

# CHEMICAL REACTIONS AND EQUATIONS

Physical change

↓  
change in shape/size physical properties.

→ process in which the final state of the substance is different from its original state is called change.

→ chemical changes

↓  
change in chemical composition along with shape/size state.

melting of wax

→ burning of candle

\* Burning of candle is both physical and chemical change.

**CHEMICAL EQUATION**: shows a chemical reaction using symbols and formulas to represent the reactants and products involved.

**CHEMICAL REACTION**: a chemical reaction is a process in which substances transform, resulting in the formation of new substances in the formation of new substances with different chemical properties.

Photosynthesis is an endothermic reaction.

\* characteristics of chemical reaction:

1. change in colour.  $\Rightarrow \text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
2. change in temperature  $\Rightarrow \text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{Heat}$
3. change in state  $\Rightarrow \text{H}_2\text{O} + \text{O}_2 \rightarrow \text{H}_2\text{O(l)}$
4. evolution of gas  $\Rightarrow \text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$
5. Formation of precipitate  $\Rightarrow \text{Pb(NO}_3)_2 + \text{KI(aq)} \rightarrow \text{PbI} \downarrow + \text{KNO}_3$

- endothermic: energy is absorbed.
- exothermic: energy is released.

\* Physical and chemical change both can be both reversible and irreversible.



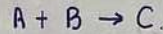
Q. Why chemical equation should be balanced?  
 → so that chemical equation follows law of conservation of mass.

\* **CATALYST**: A substance that increases or decreases the speed of reaction without being involved in the reaction.  
 Eg: Fe.

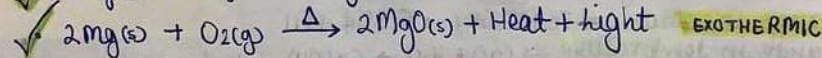
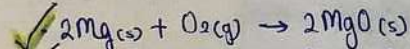
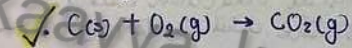
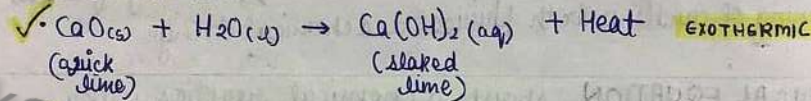
**TYPES OF CHEMICAL REACTION:**

**1- Combination reaction**

A chemical reaction in which 2 or more elements or compounds react to form a single component.

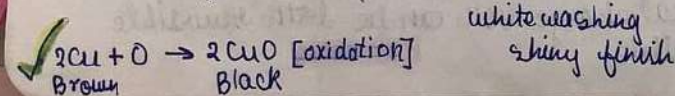
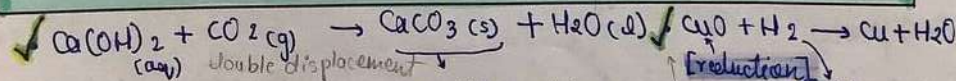


NCERT EXAMPLES:-



\* observation when quick lime is added to water:

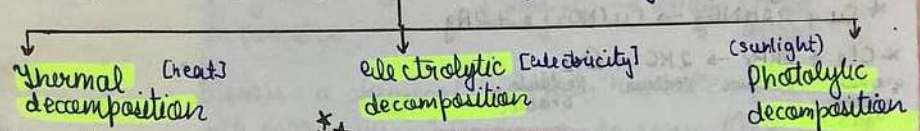
- 1) very fast reaction
- 2) Heat is evolved
- 3) water boils to form steam and produce hissing sound.



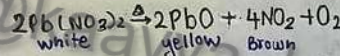
are all combination reaction exothermic? Prove it.  
 $\rightarrow \text{N}_2 + \text{O}_2 \rightarrow 2\text{NO}$  is a combination reaction but an endothermic reaction.

## 2. DECOMPOSITION REACTION $\rightarrow$ endothermic.

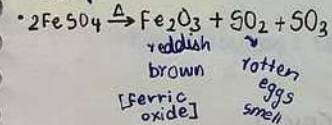
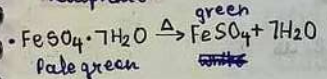
A chemical reaction in which a single compound breaks down into 2 or more elements or compounds where energy is supplied in form of heat, electricity or sunlight.



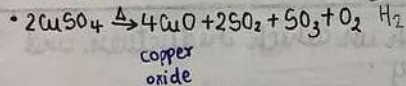
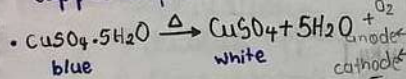
Thermal decomposition  
 1) Thermal analysis of lead nitrate.



2) Thermal analysis of ferrous sulphate.



