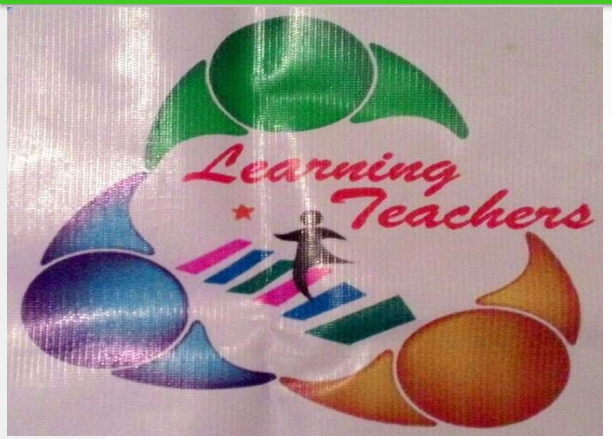
2 Acids and Bases



T SREELAL

NSS UPS UPPADA

Learning teachers Kerala

Acids and Bases

Let's go through the magic world of acids and Bases

welcome

What is behind this magic...?

03.07.24
Wednesday

Our Science teacher usually comes to the class with some science experiments that kindle the curiosity of the children. Today the teacher had brought two transparent glass tumblers. One of them contained a pink liquid. The second tumbler was empty. The teacher placed both the tumblers on the table. She asked me to pour the pink liquid from the first tumbler into the empty glass tumbler. I did the same. And then, something amazing happened!! The pink liquid that was poured into the second tumbler turned yellow! We were thrilled by this magic.

Haven't you read Jinu's diary entry?

What could be the secret behind the experiment?

Let’s do the experiment

You can collect many materials that are required to conduct science experiments from your home and surroundings. Science Kit is a collection of such materials.

Materials to be kept in the Science Kit to conduct the experiments in this unit are....

- transparent glass tumblers,
- pink coloured water obtained by water boiled with pathimugam,
- vinegar, tamarind water, lemon juice, salt, ash, lime, baking soda and buttermilk.

You can expand your kit by adding more materials required to conduct experiments in each unit.

Experiment

- Take out the glass tumblers from your Science Kit and arrange them on the desk.
- Add two or three drops of vinegar, tamarind water, lemon juice, salt solution, ash suspension and baking soda solution into separate tumblers.
- Pour half a glass of pathimugam water into each tumbler.
- Does the water in any of the tumblers turn yellow? Record your observation?

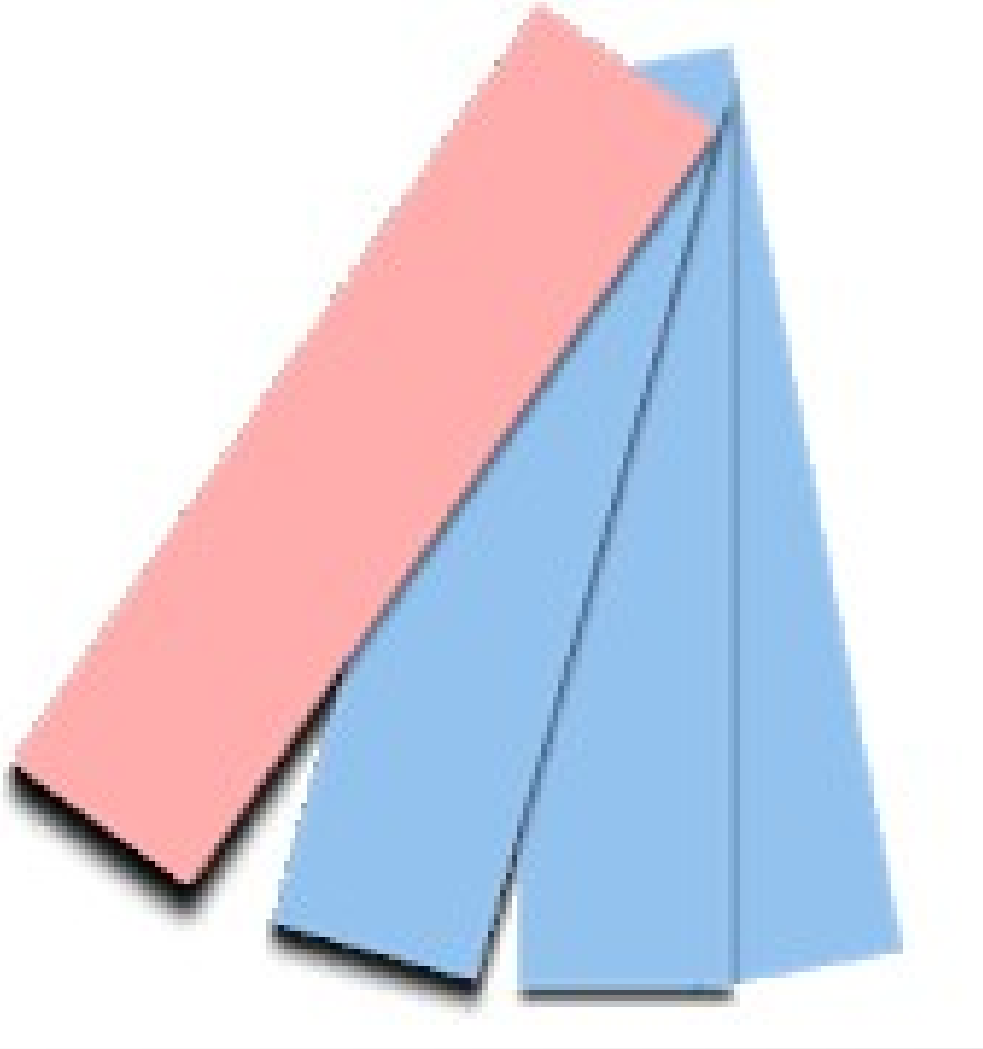
Do the substances that turned pathimugam water into yellow have anything common in their taste?

