ca | Foundation

missiongyan
LET'S LEARN TOGETHER

Class - 10

Chapter - 2

# ACIDS, BASES AND SALTS

Part-6

## pH Scale and Its Importance



Disha Didi (DD)

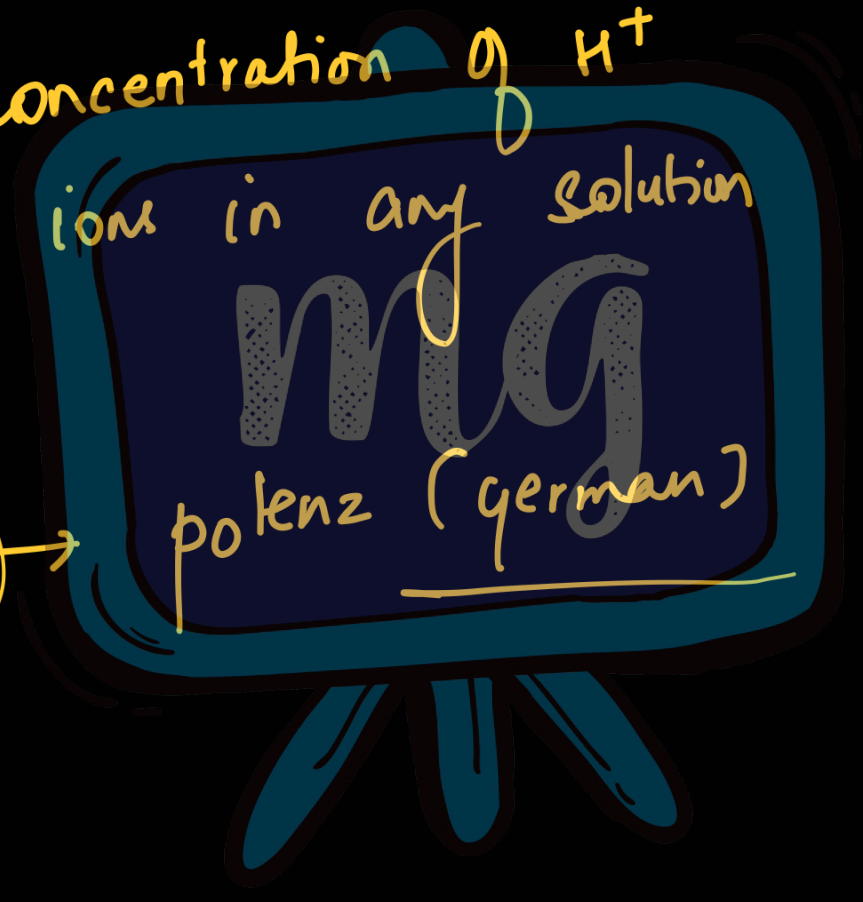
pH

↓

power of hydrogen ions

↓

Concentration of $H^+$ ions in any solution

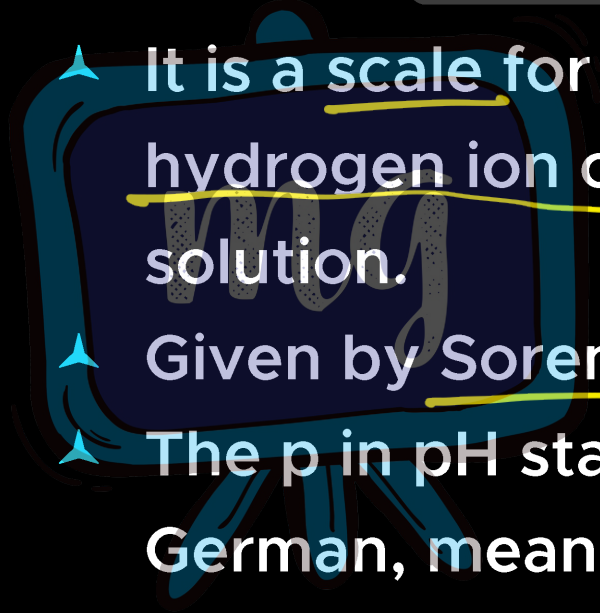



pH → potenz (german)

