longrightarrow NaCl + H_2O$

② $3H_2SO_4 + 2Al(OH)_3 \longrightarrow Al_2(SO_4)_3 + 6H_2O$

$Al^{3+} \times SO_4^{2-} \rightarrow Al_2(SO_4)_3$

③ $H_3PO_4 + Mg(OH)_2 \longrightarrow Mg_3(PO_4)_2 + 6H_2O$

$Mg^{2+} \times PO_4^{3-} \rightarrow Mg_3(PO_4)_2$

④ $3HNO_3 + Al(OH)_3 \longrightarrow Al(NO_3)_3 + 6H_2O$

$Al^{3+} \times NO_3^{-} \rightarrow Al(NO_3)_3$

Method 3 :-

Acid + Metal Carbonate ⟶ Salt + CO_2 + H_2O

① $2HCl + Na_2CO_3 \longrightarrow 2NaCl + CO_2 + H_2O$

② $3H_2SO_4 + Al(CO_3)_3 \longrightarrow Al_2(SO_4)_3 + 3CO_2 + 3H_2O$

$Al^{3+} \times SO_4^{2-} \rightarrow Al_2(SO_4)_3$

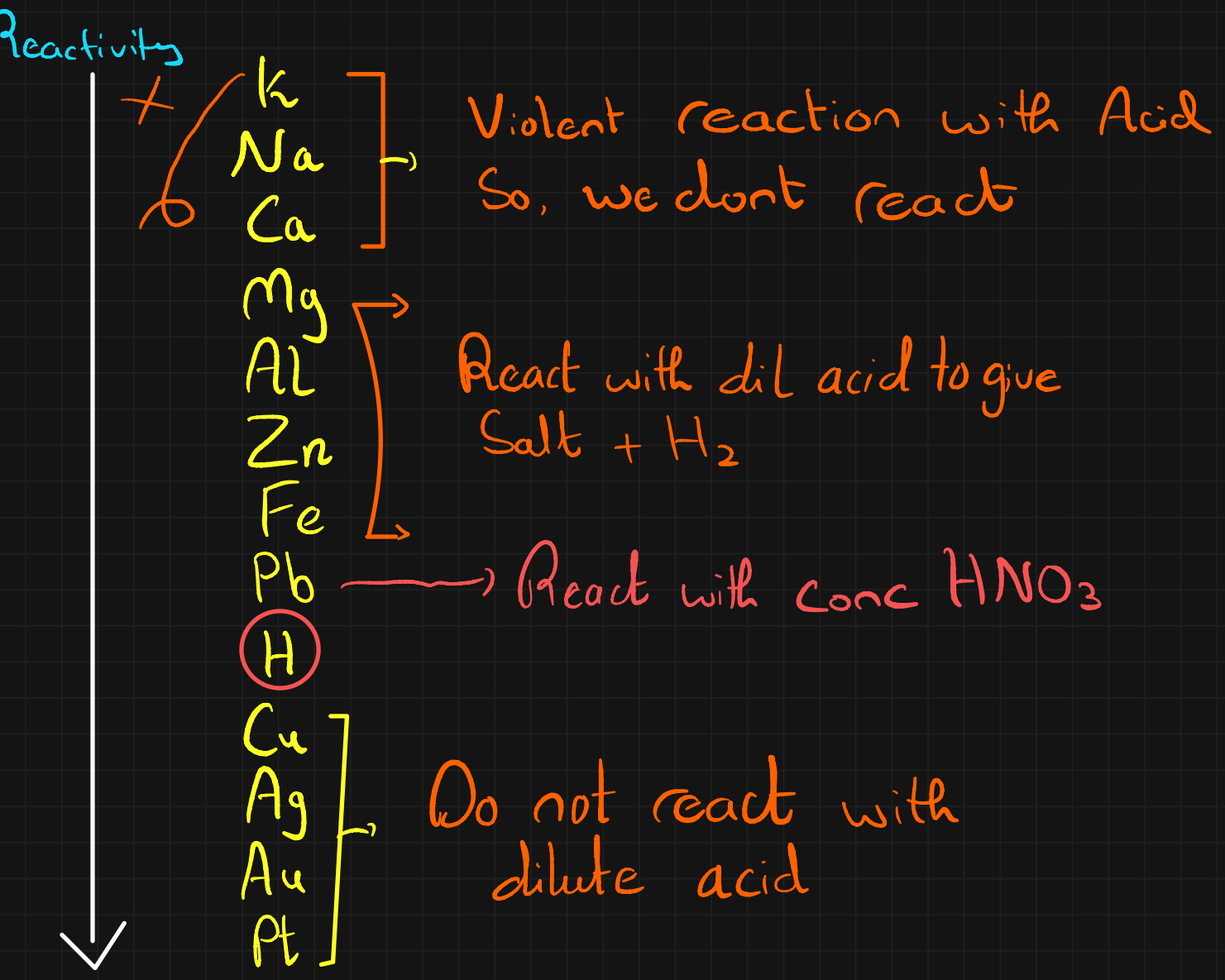
③ $HNO_3 + MgCO_3 \longrightarrow Mg(NO_3)_2 + CO_2 + H_2O$

