Acids, Bases& Salts Introduction & characteristics of Acid n Bases

Introduction

The word 'acid' is derived from the Latin acidus, meaning sour. Acids are sour. Lemon and other citrus fruits contain citric acid. Curd turns sour due to lactic acid. We know that many non-metal oxides, e.g., SO₂, SO₃, NO₂, N₂O₅ are acidic oxides and form acid with water. Sulphuric acid, hydrochloric and nitric acids are generally called minerals acids. The word 'base' is not related to taste. All bases taste bitter. Most metal oxides and hydroxides, e.g., MgO, CaO and Mg(OH)₂ are bases. Ammonia is also a base. The colour of fishes is due to trimethyl amine, an organic base similar to ammonia. Bases which are soluble in water are called alkalis, e.g., NaOH and KOH.

Acids combine with bases to form salts. For example, hydrochloric acid reacts with sodium hydroxide to form sodium chloride the most well-known salt.

\neg General Characteristics of acids:

All acids have some common characteristics.

- 1. They have a sour taste.
- 2. They turn blue litmus red.
- 3. Their aqueous solutions conduct electricity.
- 4. Metals react with acids to give hydrogen gas and the corresponding metal salt. Nitric acid, HNO₃ is one acid which does not give hydrogen with any metal except magnesium and manganese.

$$2\text{HCl} + \text{Mg} \rightarrow \text{MgCl}_2 + \text{H}_2$$
$$\text{H}_2\text{SO}_4 + \text{Zn} \rightarrow \text{ZnSO}_4 + 2\text{H}_2$$

Acids produce CO₂ gas with carbonates and hydrogen carbonates (also called bicarbonates).
 CO₂ evolves with effervescence.

$$Na_2CO_3 + HCl \rightarrow 2NaCl + CO_2 + H_2O$$

 $NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$

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6. Metal sulphites gives SO₂ gas with effervescence of being treated with acids.

$$Na_2SO_3 + 2HCl \rightarrow 2NaCl + SO_2 + H_2O$$

 $Na_2SO_3 + H_2SO_4 \rightarrow Na_2SO_4 + SO_2 + H_2O$

7. Metal sulphides give H_2S gas with acids. It may be identified by its smell of rotten eggs.

$$Na_2S + 2HCl \rightarrow 2NaCl + H_2S$$

$$Na_2S + H_2SO_4 \rightarrow Na_2SO_4 + H_2S$$

8. Acids react with metallic oxides to form salt and water

$$2HNO_3 + ZnO \rightarrow Zn(NO_3)_2 + H_2O$$
$$2HCl + CuO \rightarrow CuCl_2 + H_2O$$

Bases are compounds that react with acids to form salts, usually accompanied by water.

In general, bases are oxides and hydroxides of metals. Ammonia and some related compounds are also bases.

Examples:

1. Na_20 is a base as it reacts with acids to form salt and water.

$$Na_20 + 2HCl \rightarrow 2NaCl + H_20$$

$$Na_2O + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$$

base acid salt water

2. $Ca(OH)_2$ is a base as it reacts with acids to form salts and water.

 $Ca(OH)_2 + 2HCI \rightarrow CaCl_2 + 2H_2O$

3. NH₃ is a base as it reacts with acids to give salts.

$$NH_3 + HCl \rightarrow NH_4Cl$$

 $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$
base acid salt

Alkalis:

Soluble bases are called alkalis.

NaOH, KOH, $Ba(OH)_2$, and NH_4OH are example of alkalis. But $Mg(OH)_2$, $Al(OH)_3$, $Fe(OH)_2$,

Fe(OH)₃, Cu(OH)₂, Zn(OH)₂ being insoluble bases are not alkalis.

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\neg General Characteristics of Bases:

Bases have the following properties.

- 1. Alkali solutions feel slippery.
- 2. Alkali turn red litmus blue.
- 3. Bases in the molten state or in aqueous solutions conduct electricity.
- 4. Some metals, e.g. Zn, Al and Sn, give hydrogen gas when boiled with alkalis.

$$Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2$$

2Al + 2NaOH + 2H₂O → 2NaAlO₂ + 2H₂
Sn + 2NaOH → Na₂SnO₂ + H₂

5. On heating, bases decompose into metal oxide and water.

$$Cu(OH)_2 \rightarrow CuO + H_2O$$

Fe(OH)₃ → Fe₂O₃ + 3H₂O

6. Alkalis gives ammonia gas on being heated with ammonia salts.

$$(NH_4)_2SO_4 + 2KOH \rightarrow 2NH_3 + K_2SO_4$$

+ H₂O

 $NH_4Cl + NaOH \rightarrow NH_3 + NaCl + H_2O$

7. Bases react with acids to form salt and water.

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Some important acids	Uses
Sulphuric Acid	Manufacture of
	fertilizers, dyes,
	drugs,
	explosives,
	chemicals,
	paints, artificial
	fabrics etc.
Hydrochloric	Printing,
Acid	tanning and
	tinning
	industries.
Nitric Acid	Manufacture of
	dyes,
	explosives,
	drugs, fertilizers
	and chemicals.
Acetic Acid	Preservation of
	food and as a
	flavouring
	agent.
Citric Acid	Curdling milk,
	flavouring soft
	drinks.
Carbonic Acid	Used in soft
	drinks.
Oxalic Acid	Used in ink
	stain remover.
Boric Acid	Preservation of
	grains, to wash
	eyes.
Benzoic Acid	As food
	preservative.
Tartaric Acid	Constituent of
	baking powder.