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

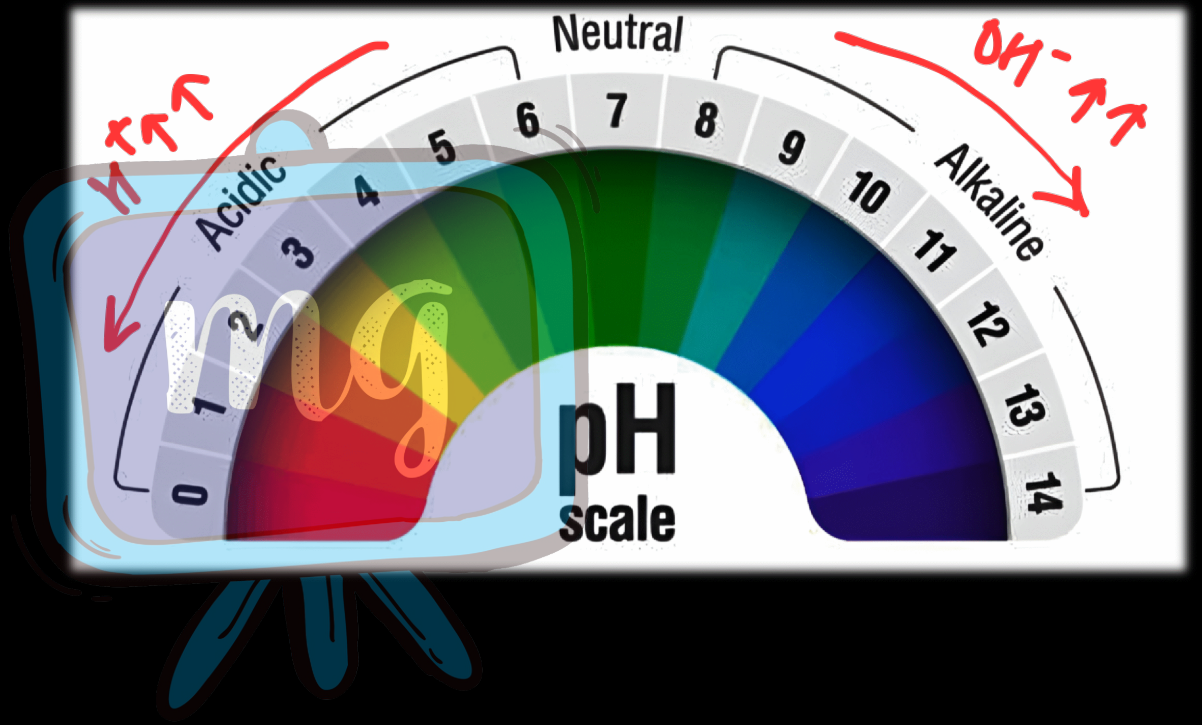
# pH Scale



- It is a scale for measuring hydrogen ion concentration in a solution.
- Given by Sorensen.
- The p in pH stands for 'potenz' in German, meaning power.
- pH generally from 0 (very acidic) to 14 (very alkaline).

