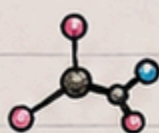


Study
• Understand
• Apply
• Succeed ♥

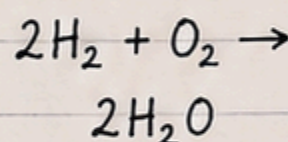
~ Chapter 1 ~



Be curious
Be bright
Be you ♥



Chemical Reactions and Equations

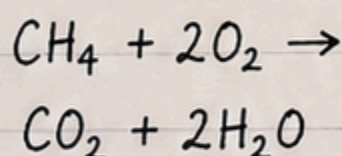
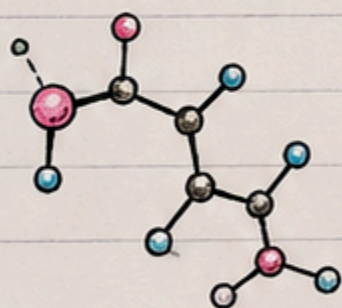


Class 10 Science

Reactants
→ Products
A change,
a discovery! ♥

- Chemical Reactions
- Balanced Equations
- Types of Reactions
- Oxidation & Reduction
- Corrosion & Rancidity

Remember:
Balance isn't
Just in Life,
It's in
Equations too! ♥

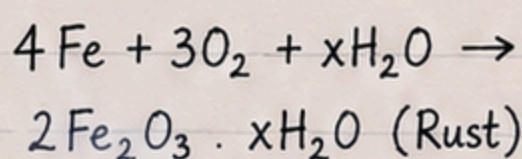


“ Every chemical reaction tells a story of change ✨ ”

Observe
Question
Learn
Repeat

Types of Reactions

- Combination
- Decomposition
- Displacement
- Double Displacement
- Redox Reaction



@DiagramDidi ✨



Introduction to Chemical Reactions



In Daily Life

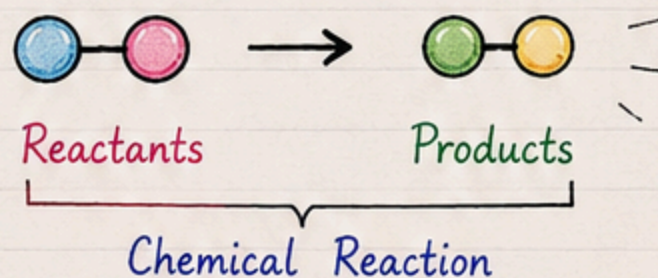
Chemical reactions occur all around us in our daily life.

- Milk left at room temperature → It turns sour due to the formation of lactic acid.
- Rusting of iron → Iron reacts with oxygen and moisture to form rust.
- Fermentation of grapes → Natural sugars in grapes are converted into alcohol.
- Cooking food → Raw food changes in taste, texture and becomes edible.
- Digestion → Complex food is broken down into simpler substances in our body.
- Respiration → Glucose reacts with oxygen in cells to release energy.

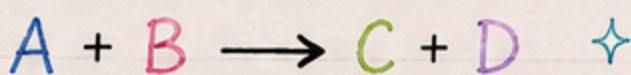
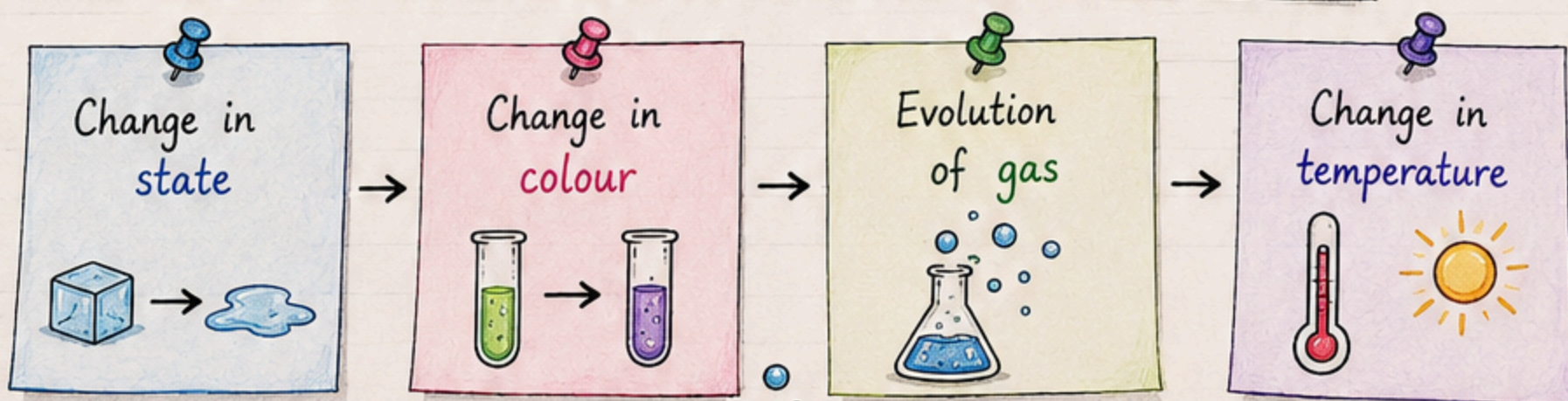


Definition

Chemical reactions involve changes in the nature and identity of one or more substances to form new substances.