$Mg^{2+} \times NO_3^{-} \rightarrow Mg(NO_3)_2$

④ $H_2SO_4 + CaCO_3 \longrightarrow CaSO_4 + CO_2 + H_2O$

Method 4 :-

Acid + Metal → Salt + H_2



① $H_2SO_4 + Cu \rightarrow$ No reaction

② $HCl + Ag \rightarrow$ No reaction

③ $H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$

≈ Acid Salt ≈

Salts → Not All H^+ ions → replaced.

1) Monobasic acids ⇸ No Acid Salt

2) Dibasic acids → Two Acid Salts.

$$\underline{\underline{H_2}}SO_4 + \underline{\underline{Na}}OH \longrightarrow NaHSO_4 + H_2O$$

(Acid Salt)

$H_2SO_4 \longrightarrow NaHSO_4$ (Sodium Hydrogen sulfate)

$\longrightarrow Na_2SO_4$

$$H_3PO_4 + NaOH \longrightarrow NaH_2PO_4 + H_2O$$

$$H_3PO_4 + 2NaOH \longrightarrow Na_2HPO_4 + H_2O$$

$$H_3PO_4 + 3NaOH \longrightarrow Na_3PO_4 + H_2O$$

$H_3PO_4 \longrightarrow NaH_2PO_4$ (Sodium hydrogen Phosphate)

$\longrightarrow Na_2HPO_4$ (Disodium hydrogen Phosphate)

$\longrightarrow Na_3PO_4$ (Tri-Sodium Phosphate)

≈ Oxides ≈

Binary Compounds of Oxygen.

4 types of Oxides :-

① Acidic Oxides :

Oxides → Acidic Solution

① $CO_2 + H_2O \longrightarrow H_2CO_3$ ⇒ Carbonic Acid

② $SO_2 + H_2O \longrightarrow H_2SO_3$ ⇒ Sulfurous Acid

③ $SO_3 + H_2O \longrightarrow H_2SO_4$ ⇒ Sulfuric Acid

★ One less oxygen ⇒ ic → ous

④ $2NO_2 + H_2O \longrightarrow \underset{\text{Nitric Acid}}{HNO_3} + \underset{\text{Nitrous Acid}}{HNO_2}$

★ All non metal oxides → Acidic

Cl_2O_7 → Acidic oxide (Chemical Property) (Covalent compound)

→ M.P / B.P = Low (Physical Property)

② Basic Oxides

Oxides → Neutralize Acids

① $Na_2O + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

② $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

FeO
- → Ionic compound (C.C.P)
- → M.P / B.P high (P.P)

★ All metal oxides → Basic

③ Amphoteric Oxides ③

Oxide → Both Acid & Alkali

① $\underset{\text{Base}}{ZnO} + \underset{\text{Acid}}{HCl} \rightarrow \underset{\text{Salt}}{ZnCl_2} + \underset{\text{water}}{H_2O}$

