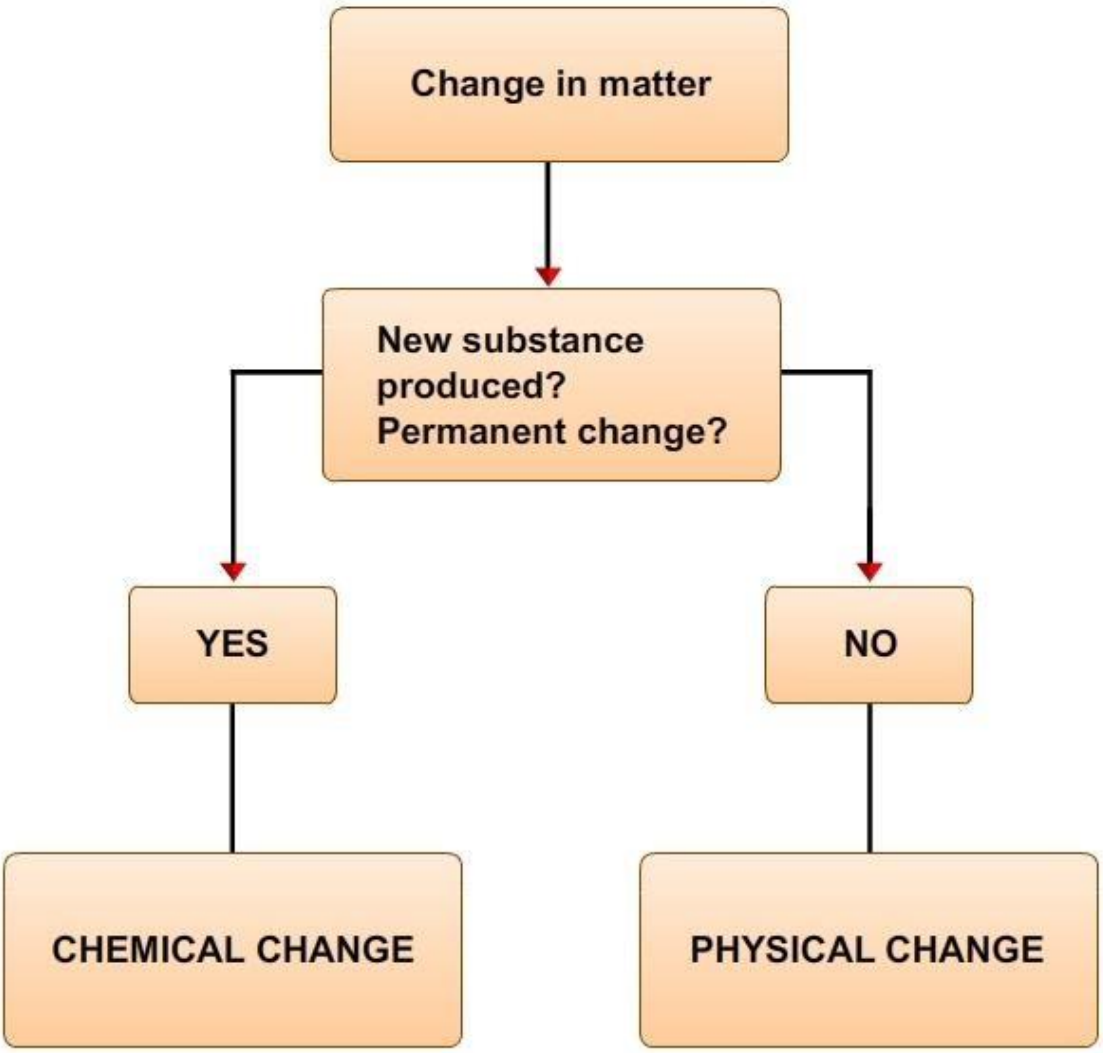
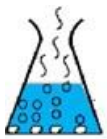
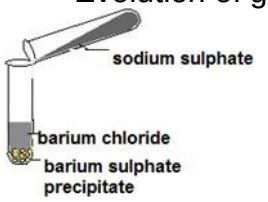
ICSE CLASS 8 LESSON 3
TRANSFORMATION OF SUBSTANCES



Characteristics of chemical reactions

- Evolution of gas

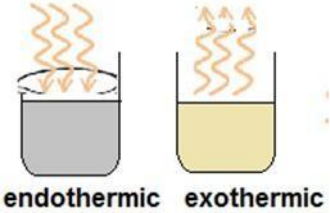




- Formation of precipitate

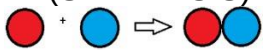
- Change of colour

- Change in energy



Types of Chemical reactions

- COMBINATION REACTIONS (SYNTHESIS)

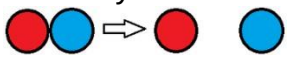


A + B → AB

E.g. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3$

$N_2 + 3H_2 \rightarrow 2NH_3$

- DECOMPOSITION REACTIONS
- Three types: thermal, electrical, photochemical
- Always endothermic

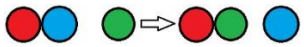


AB → A+ B

E.g. $CaCO_3 \rightarrow CaO + CO_2$

- DISPLACEMENT REACTIONS

A + BC → AC + B



- Depends on Activity series. Higher up metal displaces lower metal

E.g. $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

- DOUBLE DISPLACEMENT
- Neutralization or precipitation

AB + CD→ AD + BC

e.g. $NaOH + HCl \rightarrow NaCl + H_2O$

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

Electrolysis

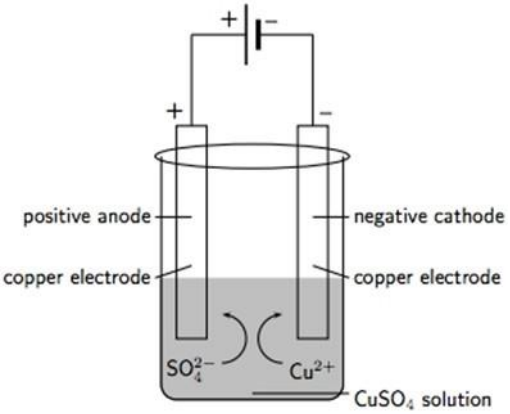
Electrolysis of copper sulphate solution