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

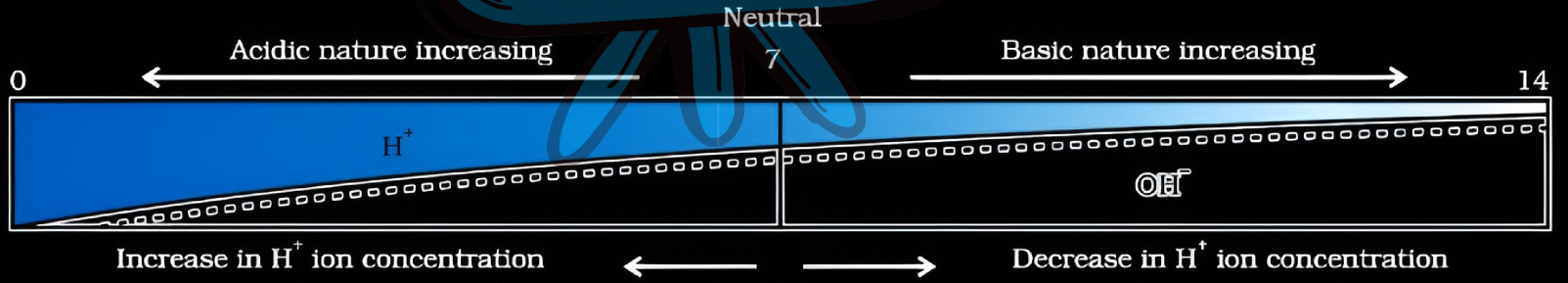


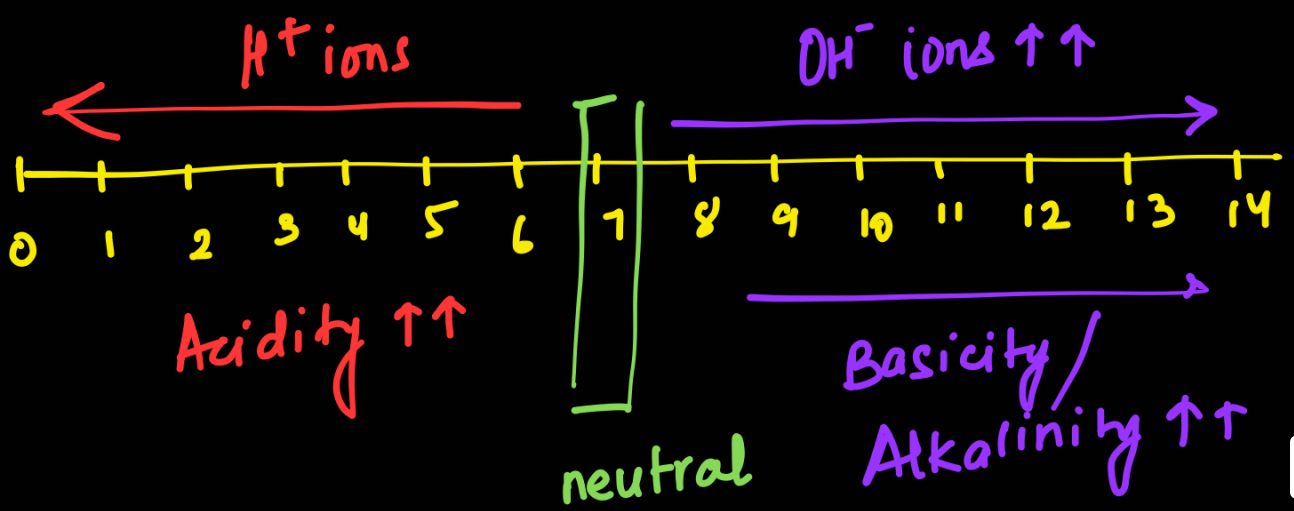
ca | Foundation

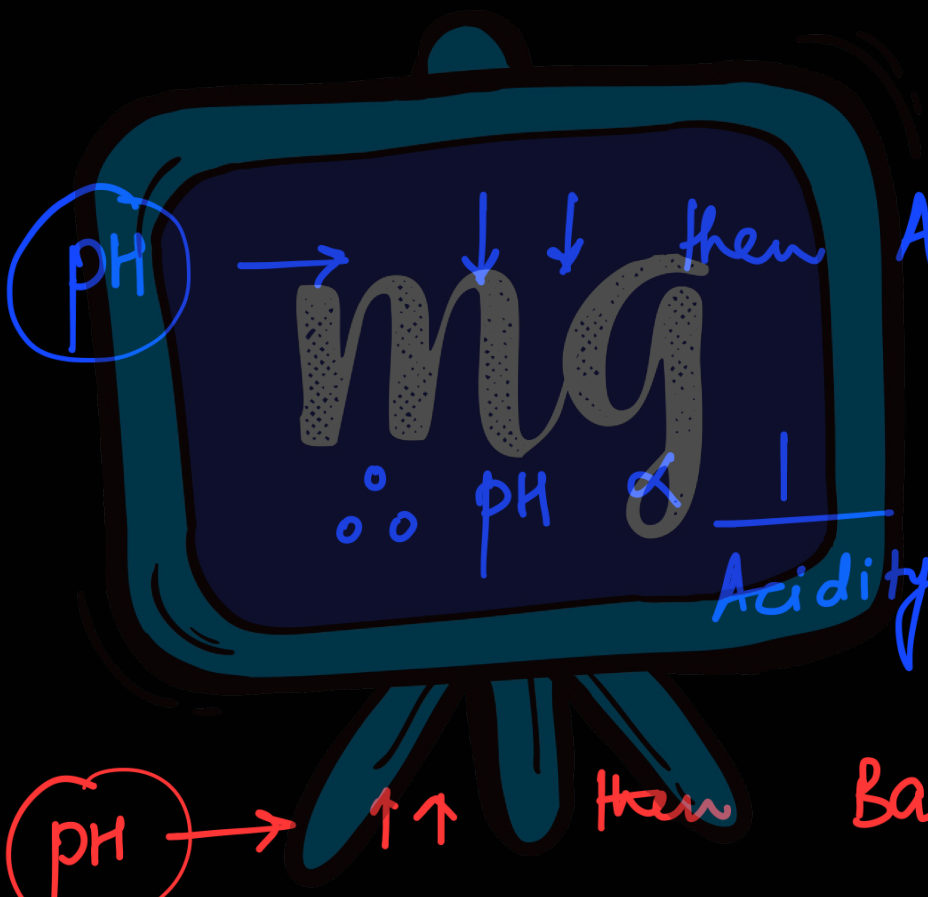
missiongyan LET'S LEARN TOGETHER

- pH > 7, solution is basic.
- pH = 7, solution is neutral.
- pH < 7, solution is acidic.

$$pH \propto \frac{1}{Acidity} \propto Basicity$$





pH → ↓ ↓ then Acidity ↑↑

∴ pH ∝ $\frac{1}{\text{Acidity}}$

pH → ↑↑ then Basicity ↑↑

∴ pH ∝ Basicity

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

## Universal Indicator —

- Universal indicator is a mixture of several indicators or dyes which gives different colours at different concentrations of hydrogen ions in a solution.