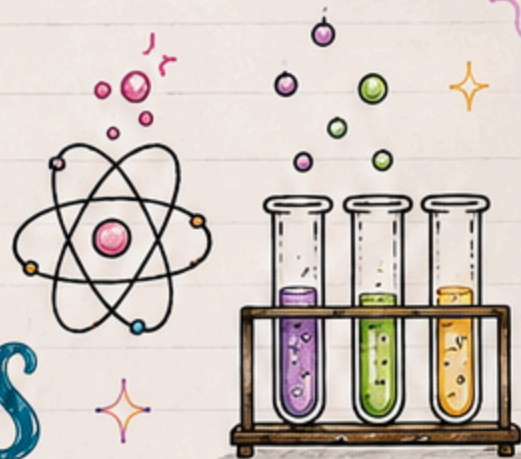


Observations determining a chemical reaction



A chemical equation is a short-hand representation of a chemical reaction. ♥

Chemical Equations



★ Word equation

The burning of magnesium in oxygen to form magnesium oxide.



• Reactants

The substances that take part in a chemical reaction are called reactants.



• Products

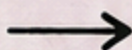
The new substances formed in a chemical reaction are called products.

★ In a chemical equation:

Left Hand Side (LHS)
Contains the reactants.



Separator
(Reacting arrow)

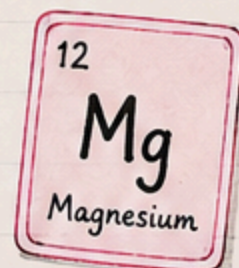
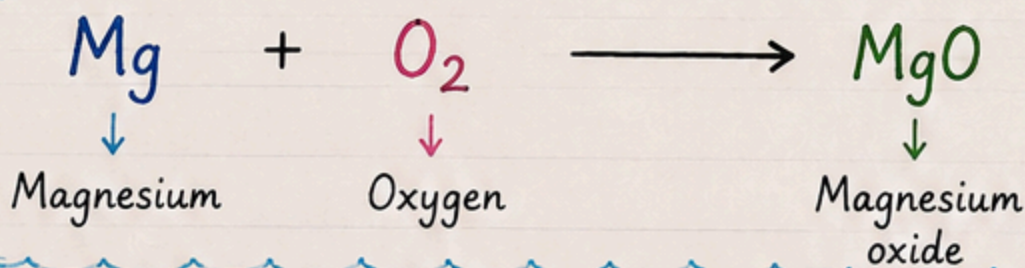


Right Hand Side (RHS)
Contains the products.

Memory Trick

Arrow points towards products 😊

★ Symbolic equation



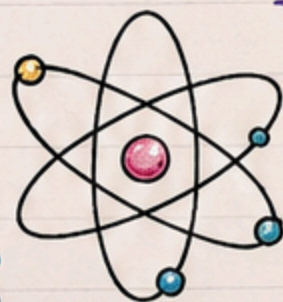
★ Skeletal / Unbalanced Equation

- The above equation is called a skeletal or unbalanced equation.
- It shows the formulas of reactants and products.
- It does not show the actual number of atoms or molecules involved in the reaction.
- It is balanced later to obey the law of conservation of mass.





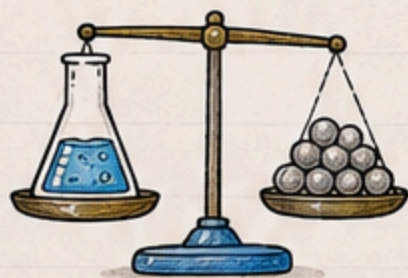
Balanced Chemical Equations



Law of Conservation of Mass

Mass can **neither** be created **nor** destroyed in a chemical reaction.

Nothing is lost,
Nothing is gained,
Everything is transformed.

