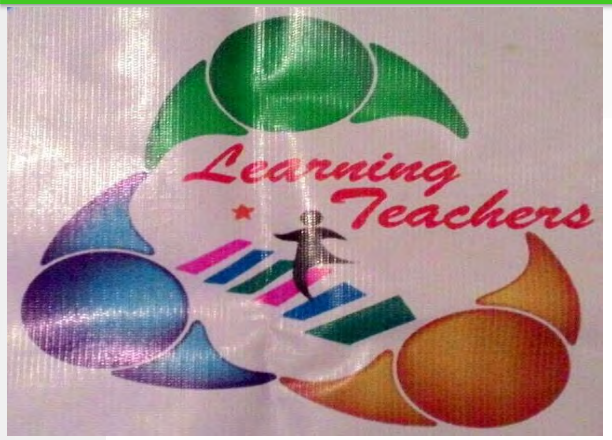
3 Acids and Alkalis



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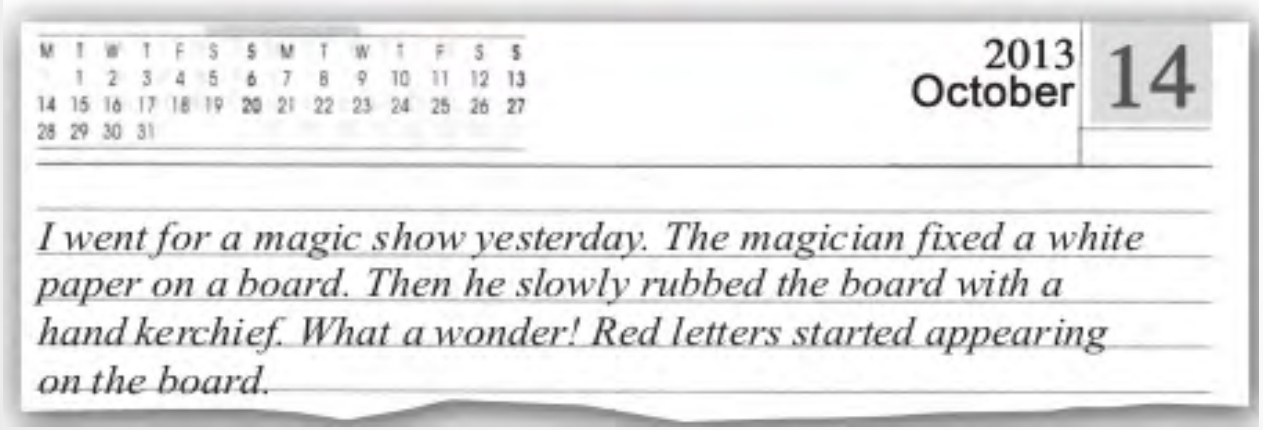
Acids and Alkalis

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

welcome

What is behind this magic...?



Didn’t you read shahana’s diary...?

How did the red letters appear on the board ?

Does the magician have an extra ordinary power ?

Let’s do an experiment

Materials needed:-

White paper, lemon juice, 2/3 hibiscus flower, cloth piece, thin brush/stick.

Procedure:-

Draw the picture of a plant.., draw flower petals with the stick dipped in lemon juice..., allow to get dried.

Rub hibiscus flowers thoroughly on the cloth..., rub the portion of flowers gently with this cloth.

Note down your observation and conclusion.

Let’s check your findings...

Observation :-

Ruddy flowers appear in the rubbed portions.

Inference:-

The essence of hibiscus flower have the capacity to turn the lemon juice into red colour.

Why do it happen ?

Let’s go through another experiment.....

Let's do an experiment...

