CHAPTER 4
EQUATIONS FOR CHEMICAL REACTIONS

11C UNDARGA

EQUATIONS FOR CHEMICAL REACTIONS

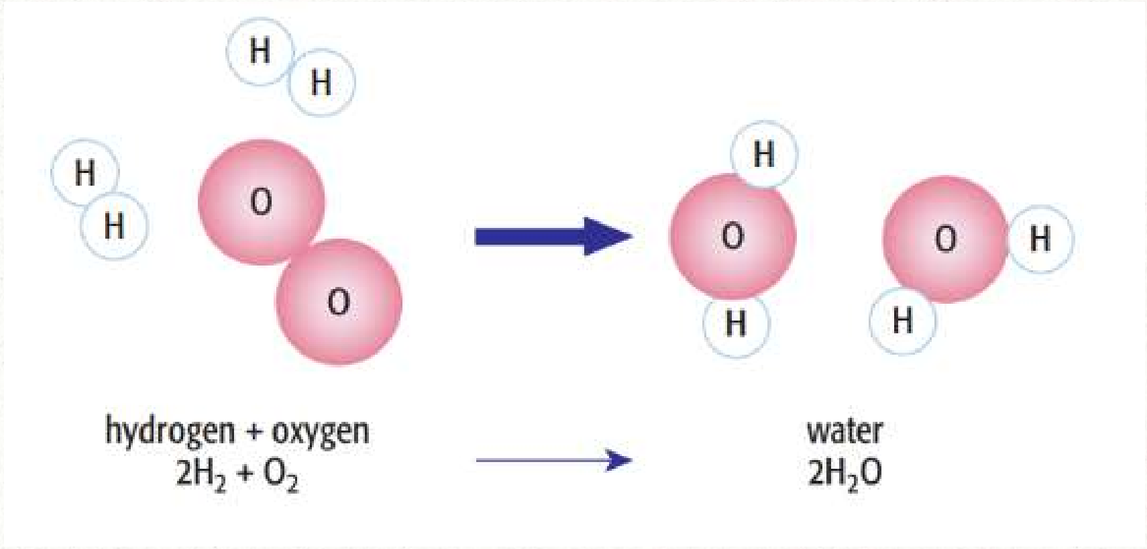
WORD EQUATION: EQUATION LINKS TOGETHER THE NAMES OF THE SUBSTANCES THAT REACT (THE REACTANTS) WITH THOSE OF THE NEW SUBSTANCES FORMED (THE PRODUCTS).

MAGNESIUM + OXYGEN → MAGNESIUM OXIDE

(REACTANT) (PRODUCT)

SYMBOL EQUATIONS: EQUATIONS THAT USING CHEMICAL FORMULAE.