Behind the sour taste....

The sour taste is due to the presence of Some acids in them.

Litmus paper

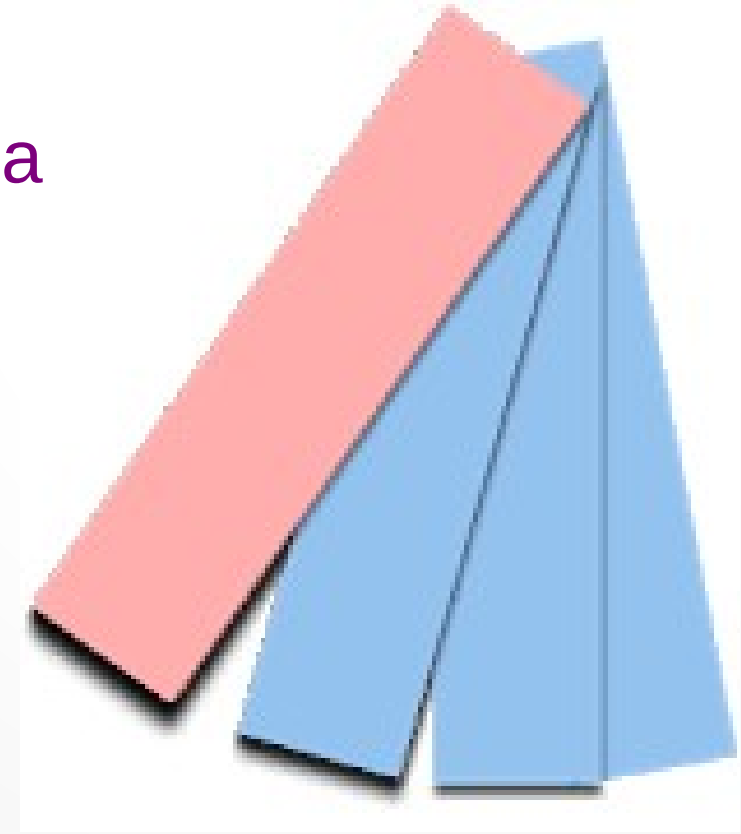
- Litmus is a dye made from the extract of lichens which grow on trees, rocks etc. It helps to identify the nature of substances by changing their colour.
- The extract of lichens is applied on paper to make litmus paper and dissolved in water to make a litmus solution.
- Litmus papers and litmus solutions of blue and red colours are available in school laboratories.



Let's do an experiment...

Take blue and red litmus papers from the school laboratory. Dip blue and red litmus papers in these liquids. Tabulate your observations

- Soap water
- Lemon juice
- Clear baking soda solution
- Clear lime water
- Vinegar
- Buttermilk
- Tamarind water
- Clear ash suspension



Let's check the results

Liquid	Colour change	
	In blue litmus	In red litmus
Soap water	Blue	Blue
Lemon juice	Red	Red
Clear baking soda solution	Blue	Blue
Clear lime water	Blue	Blue
Vinegar	Red	Red
Buttermilk	Red	Red
Tamarind water	Red	Red
Clear ash suspension	Blue	Blue

Acids are substances that turn blue litmus into red.
Substances that turn red litmus into blue are bases.

Alternative for Litmus

Rub a red Hibiscus flower thoroughly on both sides of a white paper. What is the colour of the paper now? This paper can be dried and cut into strips. It can be used instead of blue litmus paper.

Dip this paper in acidic liquids.Didn’t the colour of the paper change? This paper that turned red can be used instead of red litmus paper.

Indicators

Indicators are substances that help to identify acids and bases by changing their colour. Litmus paper is an indicator.