② $\underset{\text{Acid}}{ZnO} + \underset{\text{Alkali}}{NaOH} \rightarrow \underset{\text{Salt}}{Na_2ZnO_2} + \underset{\text{water}}{H_2O}$

List of Amphoteric Oxides :-

① Zinc — (ZnO)
② Aluminium — (Al_2O_3)
③ Lead — (PbO)

③ $\underset{\text{Acid}}{Al_2O_3} + \underset{\text{Alkali}}{2NaOH} \rightarrow \underset{\text{Salt}}{2NaAlO_2} + \underset{\text{water}}{H_2O}$

④ Nuetral Oxides ④

Oxides → no reaction

CO, H_2O, NO, etc

23) Oxides of the elements may be classified as acidic, basic or amphoteric. Which set of oxides is correctly classified?

	Acidic	Basic	Amphoteric
A	Carbon dioxide	Copper (II) oxide	Zinc oxide
X B	Carbon dioxide	Zinc oxide	Copper (II) oxide
C	Copper (II) oxide	Carbon dioxide	Zinc oxide
X D	Zinc oxide	Carbon dioxide	Copper (II) oxide

Acidic Oxides → Non metals

Basic Oxides → Metals

Amphoteric Oxides → Zn, Pb, Al

Why A?

CO_2 → Acidic Oxide → Non metal

Zn → Amphoteric → Fact

≈ Ionic Equations ≈

a) Common Ions in both equations → Spectator Ions!

b) Spectator Ions → removed from Molecular equation gives you Ionic Equation!

c) Do not break H_2O, CO_2, Elements and Solids

I) Acid + Alkali ⟶ Salt + Water

✓ $HCl + NaOH \longrightarrow NaCl + H_2O$

H^+ $\cancel{Cl^-}$ $\cancel{Na^+}$ OH^- $\cancel{Na^+}$ $\cancel{Cl^-}$ H_2O

$$H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$$

✓ $H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$

H^+ $\cancel{SO_4^{2-}}$ $\cancel{K^+}$ OH^- $\cancel{K^+}$ $\cancel{SO_4^{2-}}$ H_2O

$$H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$$

↓

If acid reacts with Alkali, this Ionic Equation will always be formed!

II) Acid + Carbonate → Salt + Water + CO_2

i) Soluble Carbonate :-

✓ $2HCl_{(aq)} + Na_2CO_{3(aq)} \rightarrow 2NaCl_{(aq)} + H_2O_{(l)} + CO_{2(g)}$

H^+ Cl^- Na^+ CO_3^{2-} Na^+ Cl^- H_2O CO_2

$$2H^+_{(aq)} + CO_3^{2-}{}_{(aq)} \longrightarrow H_2O_{(l)} + CO_{2(g)}$$

✓ $2HNO_{3(aq)} + K_2CO_{3(aq)} \rightarrow 2KNO_{3(aq)} + H_2O_{(l)} + CO_{2(g)}$

H^+ NO_3^- K^+ CO_3^{2-} K^+ NO_3^- H_2O CO_2

$$2H^+_{(aq)} + CO_3^{2-}{}_{(aq)} \longrightarrow H_2O_{(l)} + CO_{2(g)}$$

↓

If acid reacts with soluble carbonates
This Ionic Equation will always be formed !

ii) Insoluble Carbonate :-

✓ $2HCl_{(aq)} + CaCO_{3(s)} \longrightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$

H^+ Cl^- $CaCO_3$ Ca^+ Cl^- H_2O CO_2

$$2H^+_{(aq)} + CaCO_{3(s)} \longrightarrow Ca^{2+}_{(aq)} + H_2O_{(l)} + CO_{2(g)}$$

✓ $2HNO_{3(aq)} + MgCO_{3(s)} \longrightarrow Mg(NO_3)_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

H^+ NO_3^- $MgCO_3$ Mg^+ NO_3^- CO_2 H_2O

$$2H^+_{(aq)} + MgCO_{3(s)} \longrightarrow Mg^+_{(aq)} + CO_{2(g)} + H_2O_{(l)}$$