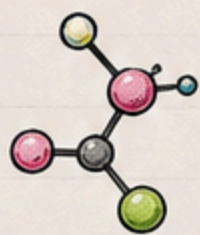


Total mass of
reactants

Chemical
Reaction



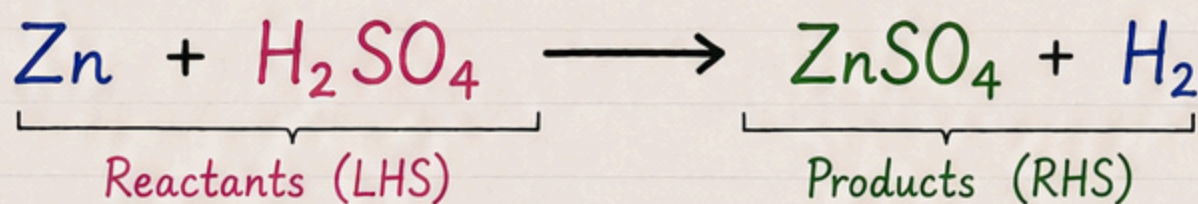
Total mass of
products



Key Idea

In a chemical equation, the **number of atoms** of each element must remain the **same** on both sides.

Example



★ Let's check the number of atoms on both sides:

Element	LHS (Reactants)	RHS (Products)	Equal?
Zn	1	1	✓
H	2	2	✓
S	1	1	✓
O	4	4	✓

Number of atoms is the **same** on both sides.



Balanced Equation

= **Equal** atoms on **both** sides ♥



Trick

Balance one element at a time! ♥

Balancing Chemical Equations



— Hit and Trial Method —

I Step I

Draw boxes around formulas.



II Step II

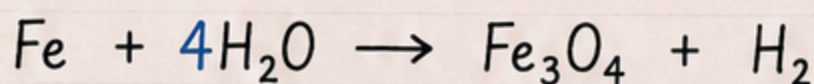
Count atoms on both sides.

Element	Left Hand Side (LHS)	Right Hand Side (RHS)
Fe	1	3
H	2	2
O	1	4

Not balanced! ♥

III Step III

Balance oxygen first.
There are 4 O atoms on RHS, so put 4 before H₂O.

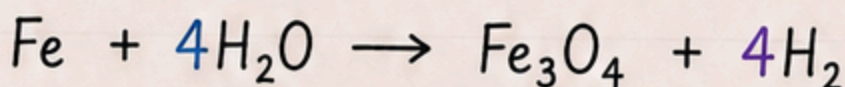


Element	LHS	RHS
Fe	1	3
H	8	2
O	4	4

Oxygen balanced!
Now balance Hydrogen. ♥

IV Step IV

Balance hydrogen next.
There are 8 H atoms on LHS, so put 4 before H₂.

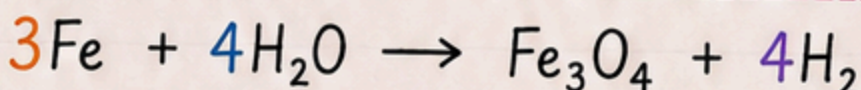


Element	LHS	RHS
Fe	1	3
H	8	8
O	4	4

Hydrogen balanced!
Now balance Iron. ♥

V Step V

Balance iron last.
There are 3 Fe atoms on RHS, so put 3 before Fe.

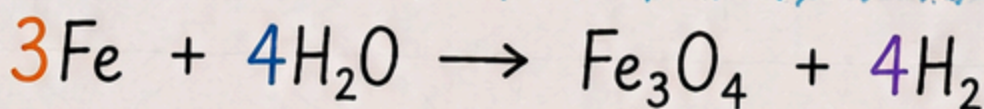


Element	LHS	RHS
Fe	3	3
H	8	8
O	4	4

All atoms are equal!
Balanced Equation. ♥

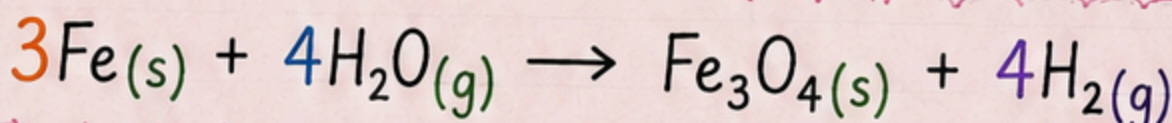
VI Step VI

Final balanced equation.



VII Step VII

Add physical states.



States of matter

(g) = gas

(aq) = aqueous

(l) = liquid

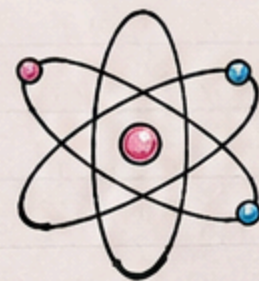
(s) = solid



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Types of Chemical Reactions



Every reaction has a reason and a result! ♥

Quick Trick

C D D D O

Can Do
Double
Displacement
Often!



