

# ACIDS, BASES, & SALTS

Class 10 Science

Understanding their Properties, Reactions, & Applications

## ACIDS

Sours

Sour taste, contain  $H^+$  ions,  
Blue Litmus to Red

Examples

HCl (Hydrochloric Acid)  
 $H_2SO_4$  (Sulfuric Acid)



Lemon  
(citric acid)



Vinegar  
(acetic acid)



HCl  
(pH 1.0)

Properties

- ✓ pH < 7
- ✓ Corrosive
- ✓ Reactive with metals

## BASES

Bitters

Bitter taste, soapy feel, contain  
 $OH^-$  ions, Red Litmus to Blue

Examples

NaOH (Sodium Hydroxide)  
 $Ca(OH)_2$  (Calcium Hydroxide)



Soap



Bleach



Antacid  
( $Mg(OH)_2$ )



NaOH  
(pH 13.0)



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14  
← Acid Neutral Base →

- ✓ pH ≈ 7
- ✓ Slippery
- ✓ Often metallic oxides/hydroxides

## SALTS

Neutral Compounds

Formed from Acid-Base  
Reaction (Neutralization)

Examples

NaCl (Sodium Chloride)  
 $NaHCO_3$  (Sodium Bicarbonate)



Table Salt



Baking Soda



Chalk  
( $CaCO_3$ )



Crystals formation



Salt cellar

- ✓ pH ≈ 7 (mostly neutral)
- ✓ Crystalline solids
- ✓ High melting points



Common Indicators

Litmus

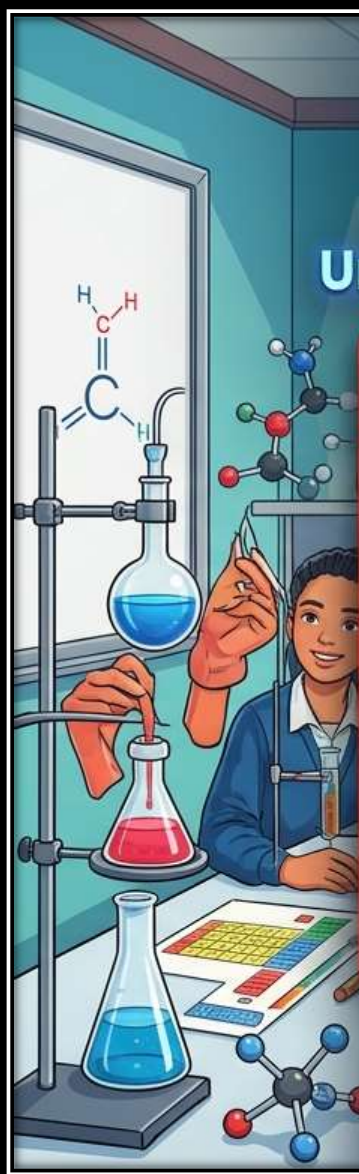
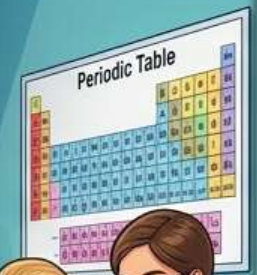
Methyl Orange