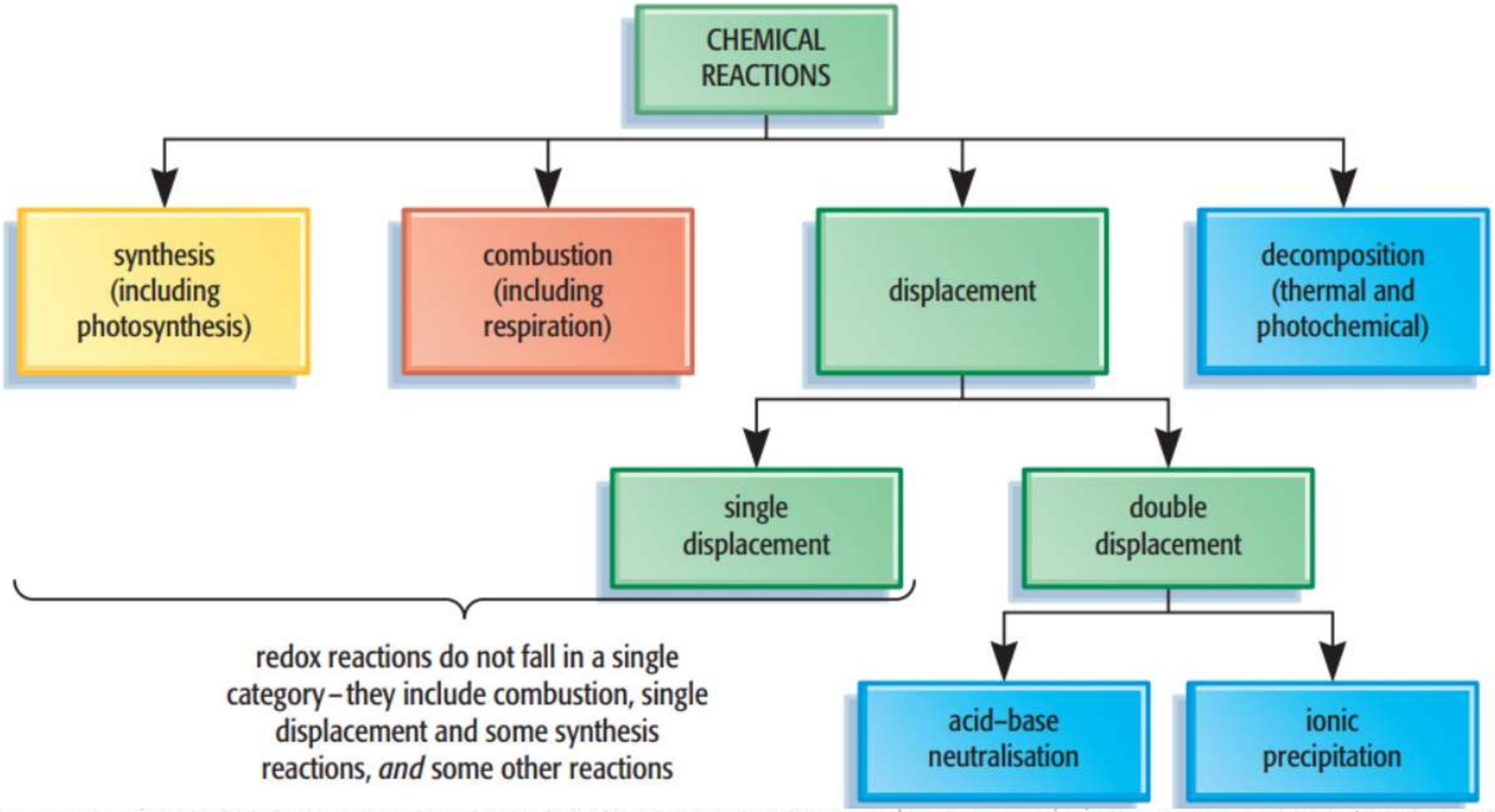
FOR EXAMPLE, HYDROGEN REACTS WITH OXYGEN PRODUCES WATER.