- **Rub a hibiscus flower on a paper, cut it into small pieces, dip it into the following liquids and tabulate the observed colour change..**
- Buttermilk
- Water
- Coconut oil
- Vinegar
- Soap solution
- Sugar solution
- Tamarind water
- Salt solution
- milk

Let's check the results

Liquid	Colour change
Buttermilk	Red
Water	No change
Coconut oil	No change
Vinegar	Red
Soap solution	No change
Sugar solution	No change
Salt solution	No change
Tamarind water	red
Milk	No change

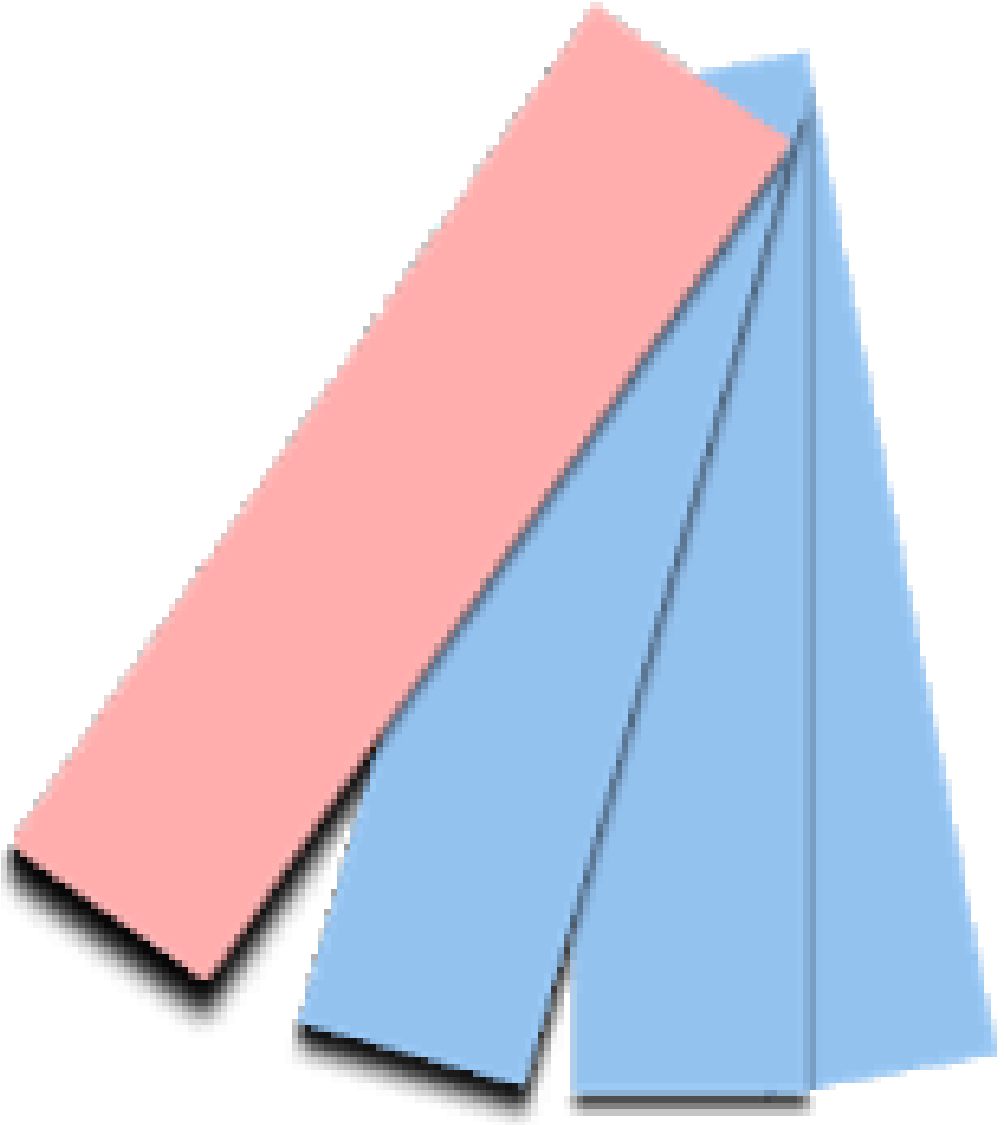
Which are the liquids that turned hibiscus paper red ?

....

Aren't they sour in taste...?

Litmus paper

- In laboratories, litmus is commonly used instead of hibiscus paper. They are available in red and blue colours.



Acids

- Lemon juice, buttermilk, tamarind, vinegar ...etc contain certain acids.
- Litmus paper is red in acids.
- All acids have sour taste.
- Acids present in food substances are weak

While handling chemicals

While handling chemicals...