ca | Foundation

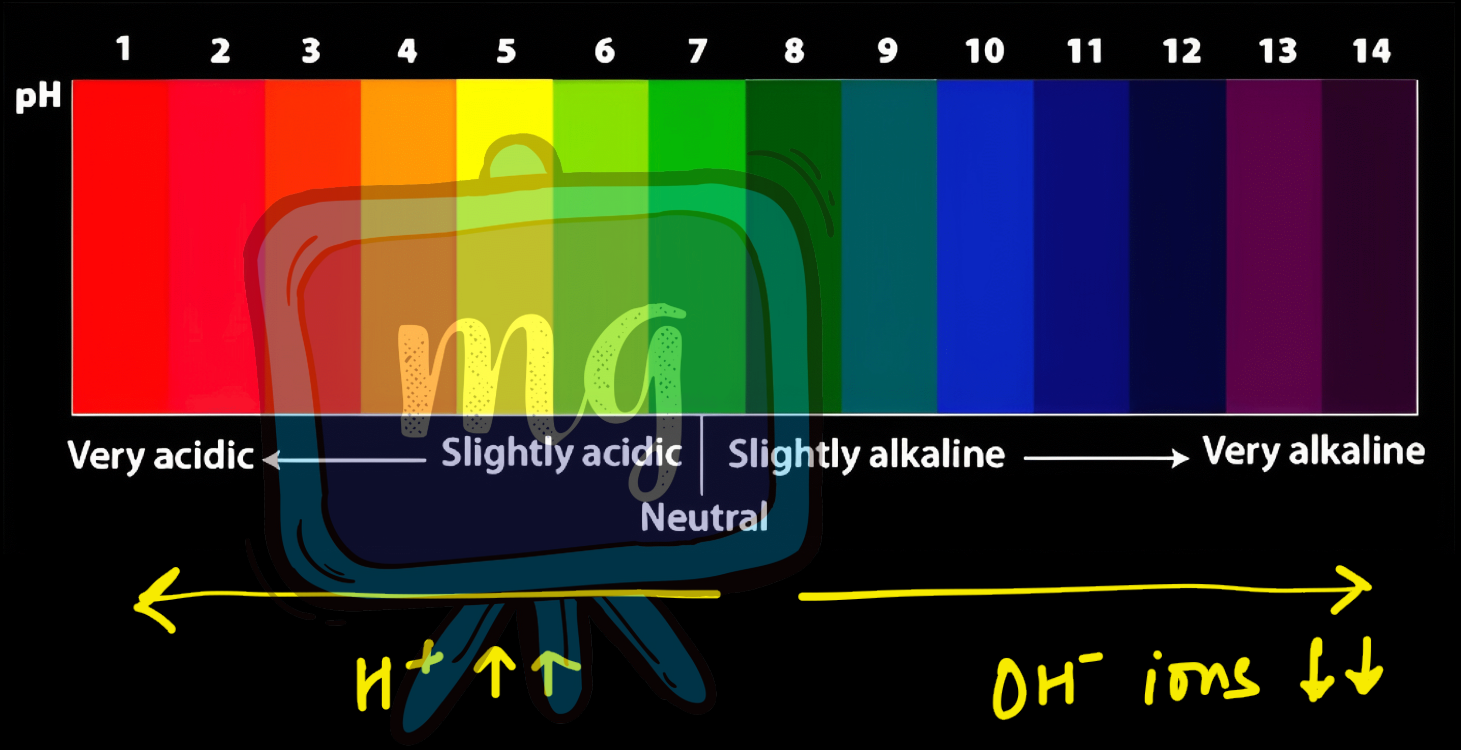
missiongyan
LET'S LEARN TOGETHER

- The colours produced by the universal indicator at various values of pH are given below:

| pH | Colour | pH | Colour | pH | Colour |
|---|---|---|---|---|---|
| 0 | Dark Red | 5 | Orange Yellow | 10 | Navy Blue |
| 1 | Red | 6 | Greenish Yellow | 11 | Purple |
| 2 | Red | 7 | Green | 12 | Dark Purple |
| 3 | Orange Red | 8 | Greenish Blue | 13 | Violet |
| 4 | Orange | 9 | Blue | 14 | Violet |

ca | Foundation

missiongyan
LET'S LEARN TOGETHER



ca | Foundation

missiongyan
LET'S LEARN TOGETHER

# Importance of pH

## Plants and Animals pH Sensitive —

- Our body works within the pH range of 7.0 to 7.8.
- Living organisms can survive only in a narrow range of pH change.

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

Pollutants :