TYPES OF REACTIONS

EXOTHERMIC: RELEASES HEAT TO SURROUNDINGS DURING REACTION OCCURS

ENDOTHERMIC: ADSORBS HEAT FROM SURROUNDINGS DURING REACTION OCCURS



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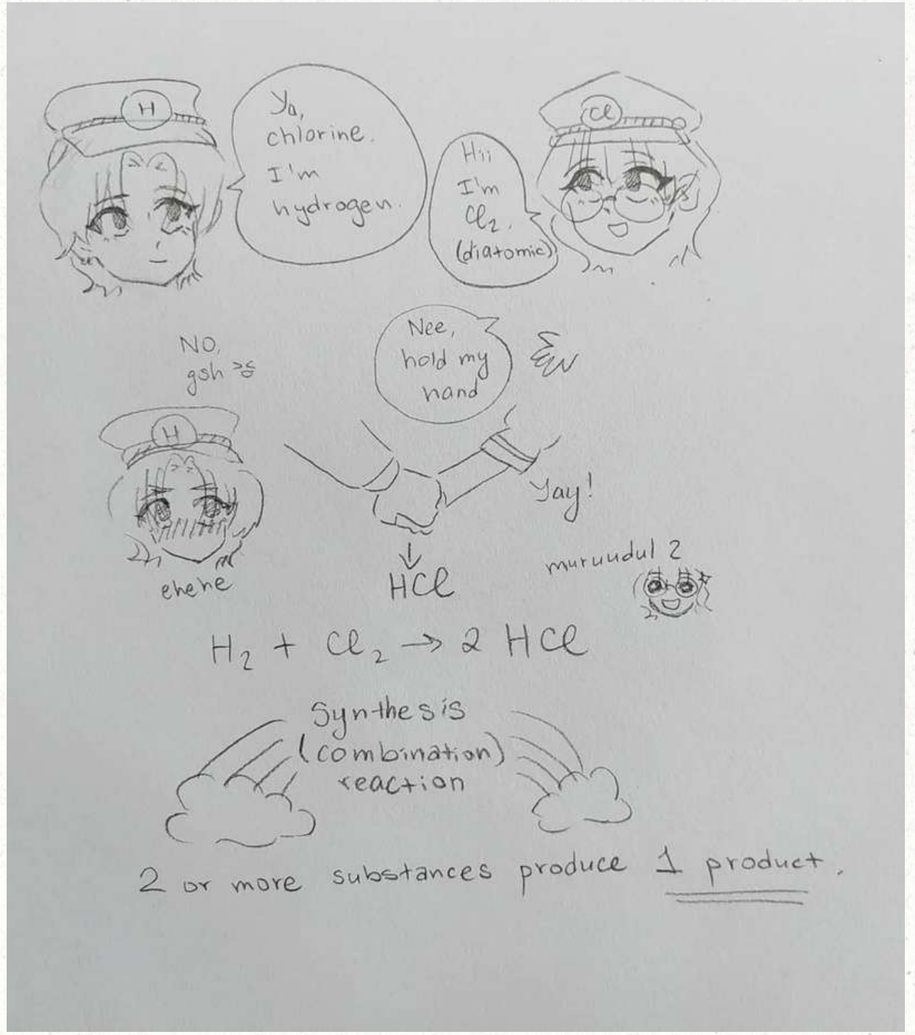