Laboratory Indicators

Two other indicators that are commonly used in laboratories are Phenolphthalein and Methyl Orange.

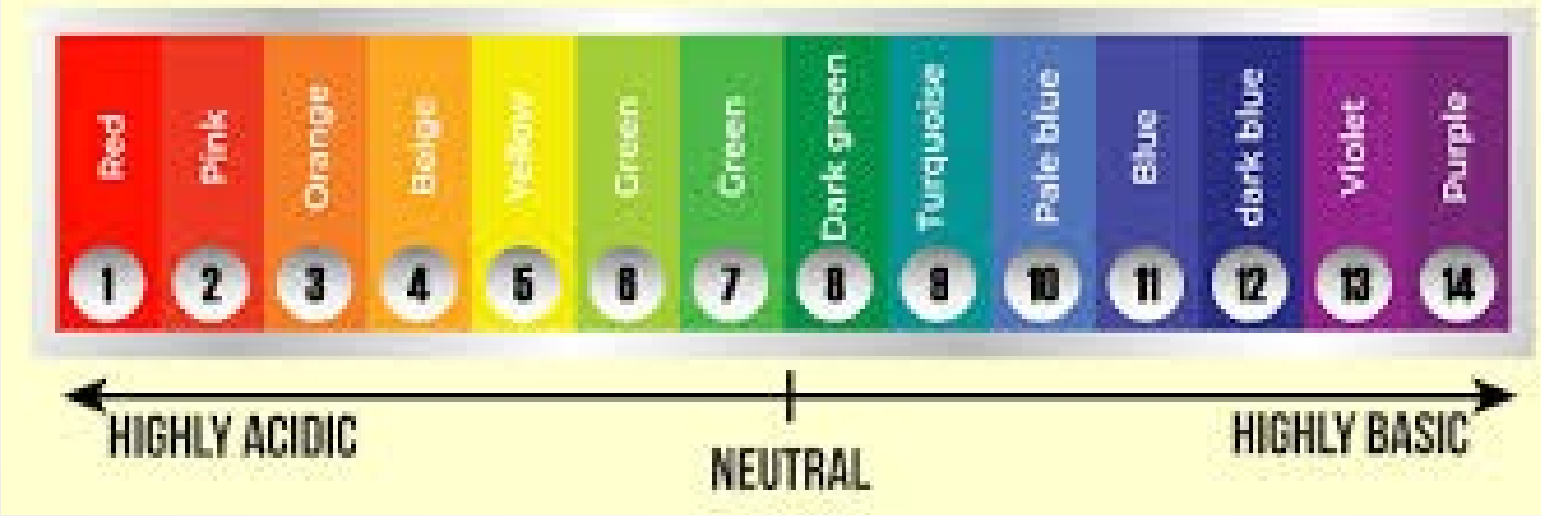
Add two or three drops of MethylOrange and Phenolphthalein in acids and bases and observe the change. Tabulate the colour change.

Let’s tabulate...

Indicator	Colour in acid	Colour in alkali
		
		

Universal indicator

Universal indicator is used to identify both acid and base. It is a mixture of many indicators. When a few drops are added to acids or bases, it gives different colours according to their nature and concentration. It can be determined by comparing with the colour chart on the bottle.



Soap water and Baking soda solution

Taste soap water and Baking soda solution. Soap and baking soda taste the same. They have an alkaline taste.

Dip your fingers in each liquids and rub the fingers together. Don’t you feel slippery?

Bases are alkaline in taste and slippery in nature

Acids in food items

- All food items with sour taste have acids in them. Most fruits contain more than one acid.
- Acids present in food substances are weak.

Acids in food items

Food item	Main acid present
Buttermilk, Curd	Lactic acid
Vinegar	Acetic acid
Lemon	Citric acid
Tamarind	Tartaric acid
Apple	Malic acid
Gooseberry	Ascorbic acid
Tomato	Oxalic acid

Behind the change

How does milk turn acidic when it becomes curd?

- Curd contains a bacteria called Lactobacillus. The lactic acid that is produced when these bacteria nourish themselves with milk, gives curd its sour taste.

Acids and Bases in Laboratories

Acids in food items are weak. But many acids and bases commonly used in laboratories are strong.

Acids	Bases
• Hydrochloric acid • Nitric acid • Sulphuric acid • Acetic acid	• Calcium hydroxide (Lime) • Sodium hydroxide (Caustic soda) • Potassium hydroxide (Caustic potash)

While handling chemicals

- Avoid spilling on body parts
- Don't touch with hands
- Don't smell
- Don't taste
- Use a dropper while taking out acid from a bottle
- Use a holder while using a test tube

If Acid Spills

Strong acids can absorb water and liberate heat. They can cause burns if they get spilled on the body. Pouring cold water on the affected area for a long time is the first aid for this. If the burn is severe, the person should be taken to hospital.