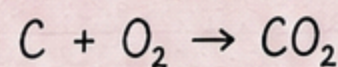
Chemical reactions are of five main types.

1

Combination Reaction

Two or more substances combine to form a single product.

Example:

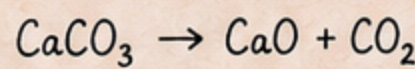


2

Decomposition Reaction

A single compound breaks down into two or more simpler substances.

Example:

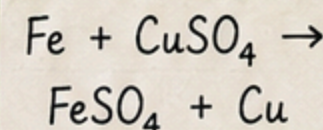


3

Displacement Reaction

A more reactive element displaces a less reactive element from a compound.

Example:

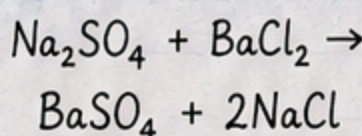


4

Double Displacement Reaction

The ions of two compounds exchange places to form two new compounds.

Example:

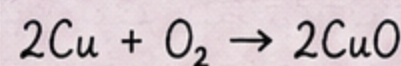


5

Oxidation & Reduction Reaction

A reaction in which oxidation and reduction occur simultaneously.

Example:



Remember ✨

- ✓ Look at the reactants.
- ✓ See what is happening.
- ✓ Match with the type.
- ✓ Write and balance.

Key Points

- Reactions help in everyday life.
- They bring change in matter.
- They are useful in industries, labs and in nature.

Golden Rule

Understand the pattern, Identify the type, Write it right! 😊

@DiagramDidi ✨

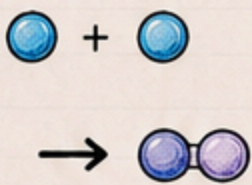


Combination Reactions & Exothermic Reactions



1 Combination Reactions

Definition:



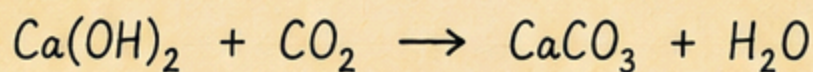
A single product formed from two or more **reactants**.

Examples:

- $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{Heat}$
- $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$



Whitewashing



This is the reaction that happens when whitewash reacts with air.



CaCO_3 is **marble** formula.



2 Exothermic Reactions

Definition:

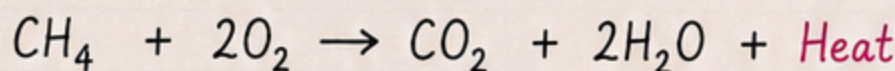
Reactions that **release heat energy** in the surroundings.

Key Point

Energy is **given out** in the form of **heat**.



i Combustion of Methane



↓
Methane

↓
Oxygen

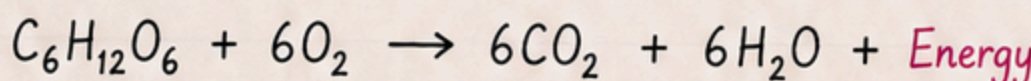
↓
Carbon dioxide

↓
Water

Heat Released



ii Respiration in Living Organisms (e.g. Glucose)



↓
Glucose

↓
Oxygen

↓
Carbon dioxide

↓
Water

Heat Released

Energy for life!



Remember

- Combination reactions form **single product**.
- Exothermic reactions release **heat energy**.





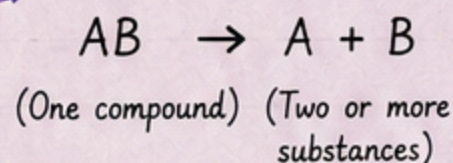
Decomposition Reactions



Key Idea

A single compound breaks down into two or more simpler substances.

General Form



1

Thermal Decomposition

Decomposition caused by heat energy.



Example	Equation	Condition	Observation
Ferrous sulphate (FeSO_4)	$2\text{FeSO}_4 \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$ Green Reddish brown solid Pungent gases	Strong heating 	Green crystals turn reddish brown. Pungent gases evolved.
Calcium carbonate (CaCO_3)	$\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$ White solid Quicklime (White solid) Gas	Strong heating 	CO_2 gas evolved. Lime (CaO) remains.
Lead nitrate ($\text{Pb}(\text{NO}_3)_2$)	$2\text{Pb}(\text{NO}_3)_2 \xrightarrow{\Delta} 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$ White crystals Yellow solid Brown fumes Gas	Strong heating 	Brown fumes evolved. Yellow solid remains.

2

Photochemical Decomposition

Decomposition caused by light energy.