$NO_2$ $SO_2$

↓ $H_2O$ ↓

weak acids

dilute $HNO_3$

dilute $H_2SO_4$

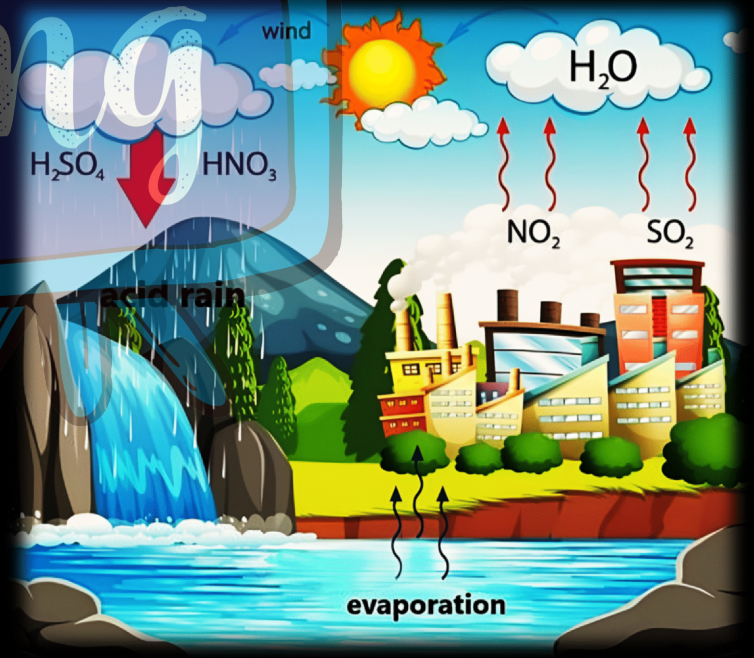
↓

fall as acid rain

pH < 5.6

## Acid Rain —

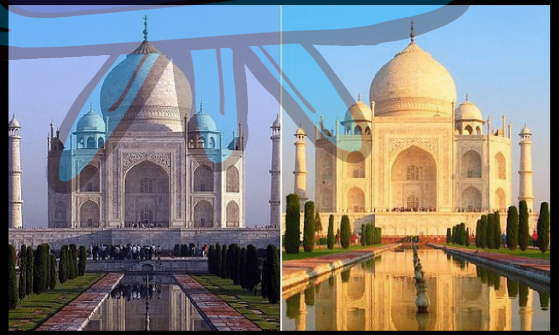
- When pH of rain water is less than 5.6, it is called acid rain.



ca | Foundation

missiongyan
LET'S LEARN TOGETHER

- When acid rain flows into the rivers, it lowers the pH of the river water.
- The survival of aquatic life in such rivers becomes difficult.