Phenolphthalein

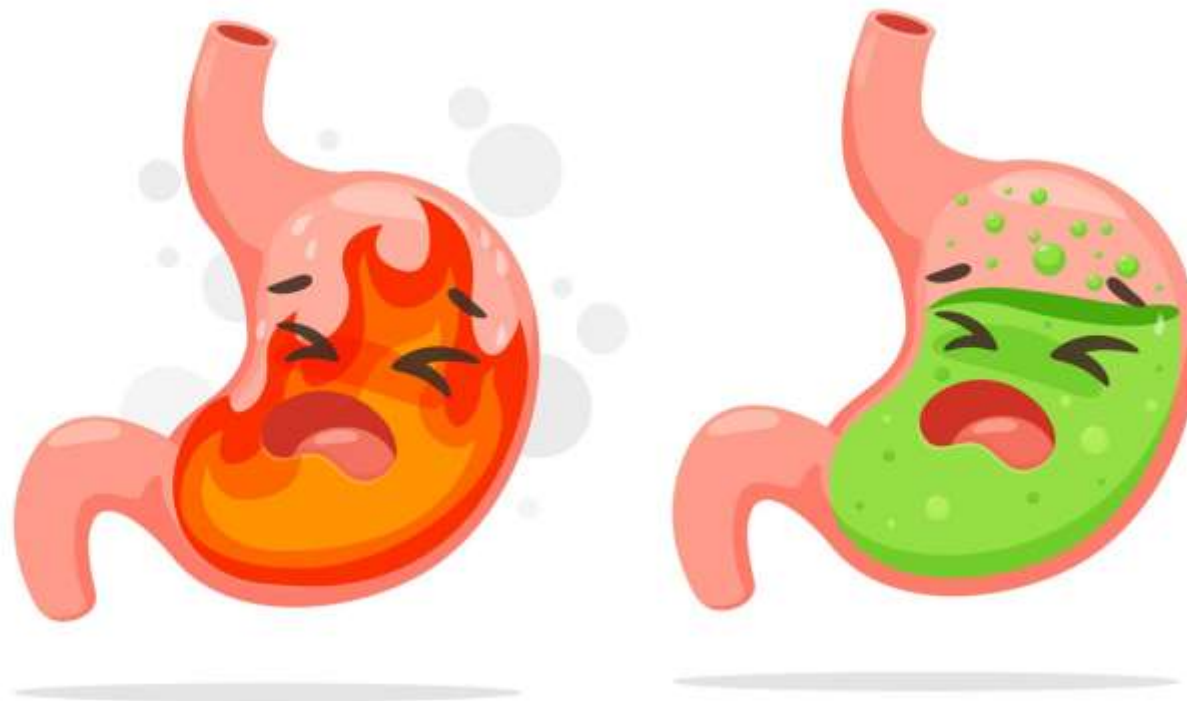
Litmus

Phenolphthalein

Universal Indicator



# Acidity and Indigestion



# EXPLORING ACIDS: TEXTURE, TASTE, & pH

## TEXTURE & CORROSIVITY

**STRONG ACID (LIKE-HCL)**



METAL

CLOTH

**SAFELY SHOUTED**



**WATERY**  
(diluted)

**STINGING**  
(if skin contact)

## TASTE & COMMON SOURCES

**CHARACTERISTIC SOUR TASTE**

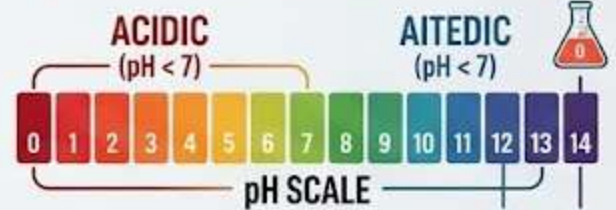


- Citric Acid (Citrazic Acid)
- Tartaric Acid (Gamanic Acid)
- Bambetic Acid (Panpetic Acid)
- Orangic Acid (Tartaric Acid)