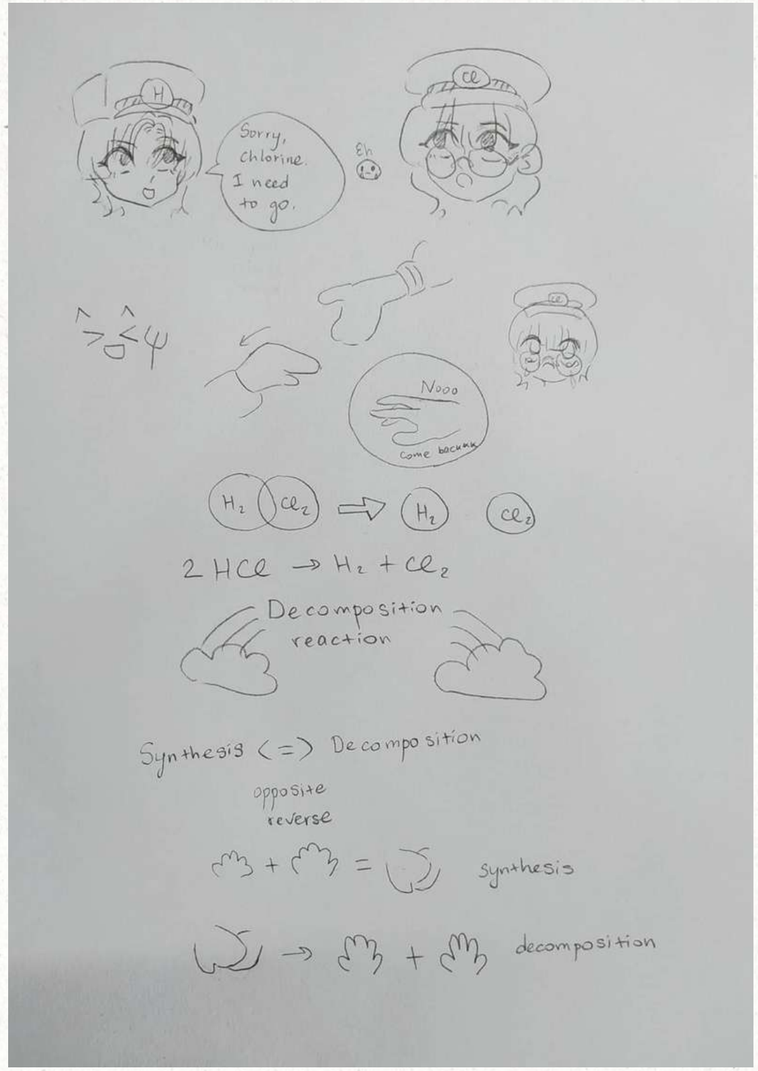

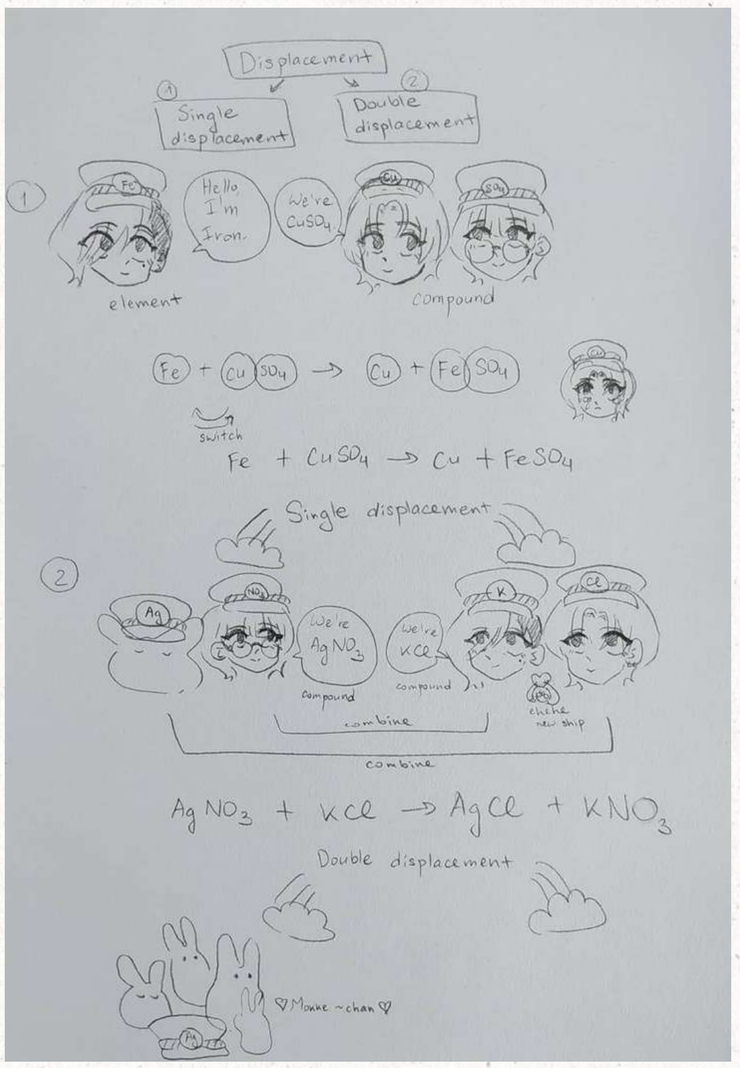