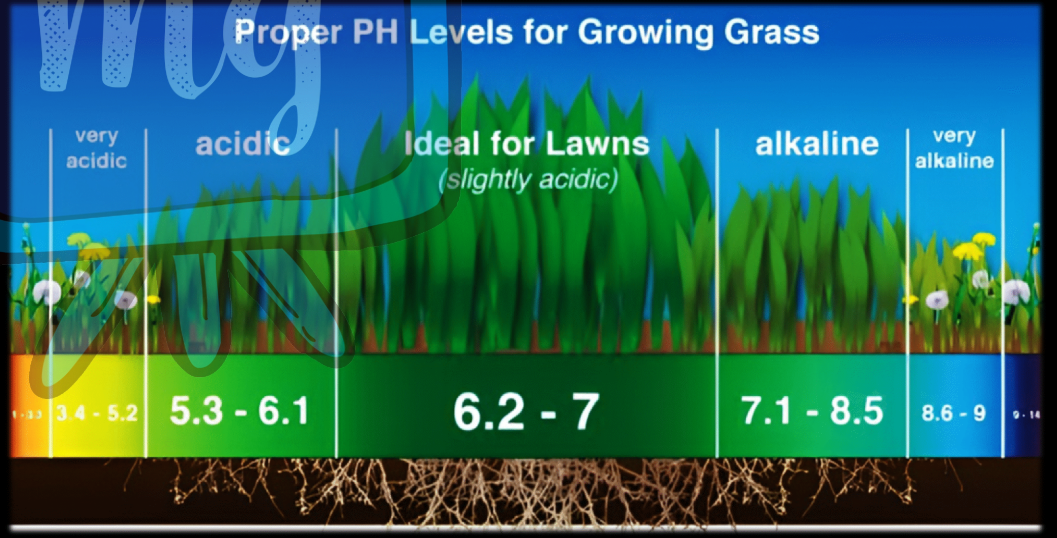


ca | Foundation

missiongyan LET'S LEARN TOGETHER

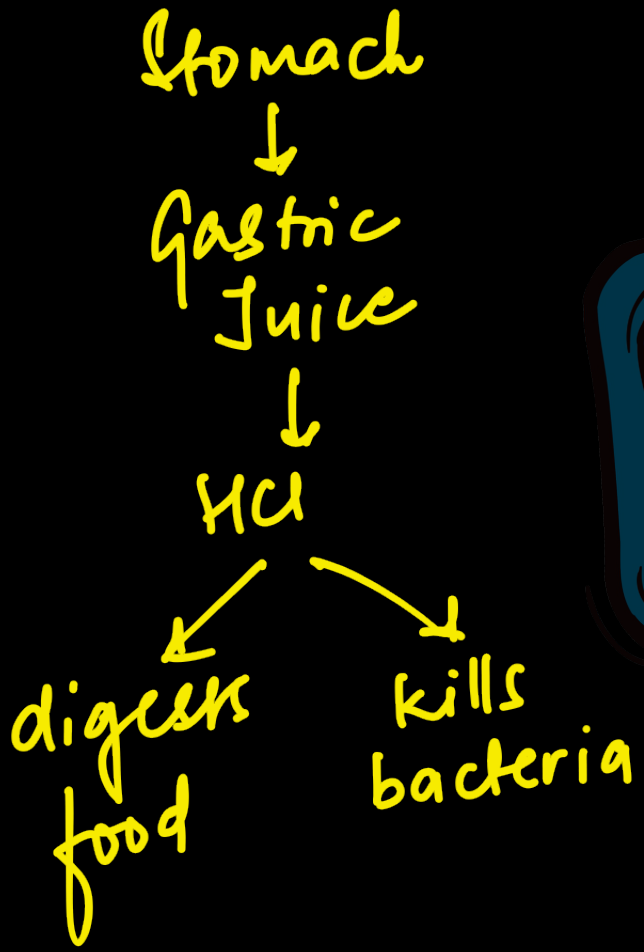
## pH of the Soil –

- Plants require a specific pH range for their healthy growth.



ca | Foundation

missiongyan
LET'S LEARN TOGETHER




## pH in our Digestive System —

- Our stomach produces hydrochloric acid.
- It helps in the digestion of food.
- During indigestion the stomach produces too much acid and this causes pain and irritation.

Overeating

Spicy food

↓

Excessive HCl Production

→ burning sensation

→ pain

↓

ACIDITY

↓

neutralize ?

↓

add BASE

∴ ACID + BASE → SALT + WATER

BASE → $Mg(OH)_2$ : Milk of Magnesia

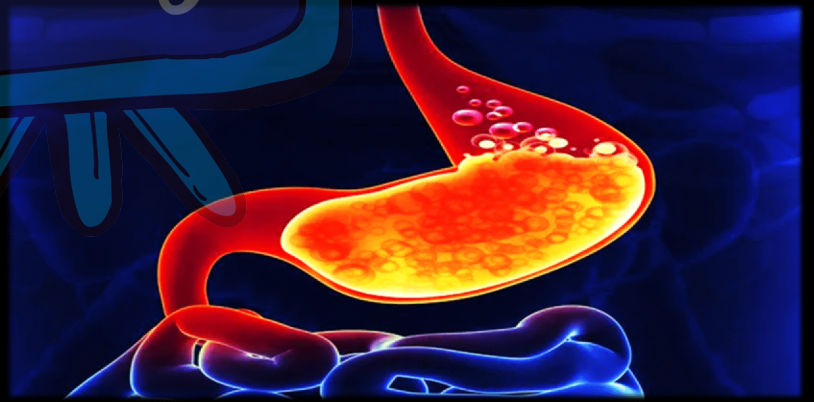
↓

ANTACID

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

- To get rid of this pain, people use bases called antacids.
- These antacids neutralise the excess acid.



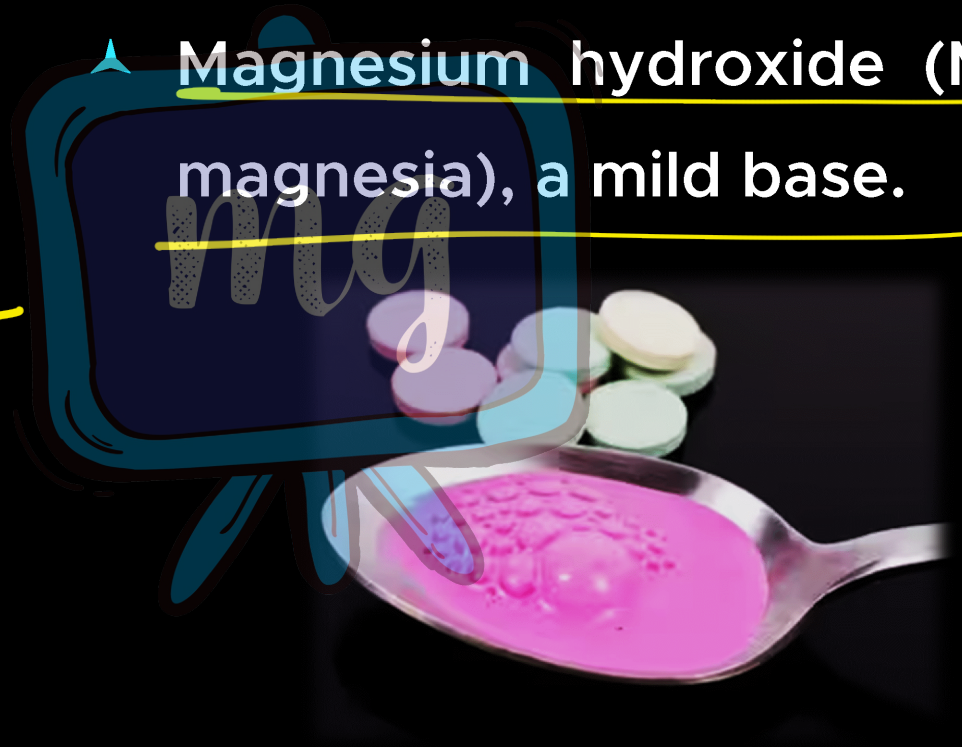
ca | Foundation

missiongyan
LET'S LEARN TOGETHER

## Example :

- Magnesium hydroxide (Milk of magnesia), a mild base.