### SOURNESS SCALE

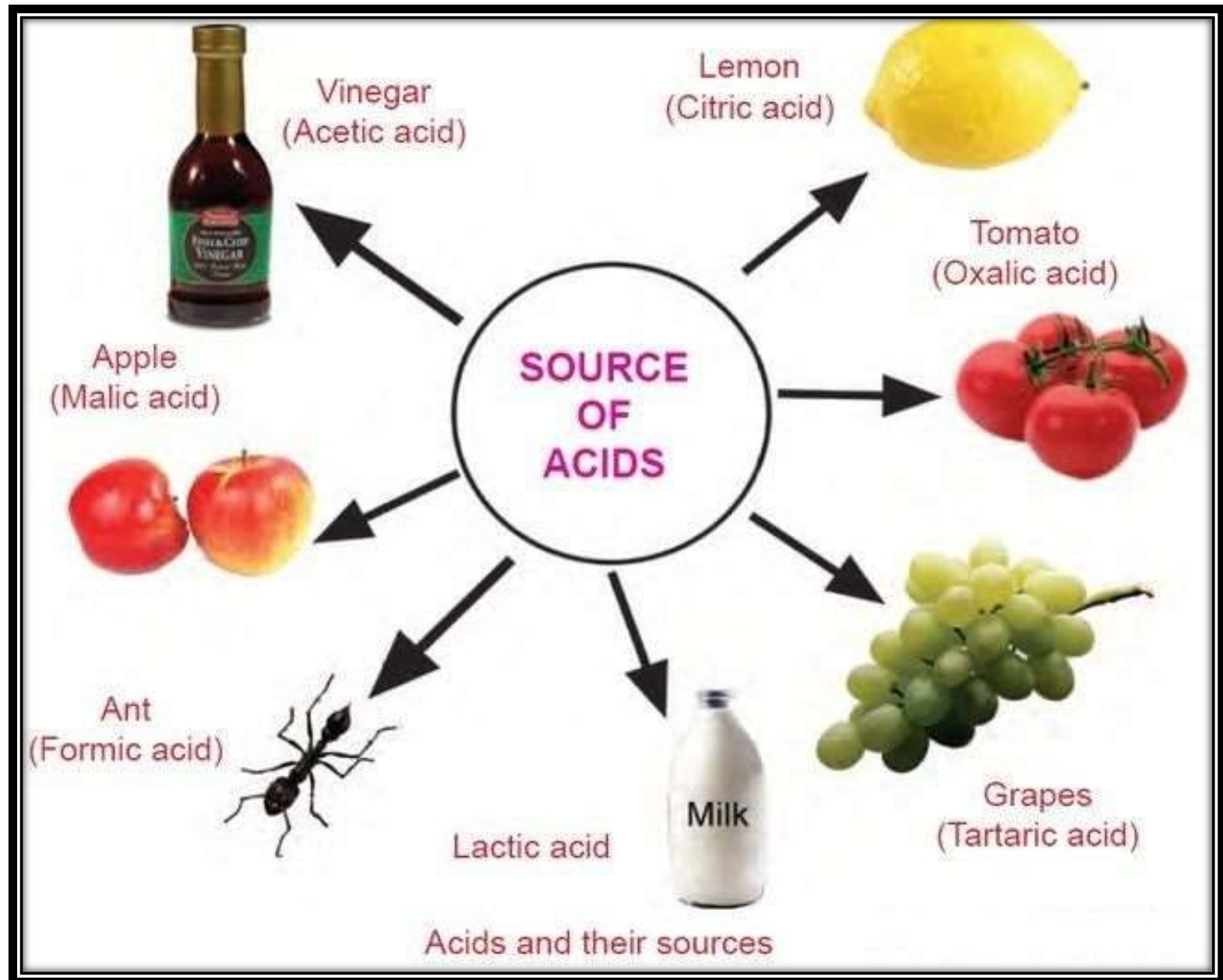


## pH VALUE & STRENGTH



- ✓ ALWAYS BELOW pH 7.0
- ✓ LOWER NUMBERS = STRONGER ACIDS
- ✓ MEASURE OF HYDROGEN IONS (H<sup>+</sup>)