III) Acid + Metal ⟶ Salt + H_2

✓ $2HCl_{(aq)} + Mg_{(s)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$

H^+ Cl^- Mg Mg^+ Cl^- H_2

$$2H^+_{(aq)} + Mg_{(s)} \longrightarrow Mg^+_{(aq)} + H_{2(g)}$$

✓ $H_2SO_4 + Ca \longrightarrow CaSO_4 + H_2$

H^+ SO_4^- Ca Ca^+ SO_4^{2-} H_2

$$H^+_{(aq)} + Ca_{(s)} \longrightarrow Ca^+_{(aq)} + H_{2(g)}$$

Insoluble (s)

Soluble (aq)

Soluble & Insoluble Substances!

→ All Group 1 and NH_4^+ compounds are water soluble

→ All Nitrates (NO_3^-) are water Soluble

→ All Carbonates are water Insoluble except Group I and Ammonium (NH_4^+)

→ All Lead compounds are water Insoluble except Lead (II) Nitrate [$Pb(NO_3)_2$]

→ All Halides (Cl^-, Br^-, I^-) are water soluble except Silver and Lead

★→ All Sulfates are water soluble except Lead (Pb) and Group II (From Ca to downward)

★→ All Hydroxides are water insoluble except Group I, NH_4^+ and Group II (Ca to downward)

A Few examples ↴

$NaCl$

↳ All Grp I soluble

$CaCl_2$

↳ Halide Soluble

K_2OH

↳ Grp I soluble

$BaSO_4$

Ba: II ↳ Sulfate insoluble if Grp II

$Fe(NO_3)_2$

↳ All nitrates soluble

$AgBr$

↳ Halides insoluble with Sliver (Ag)

$Be(OH)_2$ ✗
$Mg(OH)_2$ ✗
$Ca(OH)_2$
$Sr(OH)_2$
$Ba(OH)_2$

Least Soluble ↑ Solubility in water increases ↓ Most Soluble

↳ Most Soluble

$BeSO_4$ ✓
$MgSO_4$ ✓
$CaSO_4$
$SrSO_4$
$BaSO_4$

Most Soluble ↑ Solubility in water decreases ↓ Least soluble

↳ Least soluble

≈ Precipitation ≈

Two Solutions mixed → Insoluble substance ↓ Precipitate

$$NaCl_{(aq)} + AgNO_{3(aq)} \xrightarrow{\text{Precipitation}} \underbrace{AgCl_{(s)}}_{\text{Precipitate}} + NaNO_{3(aq)}$$

$$\cancel{Na^+} \quad Cl^- \quad Ag^+ \quad \cancel{NO_3^-} \qquad AgCl + \cancel{Na^+} \quad \cancel{NO_3^-}$$

$$Cl^-_{(aq)} + Ag^+_{(aq)} \longrightarrow AgCl_{(s)}$$

$$3\,NaOH_{(aq)} + Fe(NO_3)_{3(aq)} \longrightarrow \underbrace{Fe(OH)_3}_{\downarrow}{}_{(s)} + 3\,NaNO_{3(aq)}$$

$$\cancel{Na^+} \quad OH^- \quad Fe^{3+} \quad \cancel{NO_3^-} \qquad Fe(OH)_3 \quad \cancel{Na^+} \quad \cancel{NO_3^-}$$