Copper electrodes

Positive, anode, oxidation: No product- anode keeps dissolving as more Cu^{2+} ions are formed

Negative, cathode, reduction: copper

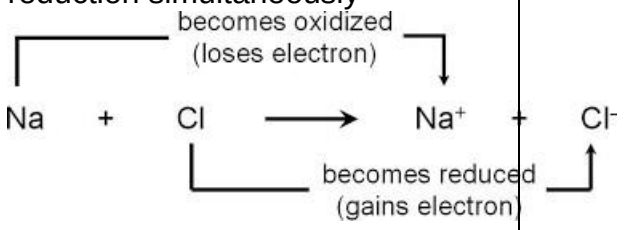
$Cu^{2+} + 2e^- \rightarrow Cu$

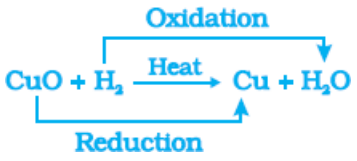


Redox reactions

Oxidation	Reduction
Addition of oxygen, loss of hydrogen	Addition of hydrogen, loss of oxygen
Loss of electrons	Gain in electrons
Oxidizing agent gets reduced	Reducing agent gets oxidised
$C + O_2 \rightarrow CO_2$	$CH_3CHO \rightarrow CH_3CH_2OH$
OIL (OXIDATION IS LOSS)	RIG (REDUCTION IS GAIN)

Redox involves oxidation and reduction simultaneously





Electroplating, electrometallurgy and electro refining are important applications of electrolysis

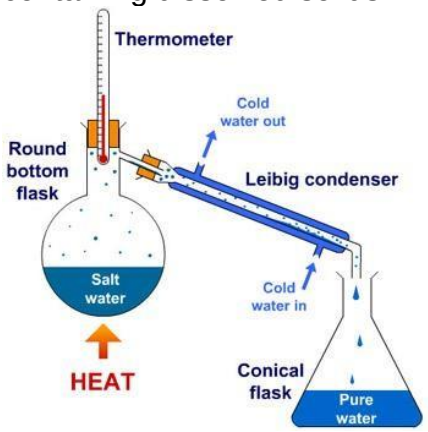
2 important definitions that characterize pure substances

- Boiling point: temperature at which liquid changes to vapour state under normal atmospheric pressure
- Melting point: temperature at which solid changes into liquid at normal atmospheric pressure

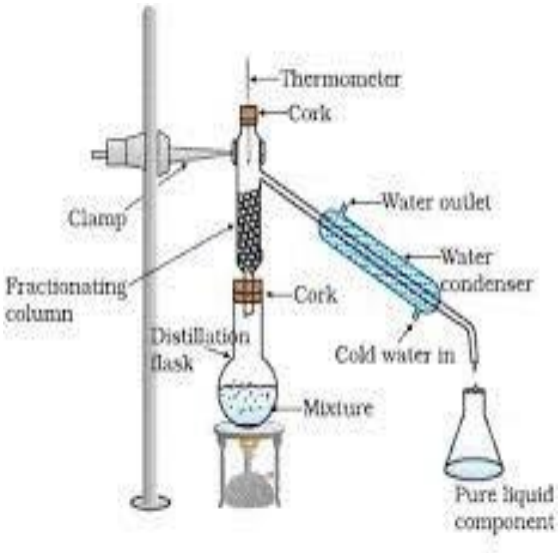
- Impurities cause increase in boiling point and decrease in melting point

Distillation

Distillation: purification of water containing dissolved solids



- Fractional distillation: separating 2 liquids with different boiling points e.g. benzene; toluene



Chemical Equations and calculations based on them

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Reactants undergo chemical reaction→ Products

Reaction is given in the form of an equation. This equation needs to be balanced

Count the number of atoms of each element on both sides of the equation

Multiply both sides with appropriate numerals to ensure that the number of atoms of each element is the same on both sides. Always add numbers as a prefix, never change the formula of the compound

Example 1

Calculate the molecular mass of $CaCO_3$

Atomic mass of Calcium=40; C=12; O=16

Molecular mass= 40 + 12 + (3 x 16)= 40+12+48= 100u

Example 2

Calculate the amount of CO_2 formed when 8g of methane completely burns in oxygen

$CH_4 + 2O_2 \rightarrow CO_2$

[12+(1 x 4)] + 2(2 x 16) → [12 + (2 x 16)]

16u 64u 44u

$+ 2H_2O$

2[(1 x 2) +16]

36u

Or 16g + 64g → 44g + 36g

16g of methane burns completely to give 44g of carbon dioxide

8g will burn to give 8 x 44/16= 22g

Example 3

What is the loss in mass if 50g of calcium carbonate is heated to give calcium oxide?

$CaCO_3 \rightarrow$ CaO + CO_2

40 + 12 +3 x 16 40 +16 12 + 2 x 16

100 56 44

or 100 g 56 g 44g

when strongly heated, 100g loses 44g of CO_2

so 50g will lose 50 x 44/100= 22g

Loss in mass =22g