**Acids, we are using in our daily life.**



## Strong Acids



Hydrochloric  
Acid



Nitric  
Acid



Hydroiodic  
Acid

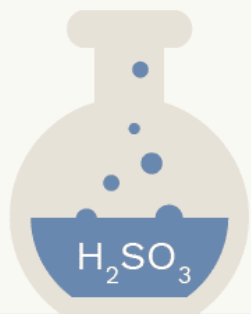


Perchloric  
Acid

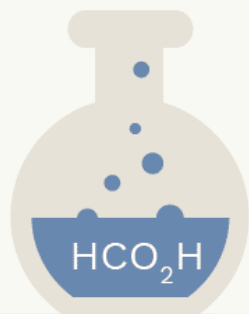


Chloric  
Acid

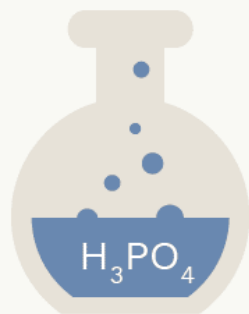
## Weak Acids



Sulfurous  
Acid



Methanoic  
Acid



Phosphoric  
Acid



Nitrous  
Acid



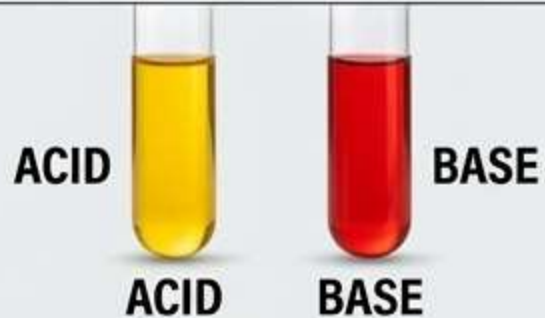
Hydrofluoric  
Acid

# NATURAL INDICATORS AND THEIR REACTIONS

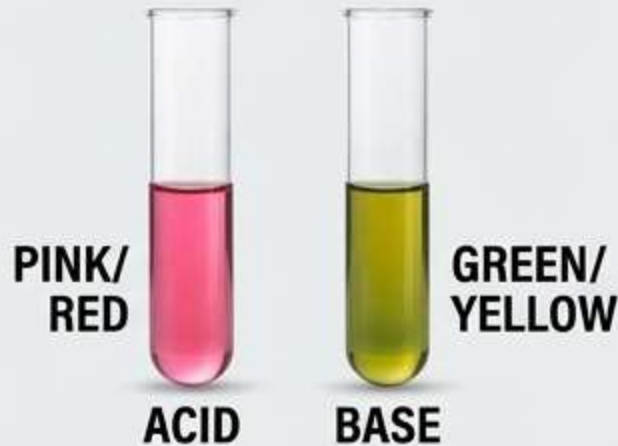
## TURMERIC POWDER INDICATOR



**TURMERIC POWDER:** YELLOW COLOUR IN ACID & NEUTRAL SOLUTIONS, BRIGHT RED COLOUR IN BASE SOLUTION.



## RED CABBAGE EXTRACT INDICATOR

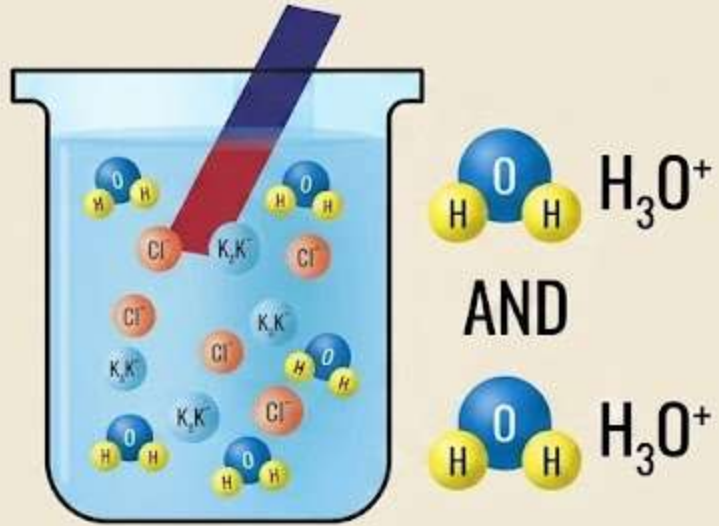


## HYDRANGEA SOIL pH INDICATOR



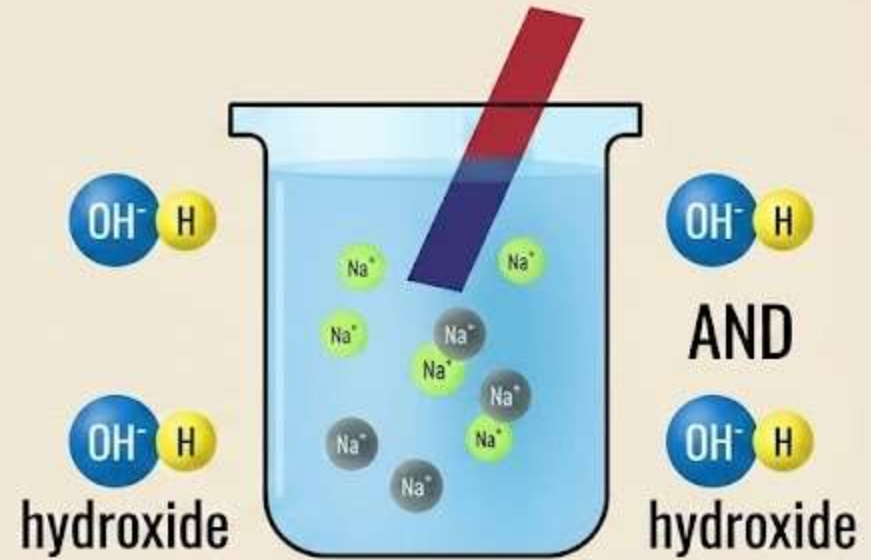
**HYDRANGEA:** BLUE FLOWERS IN ACIDIC SOIL, PINK FLOWERS IN BASIC SOIL.

