

# Analytical Chemistry - Uses of Ammonium Hydroxide & Sodium Hydroxide

## Analytical Chemistry

In the qualitative analysis of compounds, their colour helps in their identification. The table given below shows some examples of colourless and coloured ions.

Colourless		Coloured		
Cation	Symbol	Cation	Symbol	Colour
Ammonium	$\text{NH}_4^+$	Cupric	$\text{Cu}^{2+}$	Blue
Sodium	$\text{Na}^+$	Ferrous	$\text{Fe}^{2+}$	Light green
Potassium	$\text{K}^+$	Ferric	$\text{Fe}^{3+}$	Yellowish-brown
Calcium	$\text{Ca}^+$	Nickel	$\text{Ni}^{2+}$	Green
Magnesium	$\text{Mg}^{2+}$	Chromium	$\text{Cr}^{3+}$	Green
Aluminium	$\text{Al}^{3+}$	Manganese	$\text{Mn}^{2+}$	Pink
Lead	$\text{Pb}^{2+}$			
Zinc	$\text{Zn}^{2+}$			
Anion	Symbol	Anion	Symbol	Colour
Chloride	$\text{Cl}^-$	Permanganate	$\text{MnO}_4^-$	Pink or Violet
Sulphate	$\text{SO}_4^{2-}$	Dichromate	$\text{Cr}_2\text{O}_7^{2-}$	Orange
Carbonate	$\text{CO}_3^{2-}$	Chromate	$\text{CrO}_4^-$	Yellow
Nitrate	$\text{NO}_3^-$			
Bicarbonate	$\text{HCO}_3^-$			
Sulphide	$\text{S}^{2-}$			

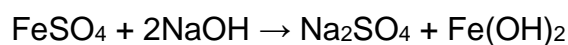
Bromide	Br <sup>-</sup>			
Acetate	CH <sub>3</sub> COO <sup>-</sup>			

### Chemical reactions of the soluble salt solutions with NaOH and NH<sub>4</sub>OH

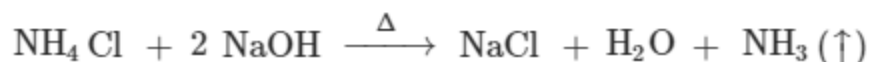
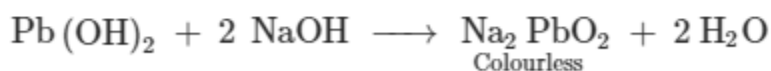
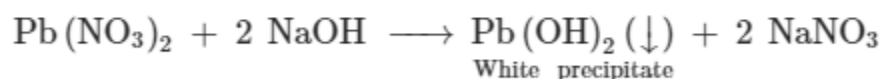
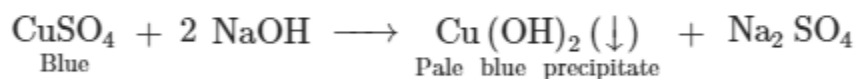
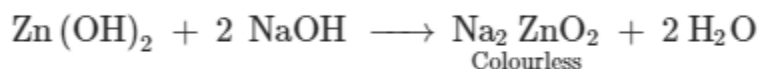
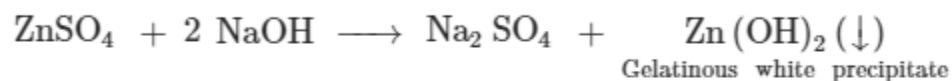
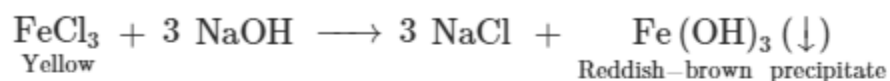
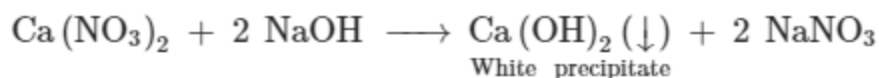
Some soluble salts (except sodium and potassium) react with sodium hydroxide and ammonium hydroxide to form insoluble precipitates.

#### Reactions with sodium hydroxide solution

Aqueous ferrous sulphate (green in colour) reacts with NaOH to form iron (II) hydroxide, which is insoluble in alkali.

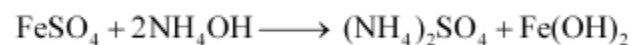


Other such reactions are shown below:

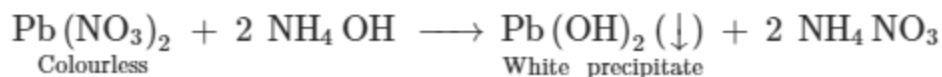
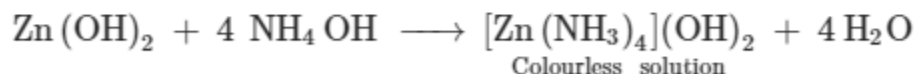
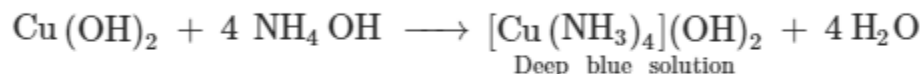


#### Reactions with ammonium hydroxide:

Aqueous ferrous sulphate (green in colour) reacts with NH<sub>4</sub>OH to form iron (II) hydroxide, which is insoluble in excess of ammonium hydroxide.

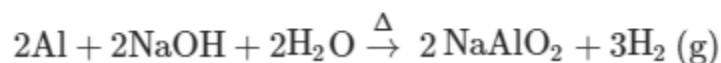
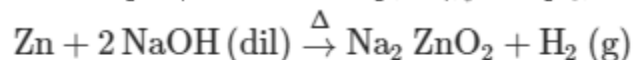


Other such reactions are shown below:

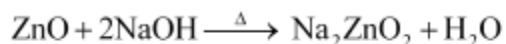
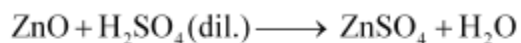


### Amphoteric nature of zinc and aluminium metals, their oxides and hydroxides

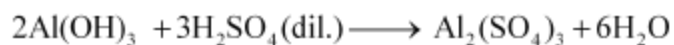
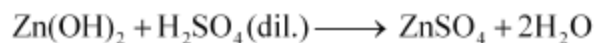
- **Amphoteric nature of zinc and aluminium metals:** As zinc and aluminium metals displace hydrogen from the acids as well as alkali, therefore, they are amphoteric in nature.



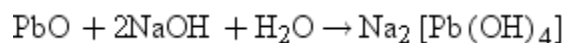
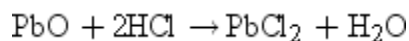
- **Amphoteric nature of zinc and aluminium oxides:** As the oxides of zinc and aluminium react with acids as well as alkalies to form salt and water, they are amphoteric in nature.



- **Amphoteric nature of hydroxides of zinc and aluminium metals:** As the hydroxides of zinc and aluminium react with acids as well as alkalies to form salt and water as the only products, therefore, they are amphoteric in nature.



- **Amphoteric nature of lead oxide:** As the oxide of lead react both with hydrochloric acid and sodium hydroxide, it is amphoteric in nature.



- **Amphoteric nature of lead hydroxide:** As the hydroxide of lead react both with hydrochloric acid and sodium hydroxide, it is amphoteric in nature.

