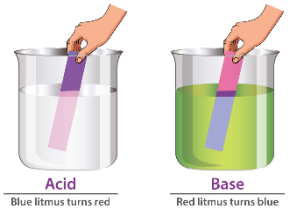
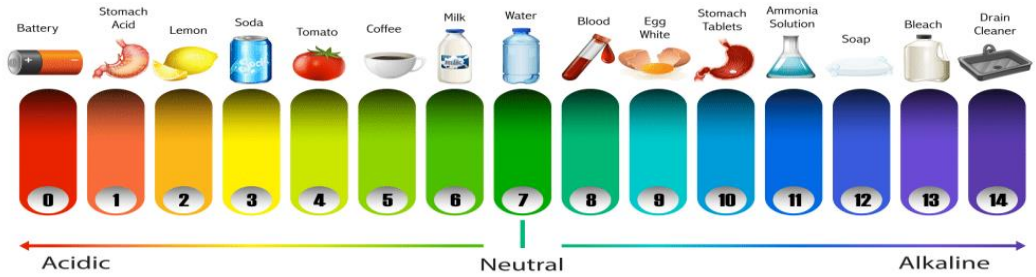
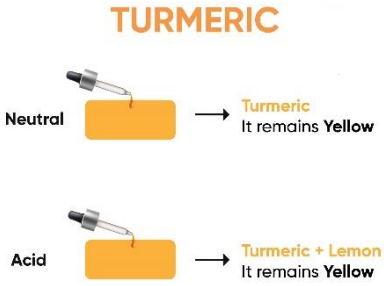
ACID	BASE
Properties of Acids: • Produce hydrogen ions [H+] in H2O. • Sour taste. • Turn blue litmus red. • Neutralize solutions carrying hydroxide ions. • React with several metals releasing Hydrogen gas. • React with carbonates releasing CO2(g) • Corrode metal surface quickly.	Properties of Base: • Produce hydroxide ions [OH–] in H2O. • Water soluble bases are called alkalise. • Bitter Taste • Turn Red Litmus blue. • Neutralize solutions containing H+ ions. • Have a slippery, 'soapy' feel.
a) Strong acids: Completely dissociate into its ions in aqueous solutions. Example: **Nitric acid (HNO3)**, **Sulphuric acid (H2SO4)**, **Hydrochloric acid (HCl).** b) Weak acids: Weak acids are those acids which do not completely dissociate into its ions in aqueous solutions. Example: Carbonic acid (H2CO3), Acetic acid (CH3COOH).	a) Strong bases: Strong bases are those bases which completely dissociate into its ions in aqueous solutions. Example: Sodium hydroxide (NaOH) Potassium hydroxide (KOH) b) b) Weak bases: Weak bases are those bases which do not completely dissociate into its ions in aqueous solutions. Example: Ammonium hydroxide (NH4OH)

	INDICATORS	COLOUR IN ACID	COLOUR IN BASE
VISUAL INDICATORS 	BLUE LITMUS		
	METHYL ORGANGE		
	PHENOPTHALEIN		
	RED LITMUS		
OLFACTORY INDICATORS 		ACID	BASE
	ONION JUICE	RETAINS SMELL	LOSES SMELL
	CLOVE OIL	PUNGENT SMELL	LOSES SMELL
	VANILLA ESSENCE	PUNGENT SMELL	LOSES SMELL







pH < 7 (Acidic Solution [$H_3O^+ > OH^-$] [$H_3O^+ = OH^-$] pH > 7 (Basic Solution [$H_3O^+ < OH^-$]

S. No.	Solution	Colour of pH paper	Approx-imate pH value	Nature of substance
1	Saliva (before meal)	Green	6.8 – 7.4	Slightly acidic or basic
2	Saliva (after meal)	Yellow green	5.8	Acidic
3	Lemon juice	Orange	2.2	Acidic
4	Colourless aerated drink	Yellow	4.0	Acidic
5	Carrot juice	Yellow green	6.0	Acidic
6	Coffee	Yellow	4.5	Acidic
7	Tomato juice	Yellow	4.3	Acidic
8	Tap water	Green	6 – 8.5	Varied
9	1M NaOH	Dark blue	14	Basic
10	1M HCl	Red	0	Acidic

pH Sensitivity of Plants & Animals:

• Human body works in a narrow range of pH 7 to 7.8. Acidity can be lethal for plants and animals.