When ants bite.....

There is formic acid in the body of ants. When ants bite, this acid enters our body. This reacts with human body and this is why ant bite causes pain.

Acid in the Body?

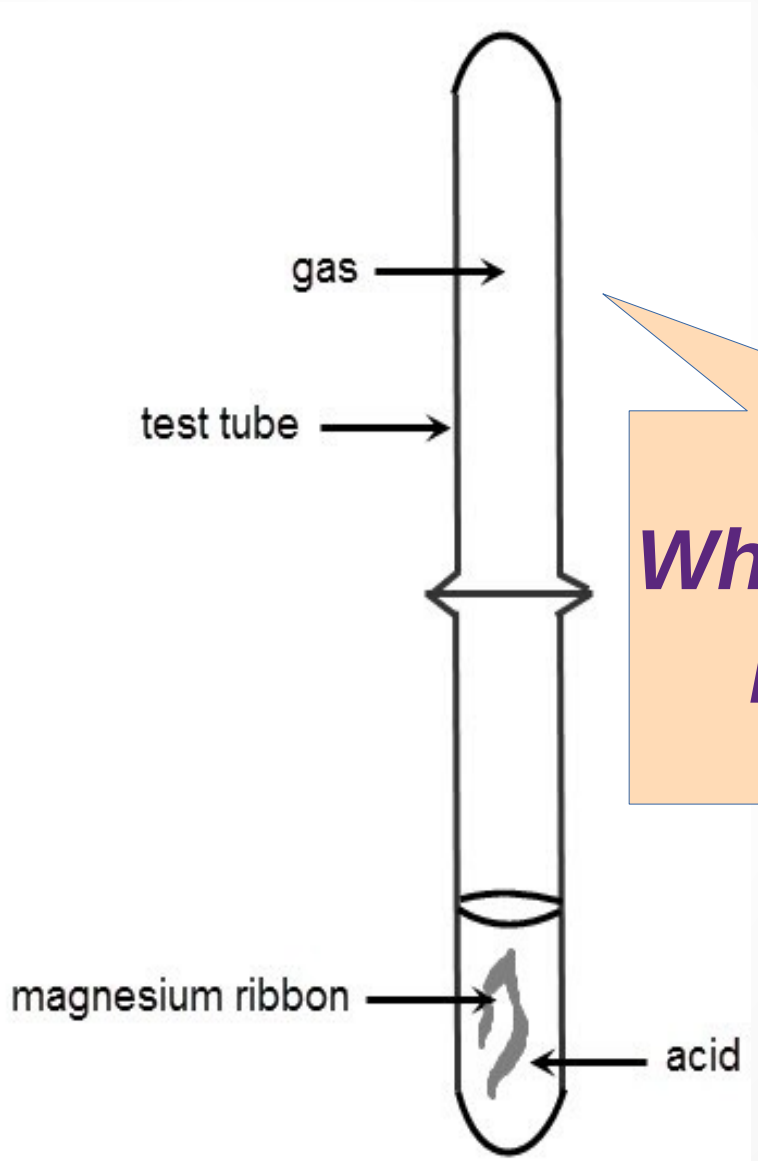
Hydrochloric acid is produced in the stomach to facilitate digestion of food. Some persons may have enhanced production of this acid in their body, resulting in a condition called acidity. Abdominal pain, heartburn, nausea and constipation are the symptoms of acidity. As a remedy for this condition, doctors prescribe medicines called antacids that can neutralize acids.

Experiment

Take a little hydrochloric acid in a test tube and put a few pieces of magnesium ribbon in to it.

What do you see?

Don’t you see bubbles arise from it?