Blue Litmas turns red




ACID


Red Litmas turns blue




BASE

# PHENOLPHTHALEIN

Neutral pH  → Phenolphthalein  
It remains **Same**


Acid pH  → Phenolphthalein  
It remains **Same**

Base pH  → Phenolphthalein  
It turns into **Pink**

(Colour change in Acid and Base on addition of Phenolphthalein)


## METHYL ORANGE INDICATOR

Neutral pH




→ Methyl Orange  
It remains **Same**

Acid pH



→ Methyl Orange  
It turns **Red - Orange**

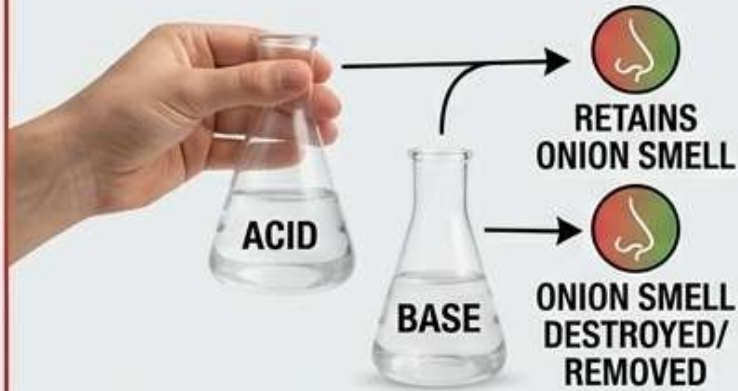
Base pH



→ Methyl Orange  
It turns **Same**

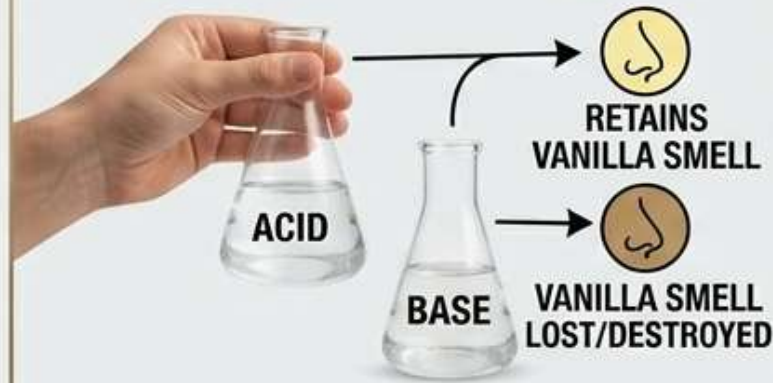
# OLFACTORY INDICATORS AND THEIR SMELLS

## ONION EXTRACT INDICATOR



**SMELL: REMAINS IN ACID, LOST IN BASE.**

## VANILLA ESSENCE INDICATOR



**SMELL: REMAINS IN ACID, LOST IN BASE.**

## CLOVE OIL INDICATOR



**SMELL: REMAINS IN ACID, LOST IN BASE.**

# PRODUCING HYDRONIUM IONS ( $\text{H}_3\text{O}^+$ ) IN ACIDS



## FORMATION OF THE HYDRONIUM ION ( $\text{H}_3\text{O}^+$ )

### STEP 1: $\text{H}^+$ ION FORMATION (DISSOCIATION)

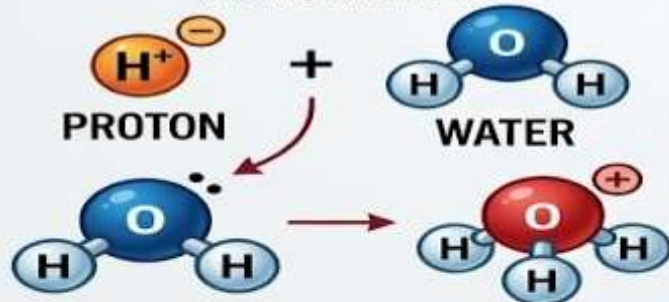


HCl  
(aqueous solution)



$\text{Cl}^-$   
(chloride)