3) Thermal analysis of hydrated copper sulphate



4) Thermal analysis of calcium carbonate  
 $\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$   
 (quick lime)

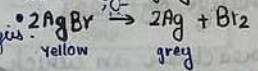
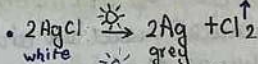
Electrolytic decomposition  
 1) Electrolysis of  $\text{H}_2\text{O}$   
 $2\text{H}_2\text{O}(\text{l}) \xrightarrow{\text{electricity}} 2\text{H}_2 + \text{O}_2$

\* when a substance is decomposed by passing electric current is known as electrolysis.  
 \* Observation:

- i] As current, there is a bubble formation.
- ii] The rate of bubble formation is different.
- iii] it is double at cathode than at anode.



Photolytic decomposition  
 1) Photolysis of silver chloride & silver bromide.



\* silver chloride and silver bromide are used in black and white photography.

**CORROSION:** when a metal is attacked by substances around it such as moisture, acids etc.

\* when iron objects forms a reddish brown powder on it is called rusting.

**RANCIDITY:** when fats & oils are oxidised, they become rancid and their smell & taste change.

- \* How to prevent rancidity:
- i] addition of antioxidants
  - ii] Filling nitrogen gas
  - iii] Refrigeration of food items

CHEM CH 2

CHEM CH 4

BIO CH 6

PHY CH 9

PHY CH 10

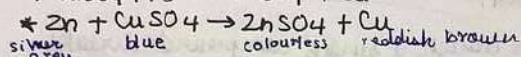
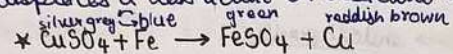
PHY CH 11

PHY CH 12

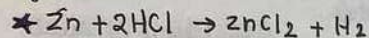
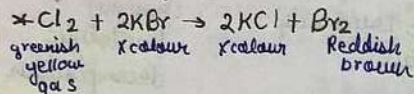


### 3. Displacement reaction

A chemical reaction in which a more active or reactive element displaces a less active or reactive element from its compound.



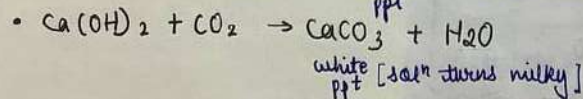
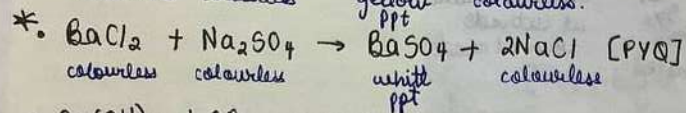
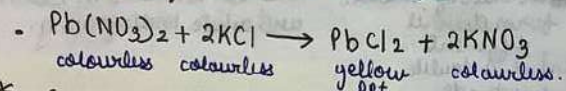
Justie for copper!



### 4. DOUBLE DISPLACEMENT REACTION

A chemical reaction in which there is an exchange of ions.

A reaction in which 2 aqueous solutions combine to form an insoluble substance is called Precipitation reaction.



### Reactivity series

K potassium  
Na sodium  
Ca calcium  
Mg magnesium  
Al aluminium  
Zn zinc  
Fe Ferric  
Pb Plumbic  
H hydrogen  
Cu Copper  
Hg mercury  
Ag silver  
Pd plated  
Au auri  
Pt

**REDOX REACTION:** a chemical reaction in which reduction and oxidation takes place simultaneously.

#### Oxidation:

- addition of  $\text{O}_2$
- removal of  $\text{H}$
- loss of  $e^-$
- reducing agent

#### Reduction:

- addition of  $\text{H}$
- removal of  $\text{O}_2$
- gain of  $e^-$
- oxidizing agent

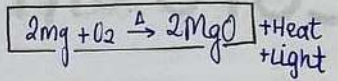


ACTIVITIES

activity 1: to demonstrate burning of Mg ribbon in air.

• observation:

- 1) Dazzling white light
- 2) white powder.

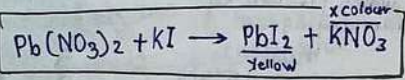


• conclusion: a chemical reaction has taken place in which magnesium & O<sub>2</sub> reacts to form MgO.

Activity 2: to study reaction between lead Nitrate & Potassium iodide.

• observation:

- 1) yellow solid appears (ppt)
- 2) another substance formed as a form of sol<sup>n</sup>.

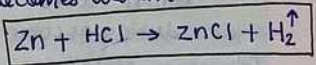


• conclusion: chemical reaction has taken place.

activity 3: to study reaction between zinc & Dil. HCl.

• observation:

- 1) bubbles appear around Zn granules
- 2) flask becomes warm.



• conclusion:

- 1) zinc reacts with HCl to form H<sub>2</sub> gas which appears as bubbles.
- 2) heat is produced.

CHEM CH 2

CHEM CH 4

BIO CH 6

PHY CH 9

PHYSICS CH 10

PHY CH 11

PHY CH 12