• **pH of Digestive System**: Stomach secretes HCl to kill bacteria in the food. The inner lining of stomach protects vital cells from this acidic pH.

• **pH and tooth decay**: Lower pH because of sour food and sweet food can cause tooth decay. The pH of mouth should always be more than 5.5.

• **pH as self defence mechanism** in plants & animals: Certain animals like bee and plants like nettle secrete highly acidic substance for self-defence.

❖ CHEMICAL PROPERTIES OF ACIDS:

• Acids react with active metals to give hydrogen gas. **$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$**

• Acids react with **metal carbonate** and **metal hydrogen carbonate** to give carbon dioxide.

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

• Acids react with bases to give salt and water. This reaction is called as neutralization reaction.

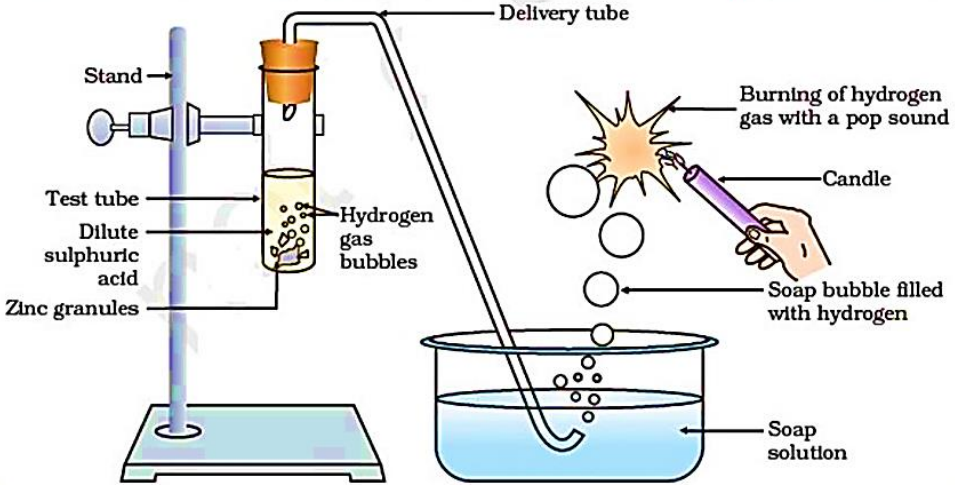
$NaOH + HCl \rightarrow NaCl + H_2O$

• Acids react with metals oxides to give salt and water. **$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$**

❖ Addition of Acids or Bases to Water: The process of dissolving an acid, especially nitric acid or sulphuric acid or a base in water is a highly exothermic one.

Note: **Always add acid to water and never the other way!** The acid must be added slowly to water with constant stirring. If one mixes the other way by adding water to a concentrated acid, the heat generated causes the mixture to splash out and cause burns.

Reaction of Zinc Metal with Dilute Sulphuric Acid



CHEMICAL PROPERTIES OF BASES:

• **Reaction with Metals** - Certain reactive metals such as Zinc, Aluminium, and Tin react with alkali solutions on heating and hydrogen gas is evolved.