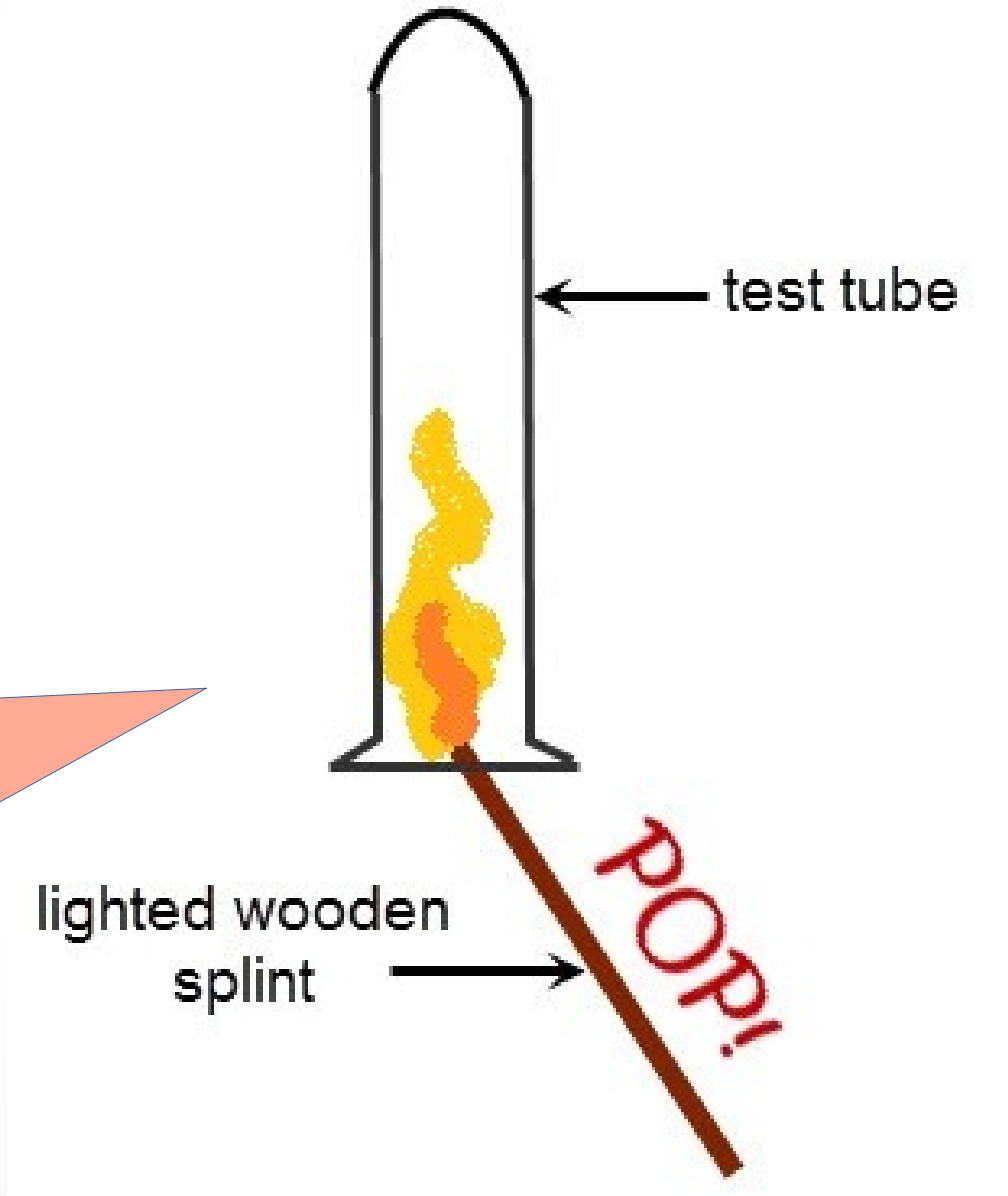


Which is the gas produced ?

Experiment

- Place a lighted wooden splint at the mouth of the above test tube without turning it.
- What do you observe ?

Which is the gas that burned with a sound ?



Burning gas....