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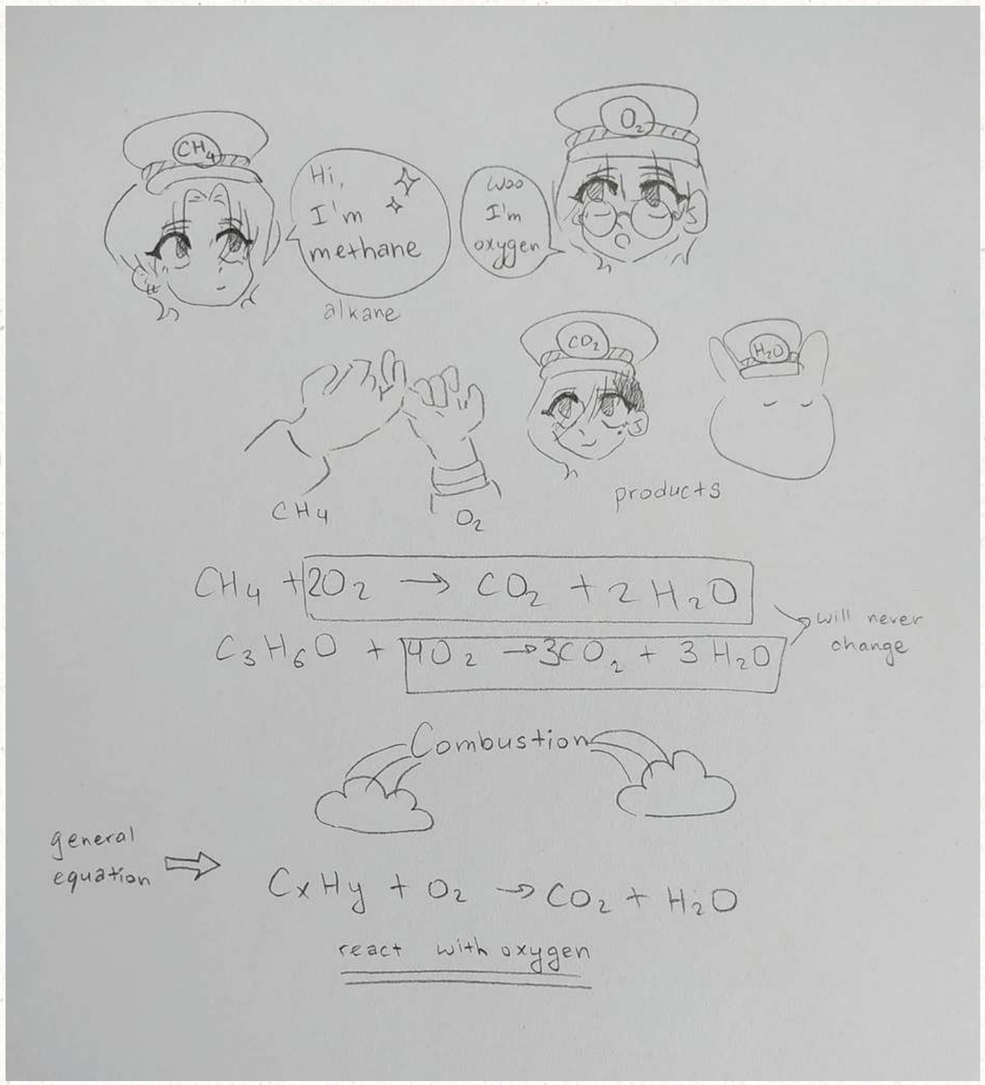