Example	Equation	Condition	Observation
Silver chloride (AgCl)	$2\text{AgCl} \xrightarrow{\text{light}} 2\text{Ag} + \text{Cl}_2$ White precipitate Silver metal Chlorine gas	Sunlight 	White AgCl turns grey due to silver metal. Chlorine gas evolves.
Silver bromide (AgBr)	$2\text{AgBr} \xrightarrow{\text{light}} 2\text{Ag} + \text{Br}_2$ Cream coloured Silver metal Bromine vapours	Sunlight 	Cream AgBr turns grey. Bromine vapours evolved.



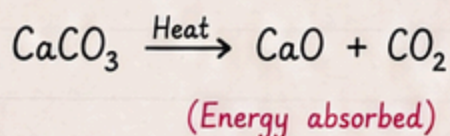
3

Endothermic Reactions

Reactions that absorb energy from surroundings.

Energy absorbed in endothermic reactions.

Endothermic Example



Remember

- ✓ Breaks down
- ✓ Needs heat/light
- ✓ Forms simpler substances

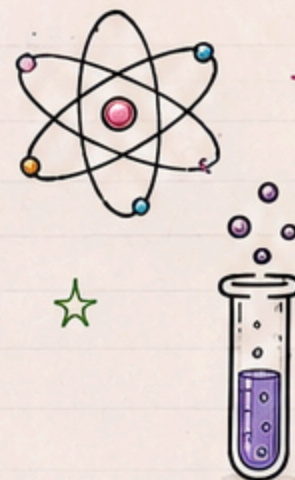
Quick Comparison

Type of Decomposition	Energy Source	Example	Key Feature
Thermal Decomposition	Heat (Δ)	$\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$	Heating breaks the compound.
Photochemical Decomposition	Light (Sunlight)	$2\text{AgCl} \xrightarrow{\text{light}} 2\text{Ag} + \text{Cl}_2$	Light breaks the compound.
Endothermic Reactions	Energy absorbed	$\text{CaCO}_3 \xrightarrow{\text{Heat}} \text{CaO} + \text{CO}_2$	Absorbs energy from surroundings.





Displacement & Double Displacement Reactions



1

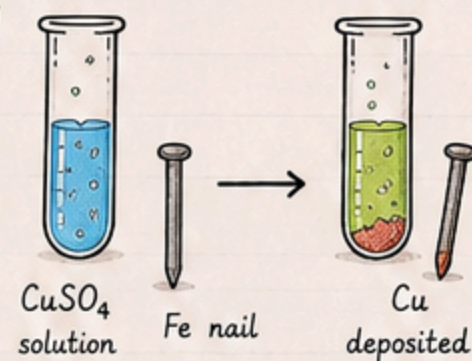
DISPLACEMENT REACTIONS

Definition:

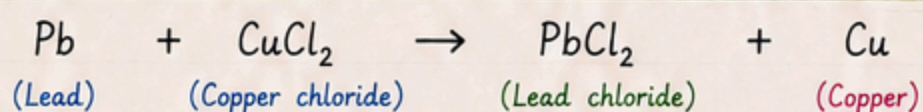
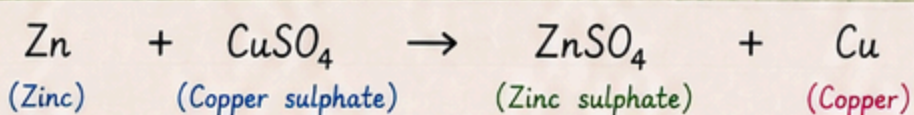
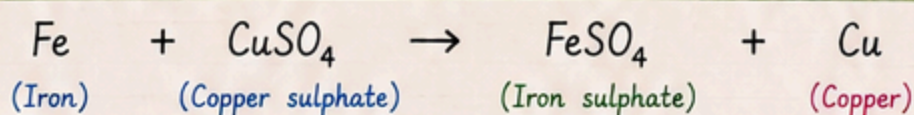
A more reactive element displaces a less reactive element from its compound.

Key Note

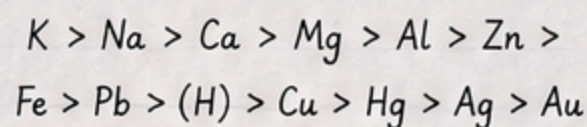
More **reactive** element displaces **less reactive** element.



Examples:



Reactivity Series



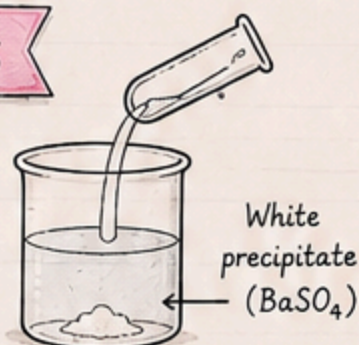
- Elements above hydrogen displace elements below it.

