

## TYPES OF CHEMICAL REACTIONS

No.	Reagent Used	Tested Compound / Ion	Observation	Type of Reaction
1	NaOH (aq)	Pb <sup>2+</sup> ions	White precipitate of Pb(OH) <sub>2</sub> forms	Precipitation
2	Dilute HCl	Carbonates (CO <sub>3</sub> <sup>2-</sup> )	Effervescence due to CO <sub>2</sub> gas	Acid–Base / Gas evolution
3	AgNO <sub>3</sub> (aq)	Cl <sup>-</sup> ions	White precipitate of AgCl	Precipitation
4	BaCl <sub>2</sub> (aq) + dil. HCl	SO <sub>4</sub> <sup>2-</sup> ions	White precipitate of BaSO <sub>4</sub>	Precipitation
5	Red/Blue litmus solution	Acids/Bases	Blue turns red → acid; Red turns blue → base	Acid–Base indicator test
6	NH <sub>4</sub> OH (aq)	Fe <sup>3+</sup> ions	Reddish brown precipitate of Fe(OH) <sub>3</sub>	Precipitation
7	Copper strip + AgNO <sub>3</sub> sol.	Ag <sup>+</sup> ions	Grey coating of Ag on copper	Displacement
8	Dil. H <sub>2</sub> SO <sub>4</sub> + sugar + heat	Organic compound (sugar)	Charring, black residue	Dehydration
9	NaOH (aq, excess)	Zn <sup>2+</sup> ions	White precipitate dissolves in excess NaOH	Precipitation + Complexation
10	KMnO <sub>4</sub> (acidic medium)	Reducing agents like Fe <sup>2+</sup>	Purple color of KMnO <sub>4</sub> decolorizes	Redox

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## 1. Combination Reactions

Two or more substances combine to form a single product.

1.  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
2.  $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$
3.  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
4.  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
5.  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
6.  $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$
7.  $\text{Cl}_2 + \text{H}_2 \rightarrow 2\text{HCl}$
8.  $\text{Fe} + \text{S} \rightarrow \text{FeS}$
9.  $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$
10.  $\text{P}_4 + 5\text{O}_2 \rightarrow 2\text{P}_2\text{O}_5$

## 2. Decomposition Reactions

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

1.  $2\text{H}_2\text{O} \xrightarrow{\text{electricity}} 2\text{H}_2 + \text{O}_2$
2.  $2\text{Pb}(\text{NO}_3)_2 \xrightarrow{\Delta} 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$
3.  $\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$
4.  $2\text{KClO}_3 \xrightarrow{\Delta} 2\text{KCl} + 3\text{O}_2$
5.  $2\text{AgCl} \xrightarrow{\text{sunlight}} 2\text{Ag} + \text{Cl}_2$
6.  $\text{ZnCO}_3 \xrightarrow{\Delta} \text{ZnO} + \text{CO}_2$
7.  $\text{FeSO}_4 \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$
8.  $2\text{HgO} \xrightarrow{\Delta} 2\text{Hg} + \text{O}_2$
9.  $\text{NH}_4\text{NO}_3 \xrightarrow{\Delta} \text{N}_2\text{O} + 2\text{H}_2\text{O}$
10.  $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$

## 3. Displacement Reactions

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

1.  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
2.  $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
3.  $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$
4.  $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$
5.  $\text{Fe} + \text{ZnSO}_4 \rightarrow \text{No reaction}$  (Iron is less reactive than Zn)
6.  $\text{Pb} + \text{CuCl}_2 \rightarrow \text{PbCl}_2 + \text{Cu}$
7.  $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
8.  $\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$
9.  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
10.  $\text{Mn} + \text{CuSO}_4 \rightarrow \text{MnSO}_4 + \text{Cu}$

## 4. Double Displacement Reactions

Exchange of ions between two compounds.

1.  $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 \downarrow + 2\text{NaCl}$
2.  $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} \downarrow + \text{NaNO}_3$
3.  $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 \downarrow + 2\text{KNO}_3$
4.  $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
5.  $\text{Ca}(\text{OH})_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + 2\text{H}_2\text{O}$
6.  $\text{Ba}(\text{OH})_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 \downarrow + 2\text{H}_2\text{O}$
7.  $\text{K}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{KCl} + \text{CO}_2 + \text{H}_2\text{O}$
8.  $\text{Na}_2\text{CO}_3 + \text{CaCl}_2 \rightarrow \text{CaCO}_3 \downarrow + 2\text{NaCl}$
9.  $\text{FeCl}_3 + 3\text{NaOH} \rightarrow \text{Fe}(\text{OH})_3 \downarrow + 3\text{NaCl}$
10.  $\text{NH}_4\text{Cl} + \text{NaOH} \rightarrow \text{NH}_3 + \text{H}_2\text{O} + \text{NaCl}$

## 5. Precipitation Reactions

**Insoluble solids (precipitates)** are formed when two aqueous solutions are mixed

1.  $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) \downarrow + 2\text{NaCl}(\text{aq})$
2.  $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) \downarrow + \text{NaNO}_3(\text{aq})$
3.  $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) \downarrow + 2\text{KNO}_3(\text{aq})$
4.  $\text{CaCl}_2(\text{aq}) + \text{Na}_2\text{CO}_3(\text{aq}) \rightarrow \text{CaCO}_3(\text{s}) \downarrow + 2\text{NaCl}(\text{aq})$
5.  $\text{FeCl}_3(\text{aq}) + 3\text{NH}_4\text{OH}(\text{aq}) \rightarrow \text{Fe}(\text{OH})_3(\text{s}) \downarrow + 3\text{NH}_4\text{Cl}(\text{aq})$
6.  $\text{MgSO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Mg}(\text{OH})_2(\text{s}) \downarrow + \text{Na}_2\text{SO}_4(\text{aq})$
7.  $\text{CuSO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Cu}(\text{OH})_2(\text{s}) \downarrow + \text{Na}_2\text{SO}_4(\text{aq})$
8.  $\text{ZnSO}_4(\text{aq}) + \text{Na}_2\text{CO}_3(\text{aq}) \rightarrow \text{ZnCO}_3(\text{s}) \downarrow + \text{Na}_2\text{SO}_4(\text{aq})$
9.  $\text{AlCl}_3(\text{aq}) + 3\text{NaOH}(\text{aq}) \rightarrow \text{Al}(\text{OH})_3(\text{s}) \downarrow + 3\text{NaCl}(\text{aq})$
10.  $\text{NiSO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Ni}(\text{OH})_2(\text{s}) \downarrow + \text{Na}_2\text{SO}_4(\text{aq})$