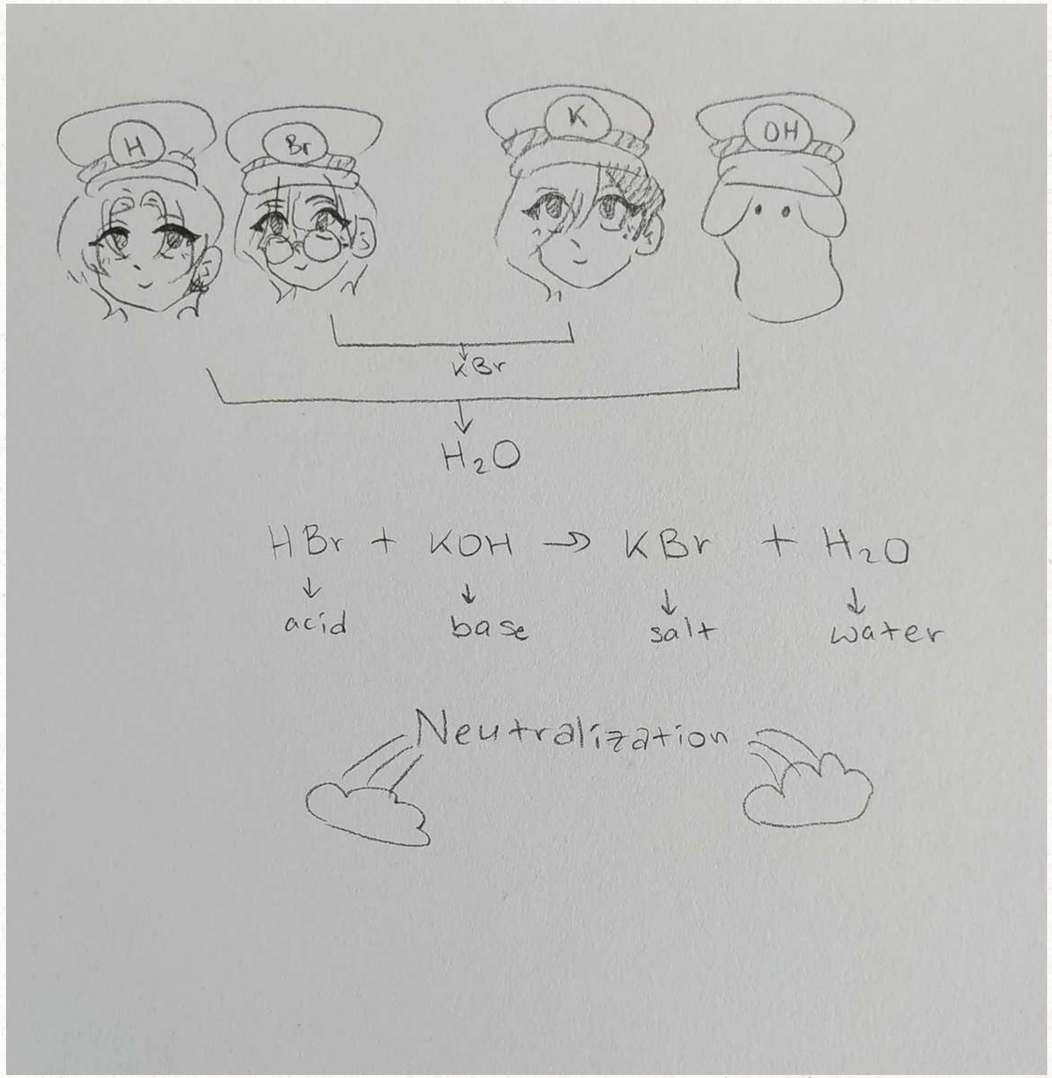
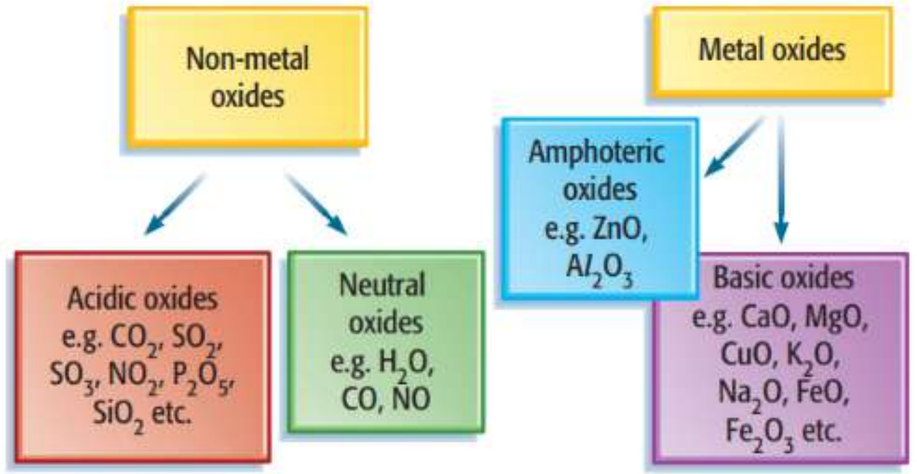