2

DOUBLE DISPLACEMENT REACTIONS

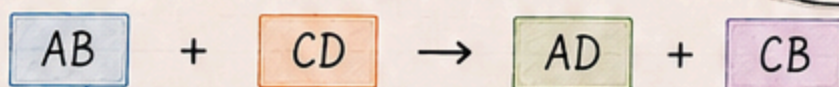
Definition:

The ions of two compounds exchange places to form two new compounds.

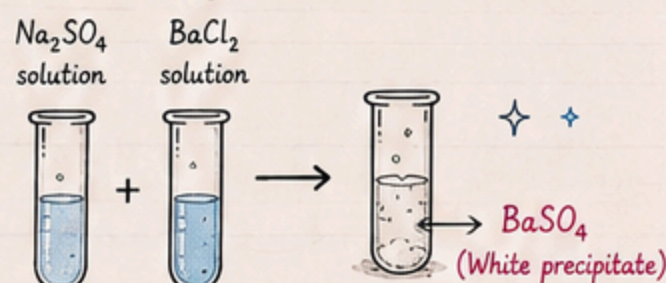
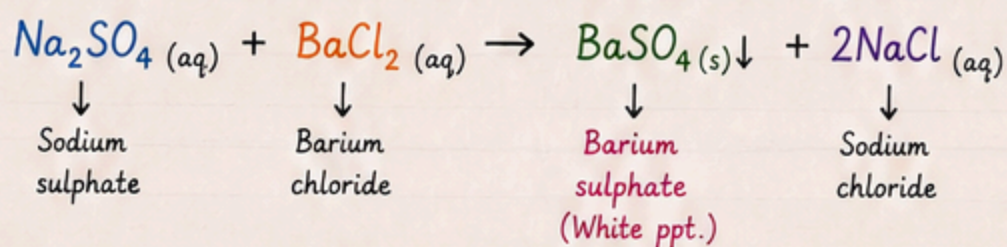


Precipitation Reaction

A reaction in which an insoluble solid (precipitate) is formed when two aqueous solutions are mixed.



Example:



Comparison - At a Glance

Feature	Displacement Reaction	Double Displacement Reaction
Definition	A more reactive element displaces a less reactive element.	Ions of two compounds exchange places to form two new compounds.
General Form	$\text{A} + \text{BC} \rightarrow \text{AC} + \text{B}$	$\text{AB} + \text{CD} \rightarrow \text{AD} + \text{CB}$
Type of Reaction	Mostly single displacement.	Double displacement.
Example	$\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$	$\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
Key Point	More reactive displaces less reactive.	Formation of precipitate, gas or water may occur.
Observation	Colour change / metal gets deposited.	Formation of precipitate / gas evolution / neutralization.





Oxidation and Reduction



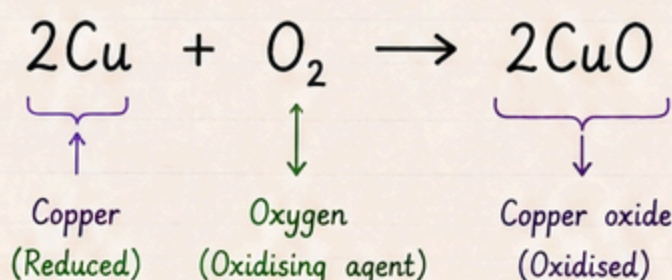
Remember
Reactions are all about **CHANGE!** ♥

1 OXIDATION

Definition:

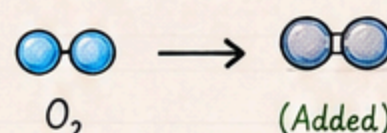
Gain of oxygen
/
loss of hydrogen

Equation:



What happens?

- Copper gains oxygen.
- Oxygen is added.



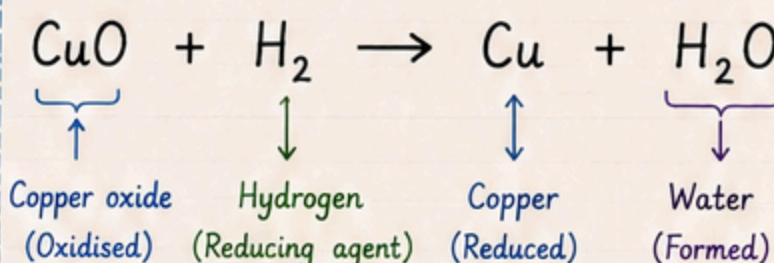
★ Oxidation = Gain of oxygen / Loss of hydrogen

2 REDUCTION

Definition:

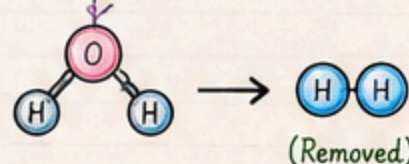
Loss of oxygen
/
gain of hydrogen

Equation:



What happens?