$$3\,OH^-_{(aq)} + Fe^{3+}_{(aq)} \longrightarrow Fe(OH)_{3(s)}$$

≈ Test For Ions ≈

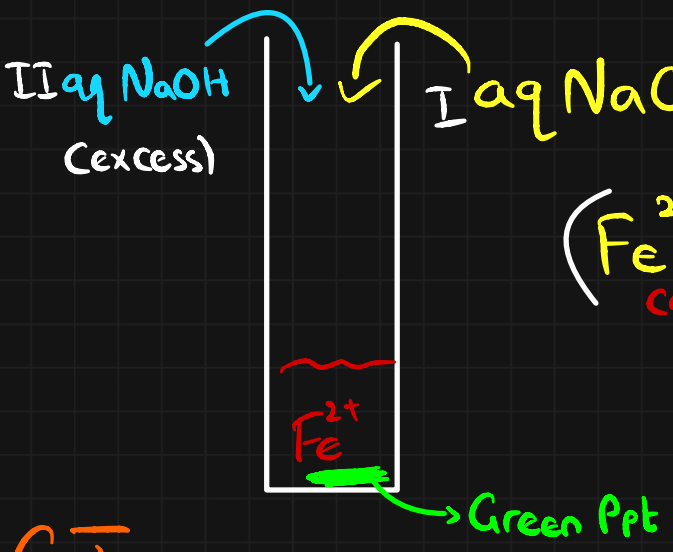
Identification of Ions with help of Precipitation !

Two reagents → Aq NH_3 & Aq NaOH

II aq NaOH (excess)

I aq NaOH Few drops

$Fe^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow \underline{Fe(OH)_2}_{(s)}$ ppt



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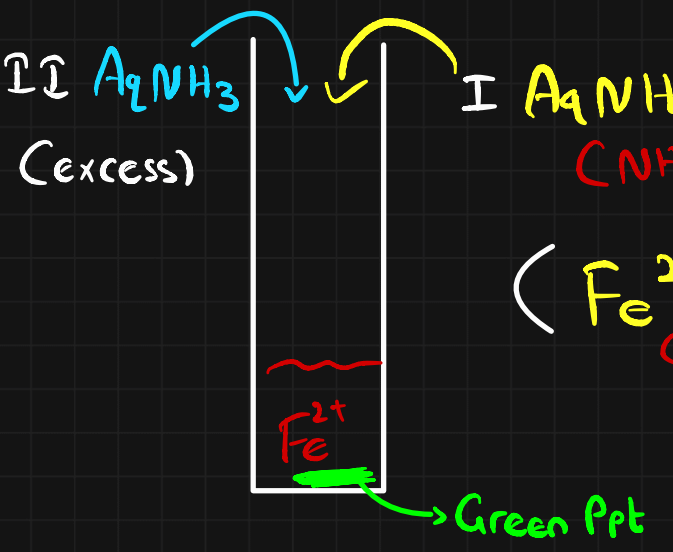
II Aq NH_3 (excess)

I Aq NH_3 Few drops (NH_4OH)

$Fe^{2+}_{(aq)} + OH^-_{(aq)} \rightarrow \underline{Fe(OH)_2}_{(s)}$



Ions	aq NaOH (few drops)	aq NaOH (excess)	aq NH_3 (few drops)	aq NH_3 (excess)	Ionic Equation
Fe^{2+}	Green Ppt	Ppt insoluble	Green Ppt	Ppt insoluble	$Fe^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Fe(OH)_{2(s)}$
Fe^{3+}	Red-Brown Ppt	Ppt insoluble	Red-Brown Ppt	Ppt insoluble	$Fe^{3+}_{(aq)} + 3OH^-_{(aq)} \rightarrow Fe(OH)_{3(s)}$
Cu^{2+}	Blue Ppt	Ppt insoluble	Blue Ppt	Ppt soluble giving dark blue solution	$Cu^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Cu(OH)_{2(s)}$
Cr^{3+}	Green Ppt	Ppt soluble giving dark blue solution	Grey-Green ppt	Ppt insoluble	$Cr^{3+}_{(aq)} + 3OH^-_{(aq)} \rightarrow Cr(OH)_{3(s)}$
Zn^{2+}	White Ppt	Ppt soluble giving Colorless solution	White Ppt	Ppt soluble giving Colorless solution	$Zn^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Zn(OH)_{2(s)}$
Al^{3+}	White Ppt	Ppt soluble giving Colorless solution	White Ppt	Ppt insoluble	$Al^{3+}_{(aq)} + 3OH^-_{(aq)} \rightarrow Al(OH)_{3(s)}$
Ca^{2+}	White Ppt	Ppt insoluble	No Ppt!	No Ppt!	$Ca^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Ca(OH)_{2(s)}$