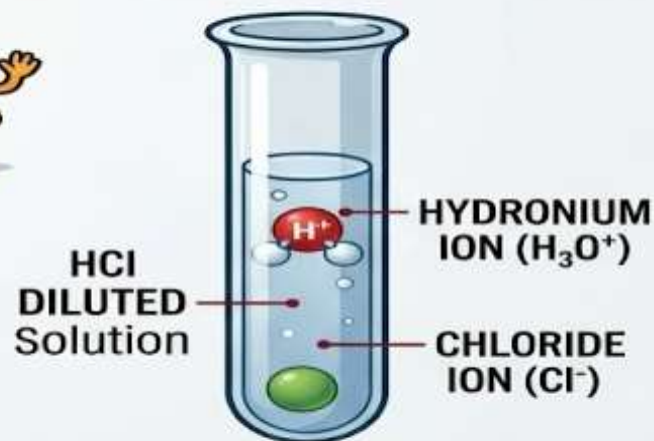
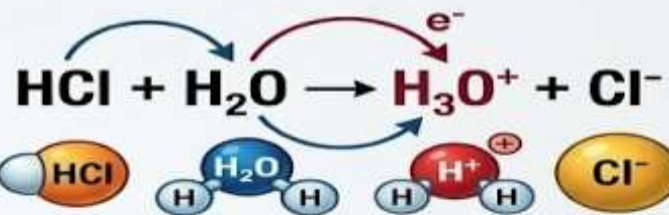
### STEP 2: $\text{H}^+$ ION REACTIONS WITH WATER



$\text{H}^+$  IS TOO REACTIVE TO EXIST ALONE; IT IMMEDIATELY BONDS WITH WATER.



## ACID DISSOCIATION IN AQUEOUS SOLUTION (e.g., HCl)



IN AN AQUEOUS (WATER) SOLUTION, ACIDS ALWAYS FORM HYDRONIUM IONS.

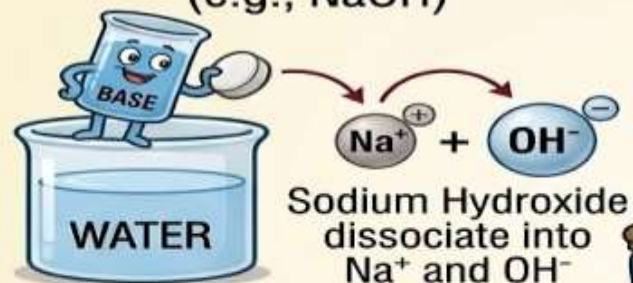


# PRODUCING HYDROXIDE IONS (OH<sup>-</sup>) IN BASES



## FORMATION OF THE HYDROXIDE ION (OH<sup>-</sup>)

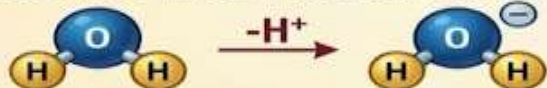
### STEP 1: IONISATION OF BASE (e.g., NaOH)



### STEP 2: OH<sup>-</sup> ION REACTION WITH WATER



Auto-ionization of water can contribute OH<sup>-</sup>, but the primary source in OH<sup>-</sup> concentration.

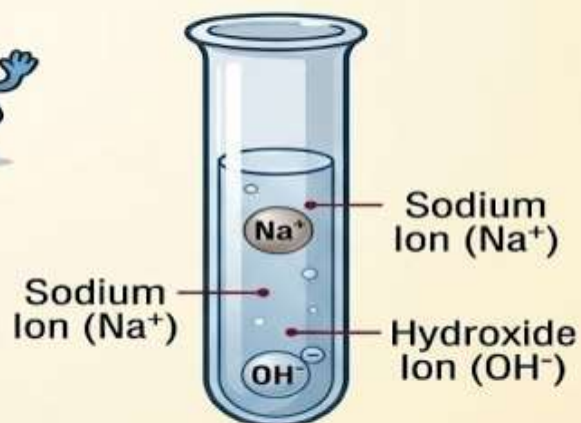
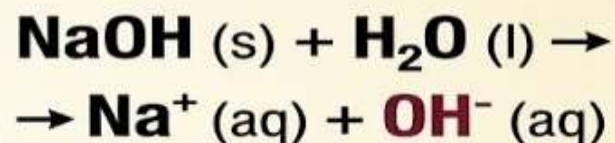


Auto-ionization of water can contribute OH<sup>-</sup>, but the primary source is the base dissociation.