- Oxygen is removed.
- Hydrogen is added.



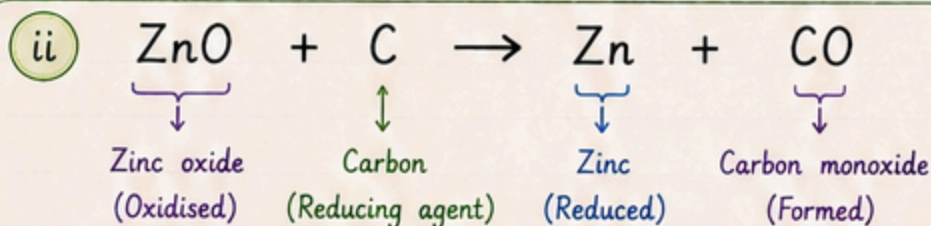
★ Reduction = Loss of oxygen / Gain of hydrogen

One substance oxidised,
another reduced. ♥

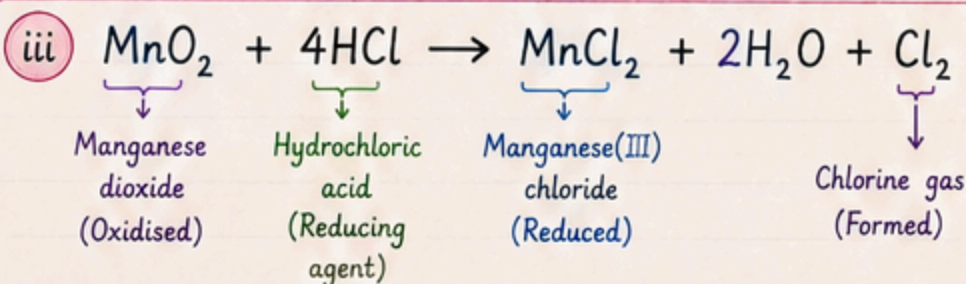
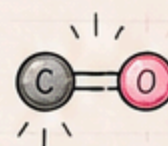


REDOX REACTIONS

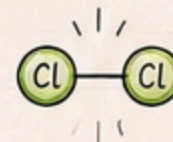
Reactions in which oxidation and reduction occur simultaneously are called **Redox Reactions**. ♥



→ Oxidation : $\text{C} \rightarrow \text{CO}$
(Gain of oxygen)
→ Reduction : $\text{ZnO} \rightarrow \text{Zn}$
(Loss of oxygen)



→ Oxidation : $2\text{Cl}^- \rightarrow \text{Cl}_2$
(Loss of electrons)
→ Reduction : $\text{MnO}_2 \rightarrow \text{Mn}^{2+}$
(Gain of electrons)



Memory Trick

- OIL RIG
- Oxidation Is Loss,
Reduction Is Gain.

Key Points

- ✓ Oxidation adds oxygen / removes hydrogen.
- ✓ Reduction removes oxygen / adds hydrogen.
- ✓ Redox reactions always occur together. ♥



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CHEMICAL REACTIONS AND EQUATIONS