≈ Test for Anions ≈

Cl^- → Chloride !

i) Acidify with dil nitric acid (HNO_3)

ii) Add aqueous sliver nitrate ($AgNO_3$

White Ppt ≈ $Cl^-_{(aq)} + Ag^+_{(aq)} \rightarrow AgCl_{(s)}$

Br^- → Bromide !

i) Acidify with HNO_3

ii) Add Aq $AgNO_3$

Cream Ppt ≈ $Br^-_{(aq)} + Ag^+_{(aq)} \rightarrow AgBr_{(s)}$

I^- → Iodide !

i) Acidify with HNO_3

ii) Add Aq $AgNO_3$ / Lead Nitrate ($PbNO_3$)

Yellow Ppt ≈ $I^-_{(aq)} + Ag^+_{(aq)} \rightarrow AgI_{(s)}$ OR

$2I^-_{(aq)} + Pb^{2+}_{(aq)} \rightarrow PbI_{2(s)}$

CO_3^{2-} → Carbonate !

Add dil HCl

effervescenses ≈ bubbles of colorless gas

$$2H^+_{(aq)} + CO_3^-{}_{(aq)} \rightarrow H_2O_{(l)} + CO_{2(g)}$$

SO_4^{2-} → Sulfate !

Acidify with dil HNO_3

add Barium Chloride ($BaCl_3$)

White Ppt → Add dil HCl → Ppt insoluble

$$Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)}$$

SO_3^{2-} → Sulfite !

Acidify with dil HNO_3 & add $BaCl_3$

White Ppt → Add dil HCl

Ppt soluble giving colorless Gas which turns

$K_2Cr_2O_7$:- Orange to Green

$KMnO_4$:- Purple to Colorless

$$Ba^{2+}_{(aq)} + SO_3^{2-}{}_{(aq)} \rightarrow BaSO_{3(s)}$$

NH_4^+ Ammonium!

Add NaOH then heat the solution

Colorless gas, turns moist red litmus Blue!

$$NH^{4+}_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)} + NH_{3(g)}$$

NO_3^- Nitrate!

Add aq NaOH & Aluminium foil, then HEAT!

Colorless gas evolved, turns moist Red litmus Blue!

Test for Gases

Gas	Test	Observation
H_2	Burning Splint	Burns with "Pop" Sound
O_2	Glowing Splint	Relights Glowing Splint
CO_2	Pass through Lime water	turns milky / Cloudy
NH_3	Damp/moist Red Litmus Paper	Turns Blue
Cl_2	Damp/moist Blue Litmus Paper	Turns red then Bleaches
SO_2	Pass through acidified $K_2Cr_2O_7$ or $KMnO_4$	Orange to Green Purple to Colorless

Acid Bases Salts :- Keypoints ! ①

- H_2, O_2 → Neutral Gas
- NH_3 ⟶ Alkaline Gas
- CO_2, SO_2, Cl_2 → Acidic Gas

✡ H_2 ≈ Insoluble in water

- O_2, CO_2 ≈ Slightly soluble in water
- Cl_2 ≈ Moderately soluble in water
- NH_3, SO_2 ≈ Soluble in water

✡ H_2 ≈ Burns !

- O_2 ≈ Helps in Burns !
- CO_2 ≈ Extinguishes !

✡ Lime ≈ CaO

- Limestone ≈ $CaCO_3$
- Lime water ≈ $Ca(OH)_2$

Acid Bases Salts :- Keypoints ! (2)

☆ Cl_2 ≈ o) Disinfectant
o) Bleaching Agent

☆ SO_2 ≈ o) Reducing Agent
o) In Paper Industry as Bleaching agent
o) Food Preservatives

☆ PH ≈ depends on 2 ions only

H^+ → Acidity

OH^- → Alkalinity

☆ CaO and $Ca(OH)_2$ used to reduce acidity of Soil !