$Mg(OH)_2$



Tooth

↓

Enamel

↓

Calcium Hydroxyapatite

↓

Crystalline form of Calcium Phosphate ($Ca_3(PO_4)_2$)

HARDEST SUBSTANCE IN HUMAN BODY

FOOD PARTICLES / SUGAR → Bacteria degrade to form → ↓ → ACIDS

ACIDS produced in mouth

↓

mouth pH < 5.5

↓

TOOTH DECAY

Enamel gets Degraded.

!!!

ACID → neutralize → Base

↓

Toothpaste

↓

Clears acid from mouth

☺

TOOTH DECAY PREVENTED

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

## pH Change Leads to Tooth Decay—

- Tooth enamel, made up of calcium hydroxyapatite (a crystalline form of calcium phosphate) is the hardest substance in the body.
- Tooth decay starts when the pH of the mouth is lower than 5.5.

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

- Bacteria present in the mouth produce acids by degradation of sugar and food particles.
- To prevent this clean the mouth after eating food.



ca | Foundation

missiongyan
LET'S LEARN TOGETHER

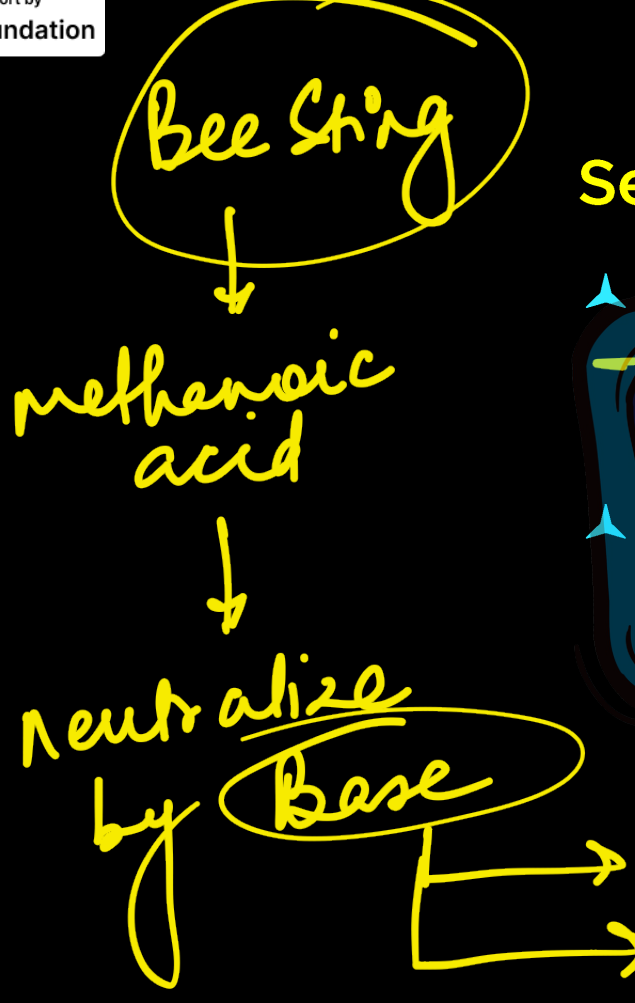
- Using toothpastes, which are generally basic, for cleaning the teeth can neutralise the excess acid.






ca | Foundation

missiongyan
LET'S LEARN TOGETHER




## Self Defence by Animals and Plants—

- Bee-sting leaves an acid which causes pain and irritation.
- Use of a mild base like baking soda on the stung area gives relief.

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

Nettle
↓
stinging
↓
methanoic acid
↓
neutralize
↓
Dock Plant (Basic)



- Stinging hair of nettle leaves inject methanoic acid causing burning pain.
- It is cures by rubbing the affected area with the leaves of dock plant, which often grow beside the nettle plant.

ca | Foundation

missiongyan LET'S LEARN TOGETHER

# pH of some common substances

| Solution | Colour of pH paper | Approximate pH value | Nature of substances |
|---|---|---|---|
| Saliva (before meal) | Red | 6.5-6.9 | Acidic |
| Saliva (after meal) | Red | 5.1-5.5 | Acidic |
| Lemon juice | Red | 2.2-2.4 | Acidic |
| Colourless aerated drink | Red | 3.0-3.5 | Acidic |
| Carrot juice | Red | 4.0-4.5 | Acidic |

ca | Foundation

missiongyan
LET'S LEARN TOGETHER

| Solution | Colour of pH paper | Approximate pH value | Nature of substances |
|---|---|---|---|
| Coffee | Red | 4.5-5.5 | Acidic |
| Tomato juice | Red | 4.0-4.4 | Acidic |
| Tap water | No effect | 7 | Neutral |
| 1 M NaOH | Blue | 14.0 | Alkaline |
| 1 M HCL | Red | 1.0 | Acidic |