TYPES OF OXIDES

The characteristic of oxides:

- Non-metals generally form **acidic oxides** that dissolve in water to form acidic solutions.
- Metals form oxides that are solids. If they dissolve in water, these oxides give alkaline solutions. Th ese metal oxides neutralise acids and are **basic oxides**
- **Neutral oxides** do not react with either acids or alkalis.



PREPARATION OF SALTS

SALT: FORMED FROM AN ACID BY THE REPLACEMENT OF THE HYDROGEN IN THE ACID BY A METAL. (IONIC)

Salts	Soluble	Insoluble
sodium salts (Na^+)	all are soluble	none
potassium salts(K^+)	all are soluble	none
ammonium salts(NH^+)	all are soluble	none
nitrates(NO_3^-)	all are soluble	none
ethanoates(CH_3COO^-)	all are soluble	none
chlorides(Cl^-)	most are soluble	silver chloride, lead(II) chloride
sulfates(SO_4^{2-})	most are soluble	barium sulfate, lead(II) sulfate, calcium sulfate
carbonates(CO_3^{2-})	sodium, potassium and ammonium carbonates	most are insoluble

ALL CARBONATES WILL REACT WITH ACIDS TO GIVE OFF CARBON DIOXIDE.

STRONG AND WEAK ACIDS AND ALKALIS

ACIDS IN SOLUTION ARE A SOURCE OF HYDROGEN IONS, H^+. THE HYDROGEN IONS ARE PRODUCED WHEN THE ACID DISSOCIATES OR BREAKS DOWN TO FORM IONS.

STRONG ACIDS COMPLETELY DISSOCIATE INTO IONS IN SOLUTION. FOR EXAMPLE, HYDROCHLORIC ACID IS A STRONG ACID. IT IONISES COMPLETELY TO FORM HYDROGEN IONS AND CHLORIDE IONS:

$$HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$$

NITRIC ACID AND SULFURIC ACID ARE ALSO STRONG ACIDS.

WEAK ACIDS ONLY PARTIALLY DISSOCIATE IN SOLUTION. FOR EXAMPLE, ETHANOIC ACID IS A WEAK ACID. IT IS ONLY PARTIALLY IONISED TO FORM HYDROGEN IONS AND ETHANOATE IONS:

$$CH_3COOH(aq) \rightleftharpoons H^+(aq) + CH_3COO^-(aq)$$

THE $\rightleftharpoons$ SYMBOL IS USED IN THE EQUATION TO SHOW THAT THE REACTION IS A REVERSIBLE REACTION AND DOES NOT GO TO COMPLETION.

ACID- A MOLECULE OR ION THAT IS ABLE TO **DONATE A PROTON** (H^+ ION) TO A BASE.

PH AND HYDROGEN ION CONCENTRATION
THE PH OF A SOLUTION IS A MEASURE OF ITS CONCENTRATION OF HYDROGEN IONS:

THE HIGHER THE CONCENTRATION OF H^+ IONS IN AN ACIDIC SOLUTION, THE LOWER THE PH
THE LOWER THE CONCENTRATION OF H^+ IONS IN AN ACIDIC SOLUTION, THE HIGHER THE PH
THIS MEANS THAT, FOR A GIVEN CONCENTRATION IN AQUEOUS SOLUTION, THE STRONGER AN ACID, THE LOWER THE PH.

STRONG AND WEAK ACIDS AND ALKALIS

STRONG ALKALIS COMPLETELY IONISE IN WATER. THEY BREAK UP COMPLETELY TO PRODUCE A HIGH CONCENTRATION OF HYDROXIDE IONS IN THE SOLUTION.

FOR EXAMPLE, SODIUM HYDROXIDE IONISES COMPLETELY INTO SODIUM AND HYDROXIDE IONS:

$$NAOH(AQ) \rightarrow NA^{+}(AQ) + OH^{-}(AQ)$$

STRONG ALKALIS INCLUDE: SODIUM HYDROXIDE , POTASSIUM HYDROXIDE

WEAK ALKALIS ONLY PARTIALLY IONISE IN WATER. FOR EXAMPLE, AMMONIA IS A WEAK ALKALI BECAUSE IT IS ONLY PARTIALLY DISSOCIATED INTO IONS:

$$NH_3(AQ) + H_2O(L) \rightleftharpoons NH_4^{+}(AQ) + OH^{-}(AQ)$$

THE 'REVERSIBLE ARROW' ($\rightleftharpoons$) INDICATES A REVERSIBLE REACTION.