This inflammable gas is hydrogen

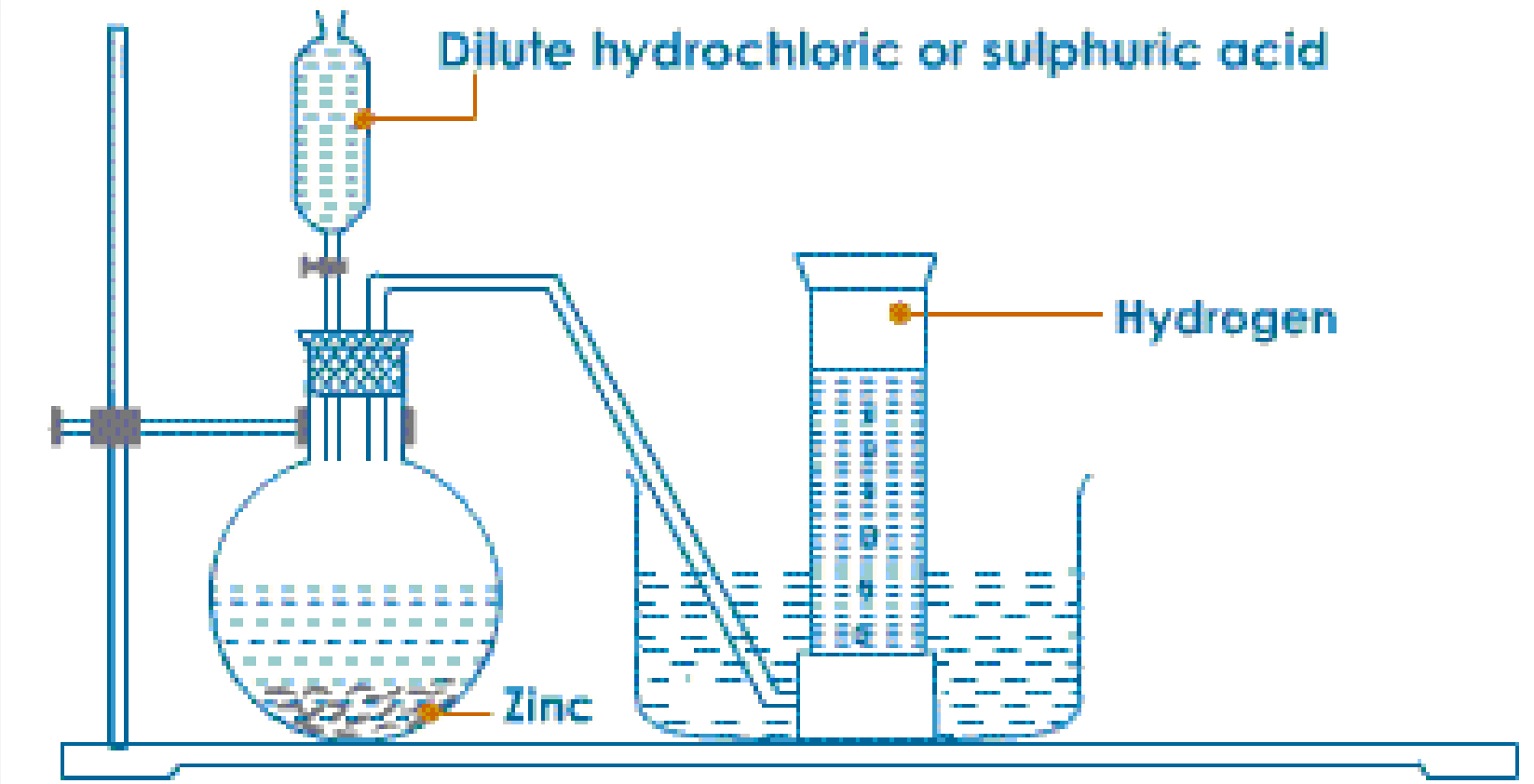
Acids react with metals to produce hydrogen

Behind hydrogen...

The meaning of the word Hydrogen is “Producing water”. Hydrogen reacts with Oxygen to form water.

Hydrogen was identified firstly by the British scientist *Henry Cavendish*

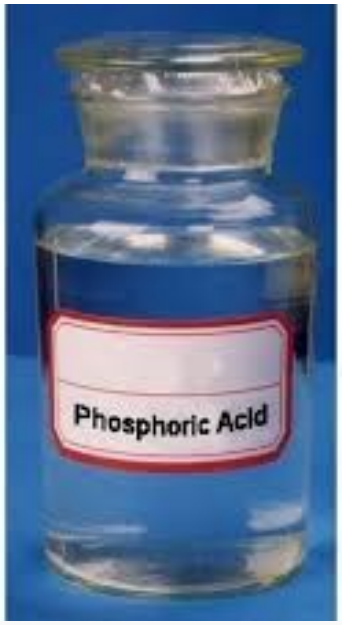
Let's make hydrogen...



Preparation of hydrogen from zinc with dilute acids

Common properties of acids

- ***Sour taste***
- ***Turn blue litmus into red***
- ***React with metals to produce hydrogen***



Common properties of bases

- ***Alkaline taste***
- ***Turn red litmus into blue***
- ***Slippery nature***

Find it out...

Have you noticed the bottles and stoppers of acids ? Why are the metal stoppers not used ?