$2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

• **Reaction with acids** -Bases react with acids to form salt and water. **$KOH + HCl \rightarrow KCl + H_2O$**

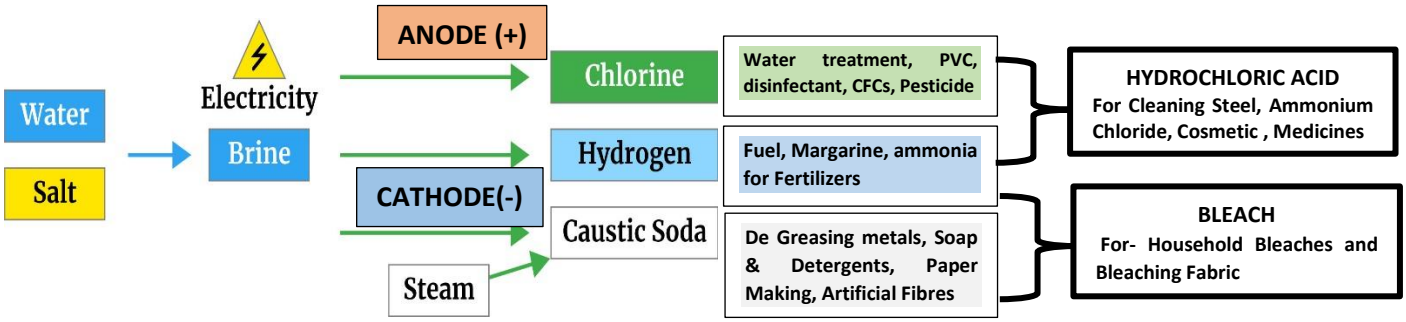
• **Reaction with Non-metallic oxides** – These oxides are generally acidic in nature. They react with bases to form salt and water.

$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

CHLOR-ALKALI PROCESS: Electricity is passed through an aqueous solution of Sodium chloride (called brine).

- ☞ **Sodium chloride decomposes to form sodium hydroxide.**
- ☞ **Chlorine gas is formed at the anode, and hydrogen gas at the cathode.**
- ☞ **Sodium hydroxide solution is formed near the cathode.**

$2NaCl(aq) + 2\ H_2O\ (l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$



SOME IMPORTANT SALTS

BLEACHING POWDER: $CaOCl_2$
Calcium Oxy Chloride
produced by the **action of chlorine on dry slaked lime**.
$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$
Uses:
- **As disinfectant and germicide especially in the sterilization of drinking water.**
- **Manufacturing of chloroform.**
- **Bleaching of silk, cotton, linen, wool (fabric industry) and wood pulp (paper industry).**
- **As an oxidising agent in chemical industries**

BAKING SODA: ($NaHCO_3$)
Sodium bicarbonate
Baking Powder: Baking powder is a mixture of **Sodium bicarbonate ($NaHCO_3$) and tartaric acid**

$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$ Uses:
- Use to lighten the texture and to increase volume of various baked foods.

$NaHCO_3$ + H+ (From any acid) → CO_2 + H_2O + Sodium salt of acid
Carbon dioxide produced during the reaction can cause bread or cake to rise making them soft and spongy.
- Used instead of yeast for the end- products where the fermentation flavours would be undesirable.
- Used as antacid in acidity.

PLASTER OF PARIS: $CaSO4.½\ H2O$
Calcium sulphate hemihydrate
Preparation: By **heating Gypsum at 373K or 100^0 C.**
$CaSO_4.2H_2O$ -------$CaSO_4$. ½ H_2O + 1½ H_2O
Uses:
- **Used in making casts and patterns for moulds and statues.**
- **Used as cement in ornamental casting and for making decorative materials.**
- **Used as a fire proofing material and for making chalks.**
- **Used in hospitals for immobilising the affected part in case of bone fracture or strain.**

WASHING SODA: ($Na_2CO_3.10H_2O$)
Sodium carbonate Decahydrate
First step- sodium carbonate is obtained by heating baking soda.
$2NaHCO_3$ (heat) → $Na_2CO_3 + H_2O + CO_2$
Second step- Washing soda is produced by recrystallisation of sodium carbonate
$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$
Used in glass, soap and paper industries.
- **Used in the manufacture of sodium compounds such as borax.**
- **Used in domestic cleaning purposes.**
- **Used for removing permanent hardness of water.**