JSR IAS ACADEMY

GENERAL SCIENCE

CHEMISTRY

Acids

ACIDS

The word 'acid' is derived from the **Latin** name "**acidus**" which means sour taste.

In 1884, a Swedish chemist Svante ***Arrhenius*** proposed a theory on acids and bases.

According to Arrhenius theory, an acid is a substance which furnishes **H+** ions or **H3 O+** ions in aqueous solution.

$$HCl_{(aq)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$$

hydrogen chloride is dissolved in water, it gives H+ and Cl ions in water.

$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

SOURCE	ACID PRESENT
Apple	Malic acid
Lemon	Citric acid
Grape	Tartaric acid
Tomato	Oxalic acid
Vinegar	Acetic acid
Curd	Lactic acid
Orange	Ascorbic acid
Tea	Tannic acid
Stomach juice	Hydrochloric acid
Ant, Bee	Formic acid

Sulphuric acid

It is called as "King of Chemicals" and it is used to manufacture of most of the chemicals.

Hygroscopic substance

Substance which absorbs water from the surroundings.

All acids essentially contain one or more hydrogens. But all the hydrogen containing substances are not acids. For example, methane (CH_4) and ammonia (NH_3) also contain hydrogen. But they do not produce H^+ ions in aqueous solution.

Acid	Molecular Formula	Ions formed		No. of replaceable hydrogen
Acetic Acid	CH_3COOH	H^+	CH_3COO^-	1
Formic Acid	HCOOH	H^+	$HCOO^-$	1
Nitric Acid	HNO_3	H^+	NO_3^-	1
Sulphuric Acid	H_2SO_4	H^+	SO_4^{2-}	2
Phosphoric Acid	H_3PO_4	H^+	PO_4^{3-}	3

Classification of Acids

Acids are classified in different ways as follows:

Based on their sources:

(i) Organic acids

Acids present in plants and animals (living things) are organic acids.

Example: HCOOH, CH_3COOH

(ii) Inorganic Acids:

Acids prepared from rocks and minerals are inorganic acids or mineral acids.

Example: HCl, HNO_3, H_2SO_4

Based on their Basicity

Monobasic Acid:

Acid that contain only one replaceable hydrogen atom per molecule is called monobasic acid. It gives one hydrogen ion per molecule of the acid in solution.

Example: HCl, HNO_3

For example, acetic acid (CH_3COOH) has four hydrogen atoms but only one can be replaced. Hence it is monobasic.

Dibasic Acid:

An acid which gives two hydrogen ions per molecule of the acid in solution.

Example: H_2SO_4, H_2CO_3

Tribasic Acid:

An acid which gives three hydrogen ions per molecule of the acid in solution.

Example: H_3PO_4

Based on Ionisation

Acids get ionised in water (produce H+ ions) completely or partially. Based on the extent of ionisation acids are classified as follows:

Strong Acids:

These are acids that ionise completely in water.

Example: HCl

Weak Acids:

These are acids that ionise partially in water.

Example: CH3 COOH.

DO YOU KNOW? Ionisation is the condition of being dissociated into ions by heat or radiation or chemical reactions or electrical discharge.

Based on Concentration

Concentrated Acid:

It has relatively large amount of acid dissolved in a solvent.

Dilute Acid:

It has relatively smaller amount of acid dissolved in solvent.

Properties of Acids

a) They have sour taste

b) Their aqueous solutions conduct electricity since they contain ions

c) Acids turns blue litmus red

d) Acids react with active metals to give hydrogen gas

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2 \uparrow$$

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2 \uparrow$$

DO YOU KNOW? Few metals do not react with acid and liberate hydrogen gas. For example: Ag, Cu.

e) Acids react with metal carbonate and metal hydrogen carbonate to give carbon dioxide.

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

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

f) Acids react with metallic oxides to give salt and water.

$$CaO + H_2SO_4 \rightarrow CaSO_4 + H_2O$$

g) Acids react with bases to give salt and water.

$$HCl + NaOH \rightarrow NaCl + H_2O$$

Uses of Acids ,,

Sulphuric acid is called **King of Chemicals** because it is used in the preparation of many other compounds. It is used in car batteries also. ,,

Hydrochloric acid is used as a cleansing agent in toilets.

Citric acid is used in the preparation of effervescent salts and as a food preservative. ,,

Nitric acid is used in the manufacture of fertilizers, dyes, paints and drugs. ,,

Oxalic acid is used to clean iron and manganese deposits from quartz crystals. It is also used as bleach for wood and removing black stains.

Carbonic acid is used in aerated drinks. ,,

Tartaric acid is a constituent of baking powder.

Aquaregia

It is a mixture of hydrochloric acid and nitric acid prepared optimally in a molar ratio of 3:1.

It is a yellow-orange fuming liquid.

Chemical formula : 3 HCl + HNO3

Solubility in Water : Miscible in water

Melting point : - 42°C (- 44°F, 231K)

Boiling point : 108°C (226°F, 381K)

The term aquaregia is a Latin phrase meaning **"King's Water".**

The name reflects the ability of aquaregia to dissolve the noble metals such as gold, platinum and palladium.

Uses of Aquaregia:

1. It is used chiefly to dissolve metals such as gold and platinum.

2. It is used for cleaning and refining gold.