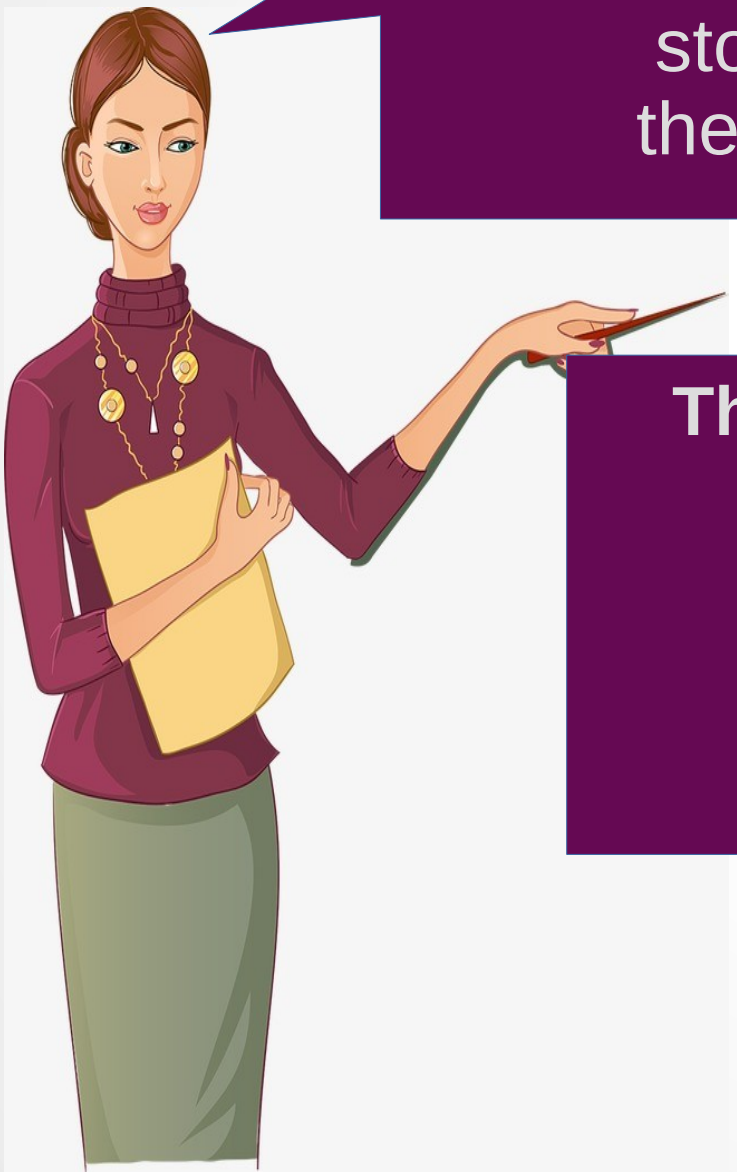
.....

.....

.....

Check your answer...

Have you noticed the bottles and stoppers of acids ? Why are the metal stoppers not used ?



The metal stoppers will react with acids, produce hydrogen and may get damaged soon.

Find it out...

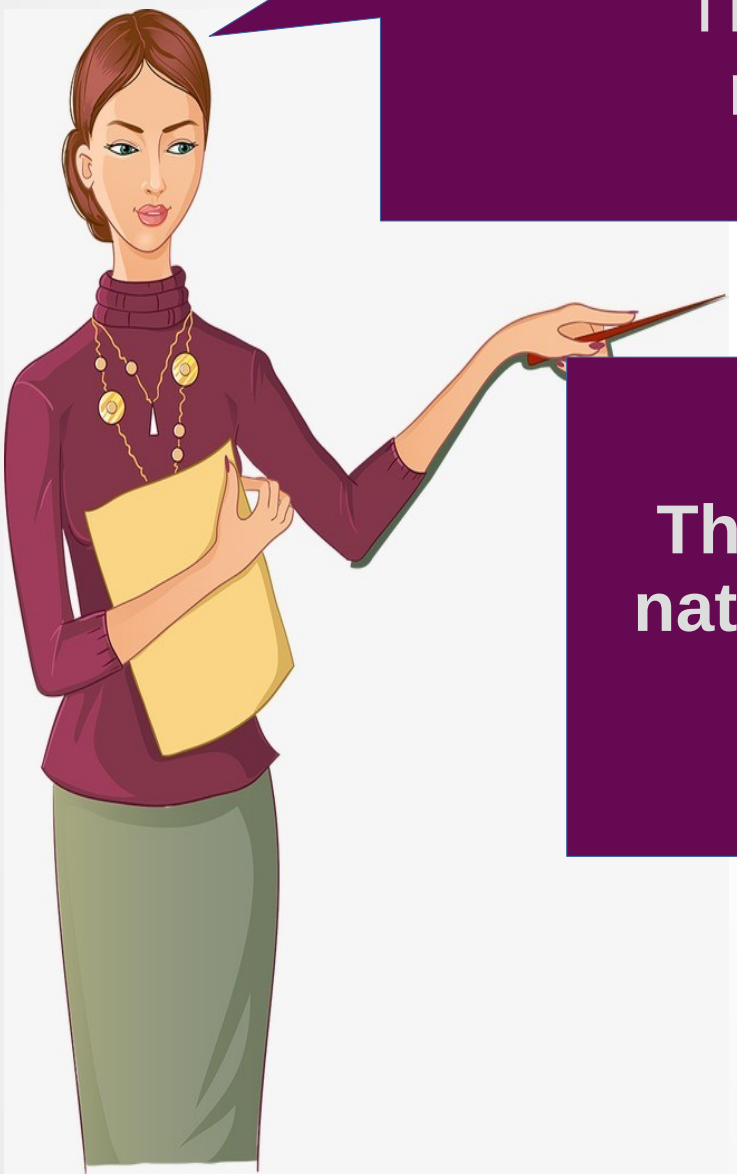
The pickles are not kept in metal containers. Why ?

.....

.....

.....

Check your answer...



The pickles are not kept in metal containers. Why ?

The pickles are acidic in nature. So they may react with metals.

Find it out...

What could be the reason for red colour appearing on clothes when the turmeric stain on them is washed with soap ?