REVISION + MCQ PRACTICE

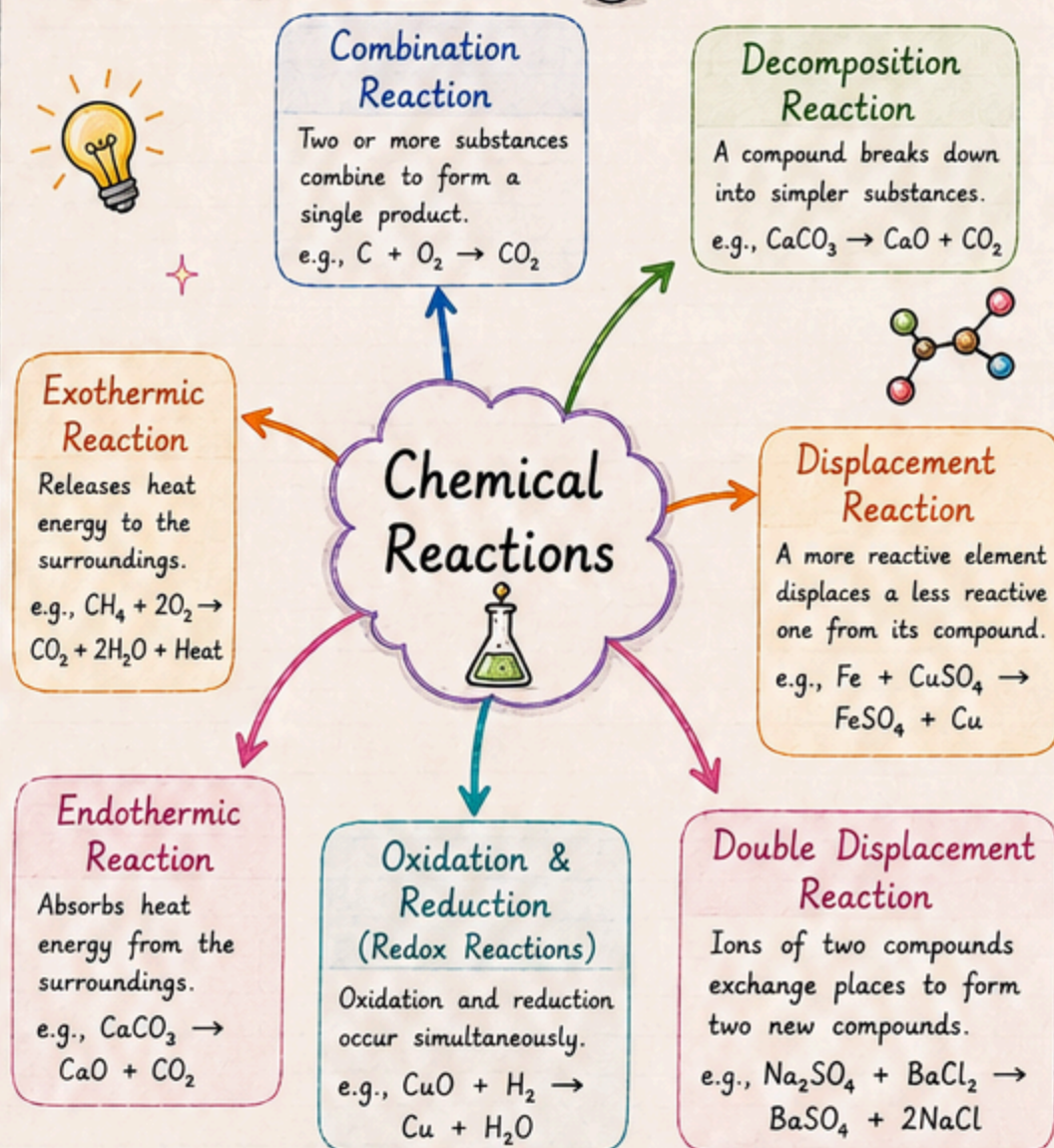
FINAL QUICK REVISION

- ✓ Learn definitions
- ✓ Practice equations
- ✓ Revise reaction types
- ✓ Solve MCQs daily
- ✓ Score full marks!

1 One-Liner Revision

Balanced equations	→	The number of atoms of each element is same on both sides of the equation.
Combination reaction	→	A single product is formed from two or more reactants.
Decomposition reaction	→	A single compound breaks down into two or more simpler substances.
Exothermic reaction	→	Reactions that release heat energy to the surroundings.
Endothermic reaction	→	Reactions that absorb heat energy from the surroundings.
Oxidation	→	Gain of oxygen / loss of hydrogen.
Reduction	→	Loss of oxygen / gain of hydrogen.
Corrosion	→	Slow destruction of metals by reaction with air and moisture.
Rancidity	→	Spoilage of food containing fats and oils due to oxidation.

2 Mind Map



3 MCQ Practice

Q1 In the reaction: $2PbO + C \rightarrow 2Pb + CO_2$

The oxidation takes place in:

- ☐ (A) PbO ☐ (B) C
☐ (C) Pb ☐ (D) CO_2



Q2 Identify the type of reaction in: $Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3$

- ☐ (A) Combination reaction
☐ (B) Decomposition reaction
☐ (C) Displacement reaction
☐ (D) Double displacement reaction



Q3 When dilute HCl is added to iron fillings, the reaction that takes place is:

- ☐ (A) Combination reaction
☐ (B) Decomposition reaction
☐ (C) Displacement reaction
☐ (D) Double displacement reaction



Answer Key

- Q1 → (B) C
 Q2 → (C) Displacement reaction
 Q3 → (C) Displacement reaction

Remember!

- ✓ Understand
- ✓ Write
- ✓ Practice
- ✓ Revise



Golden Rule

Practice more,
Score more! 😊



4 Expected Questions

1 Difference between displacement and double displacement reactions.

- Displacement: A more reactive element displaces a less reactive element from its compound.
- Double Displacement: Ions of two compounds exchange places to form two new compounds.



2 Why should equations be balanced?

- To obey the law of conservation of mass.
- The number of atoms of each element must be the same on both sides of the equation.



3 Why is respiration an exothermic reaction?

- During respiration, glucose is oxidised in cells to release energy.
- This energy is released in the form of heat, so it is an exothermic reaction.