## BASE DISSOCIATION IN AQUEOUS SOLUTION

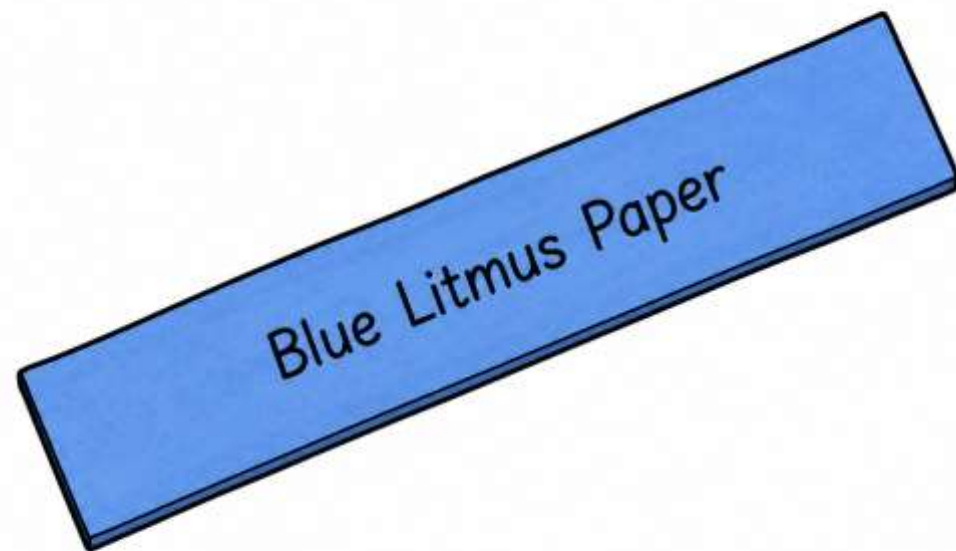
### CHEMICAL REACTION (e.g., NaOH)



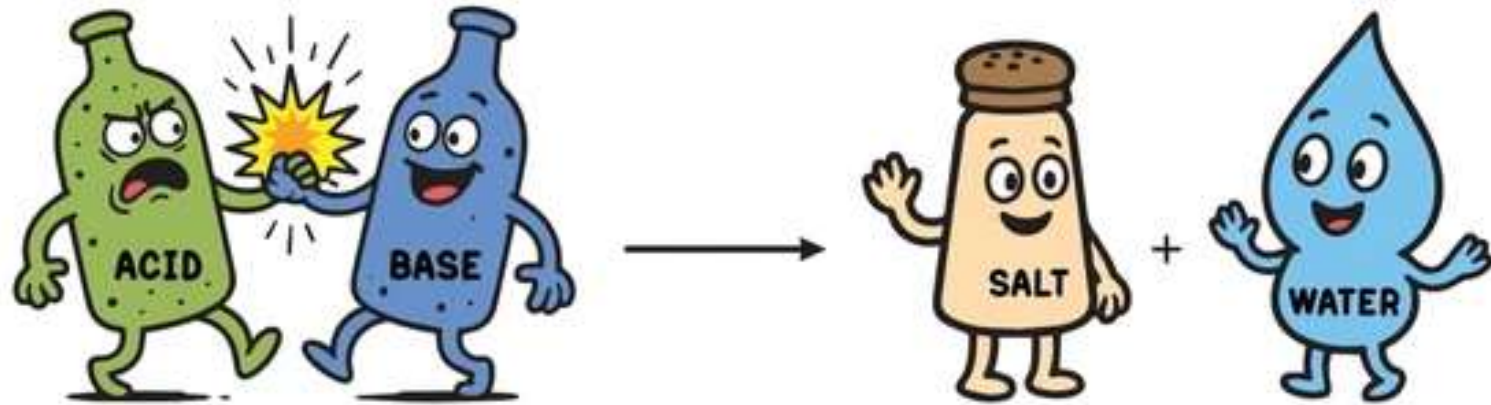
**IN AQUEOUS (WATER) SOLUTION, BASES FORM HYDROXIDE IONS (OH<sup>-</sup>).**



Dry Hcl Gas + Blue Litmus = ?



## NEUTRALIZATION REACTION



Example -



# WHY DO WE ADD ACIDS TO WATER AND NOT WATER TO ACID?



# Exceptional Case :

**Nitric acid is an Exception. It will oxidize H<sub>2</sub> into H<sub>2</sub>O.**

## **THE NITRIC ACID (HNO<sub>3</sub>) REACTION: STRONG OXIDATION**



**One more Exception:**

**Nitric Acid + Magnesium or Manganese gives Hydrogen gas.**

**Nitric acid is a powerful Oxidizing agent.**