ca | Foundation

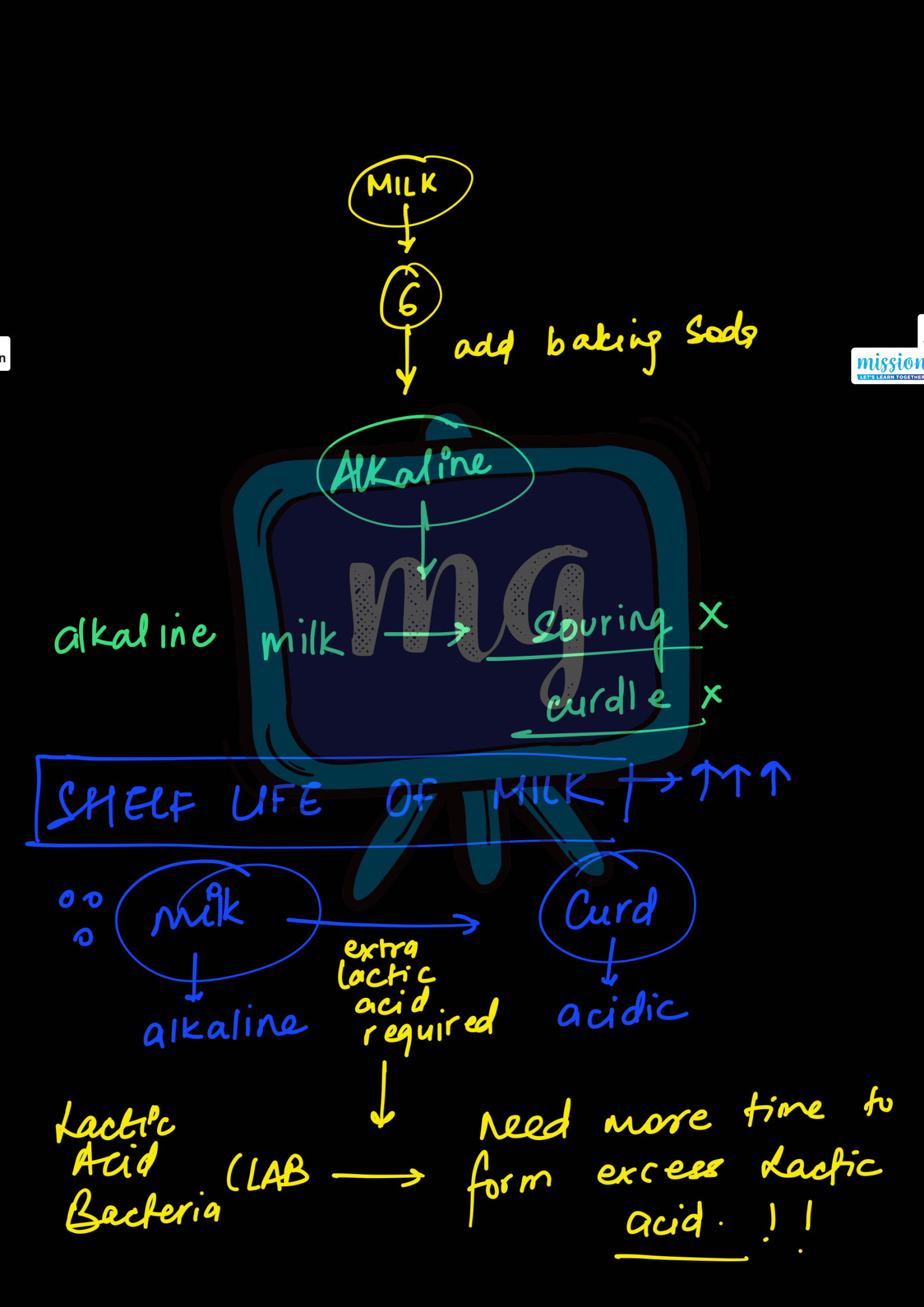
missiongyan
LET'S LEARN TOGETHER



A milkman adds a very small amount of baking soda to fresh milk.

(A) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?

(B) Why does this milk take a long time to set as curd?


MILK
add baking Soda
Alkaline
alkaline milk → souring X
curdle X
SHELF LIFE OF MILK ↑↑↑↑
milk
Curd
extra lactic acid required
alkaline
acidic
Lactic Acid Bacteria (LAB → Need more time to form excess Lactic acid. !!

ca | Foundation

missiongyan
LET'S LEARN TOGETHER



Amit saw that in his kitchen garden, the plants do not grow well. He suggested his mother to get the soil tested and it was found that the soil is acidic in nature and the pH value is between 4.0 - 5.0. What should be added to treat the soil and why?

add basic solution

↓

$NaHCO_3$

(Sodium bicarbonate)

baking soda.