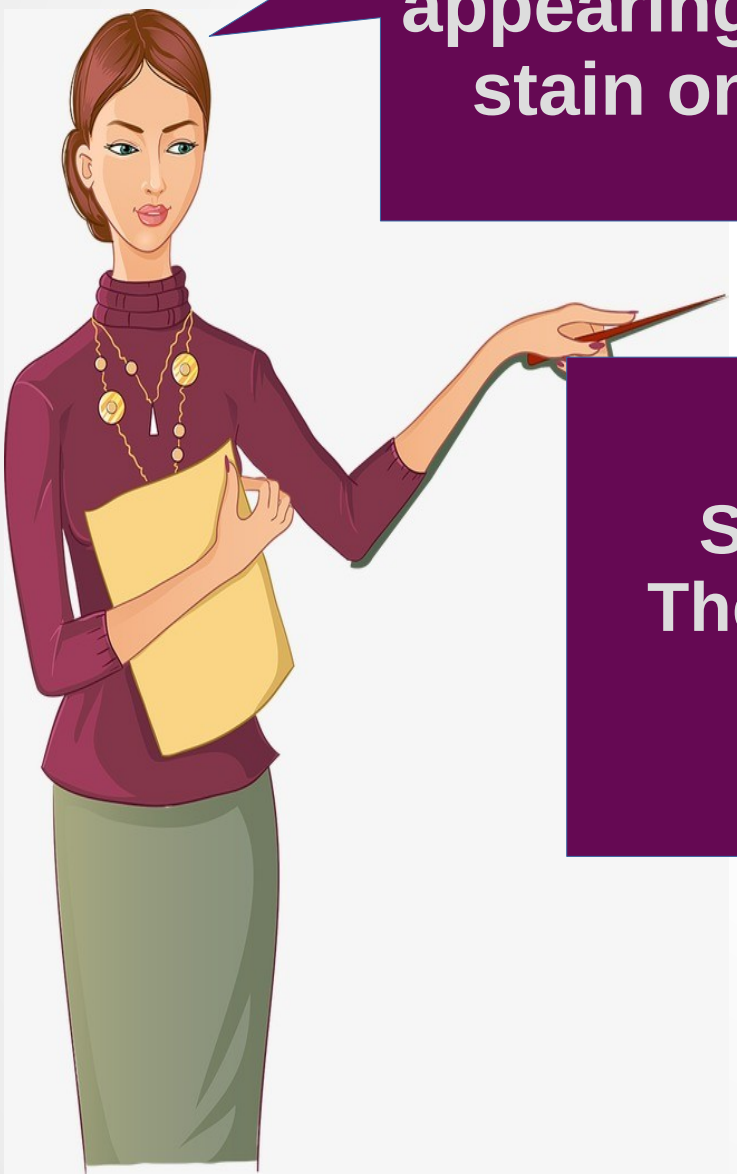
.....

.....

.....

.....

Check your answer...



What could be the reason for red colour appearing on clothes when the turmeric stain on them is washed with soap ?

Soap solution is base.
The colour of turmeric in base is red.

Uses of acids

Acid	Uses
Acetic acid	Preservation of food items
Formic acid	Coagulation of rubber from latex
Citric acid	To make drinks
Sulphuric acid	In motor vehicle batteries and for manufacturingchemical fertilisers
Nitric acid	To make chemical fertilizers, paints and dyes
Tannic acid	To make leather and ink
Carbonic acid	To improve oxygenation within the body

Uses of Bases

Bases	Uses
Calcium hydroxide	Glass manufacturing, to reduce the acidity of soil
Sodium hydroxide	To make soap, paper and rayon
Potassium hydroxide	To make soft soap
Aluminium hydroxide, Magnesium hydroxide	In medicines

Soap making

- **Materials required:-caustic soda-180 g, coconut oil-1kg, water-350 ml, sodium silicate-100 g, stone powder-100 g.**
- **Procedure:- Dissolve caustic soda in water taken in steel vessel. It will be hot. When the solution cools, pour it slowly into coconut oil and stir it.**
  Add stone powder and sodium silicate to increase hardness and quantity.
  Add perfumes and dyes for fragrance and colour.
  Stir well until it get solidifies.
  Fill it into moulds. It will become soap within 3/4 days.
  we can use the soaps after two weeks.




Experiment

- ***Collect various parts of different plants, rub them on a white paper to make their own papers like hibiscus paper.***

- ***(You can use turmeric, mango leaves, rose, beetroot, carrot ... etc for this purpose.)***

- ***Dip the papers in both acid and base and tabulate the colour change that you have observed.***

Table of observation

Substance	Colour in acid	Colour in base
Turmeric	.....	.....
Mango leaves	.....	.....
.....	.....	.....
.....	.....	.....

What are the substances that can be used to distinguish between acids and bases?