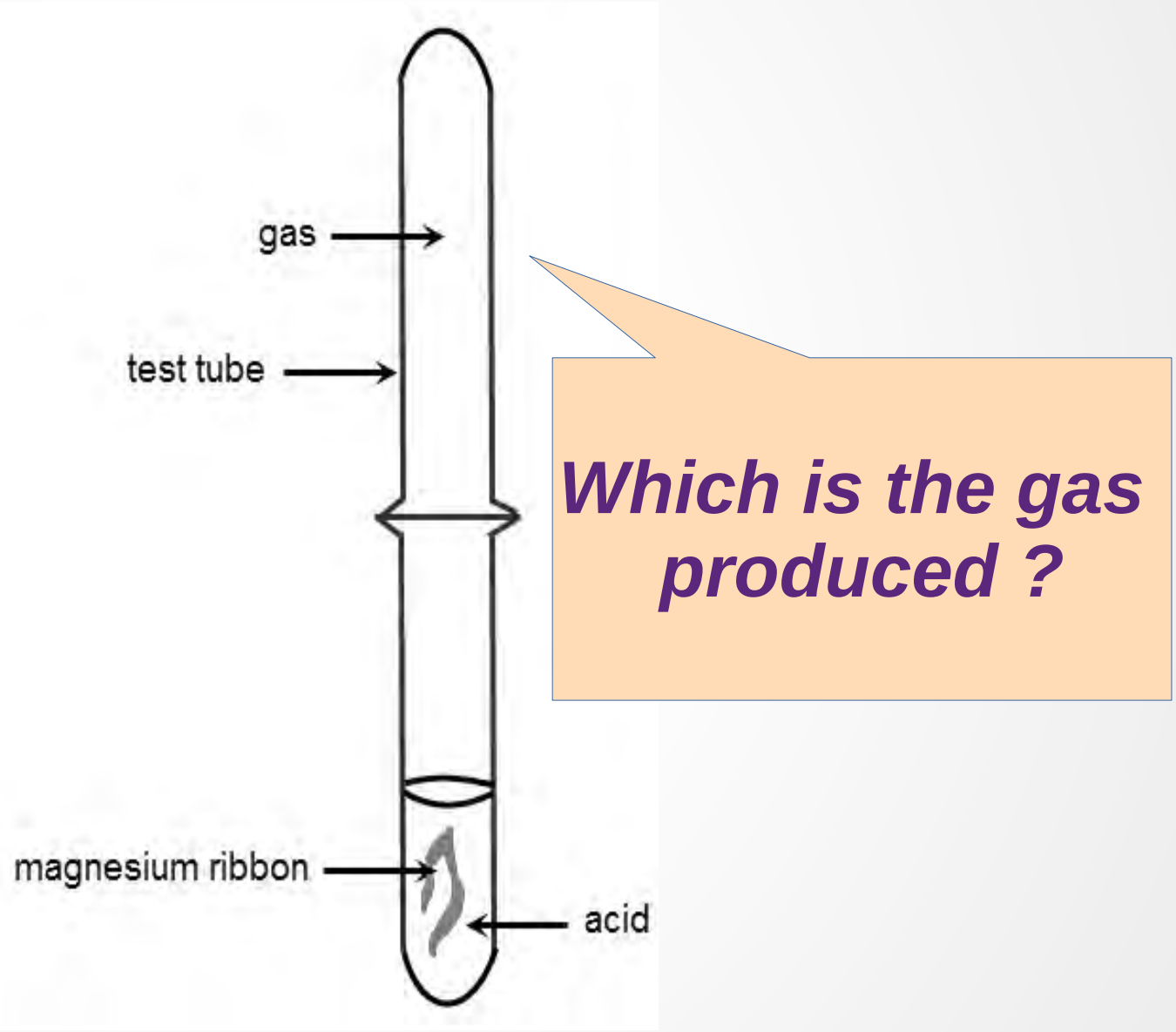
- Do not taste.
- Do not touch.
- Do not smell.
- Do not let it fall on the body.
- Use a dropper while transfe-rring acid from bottle.
- While diluting an acid, pour small quantities of acid slowly into water taken in a beaker, and stir well.
- Use a holder to hold a test tube.

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?

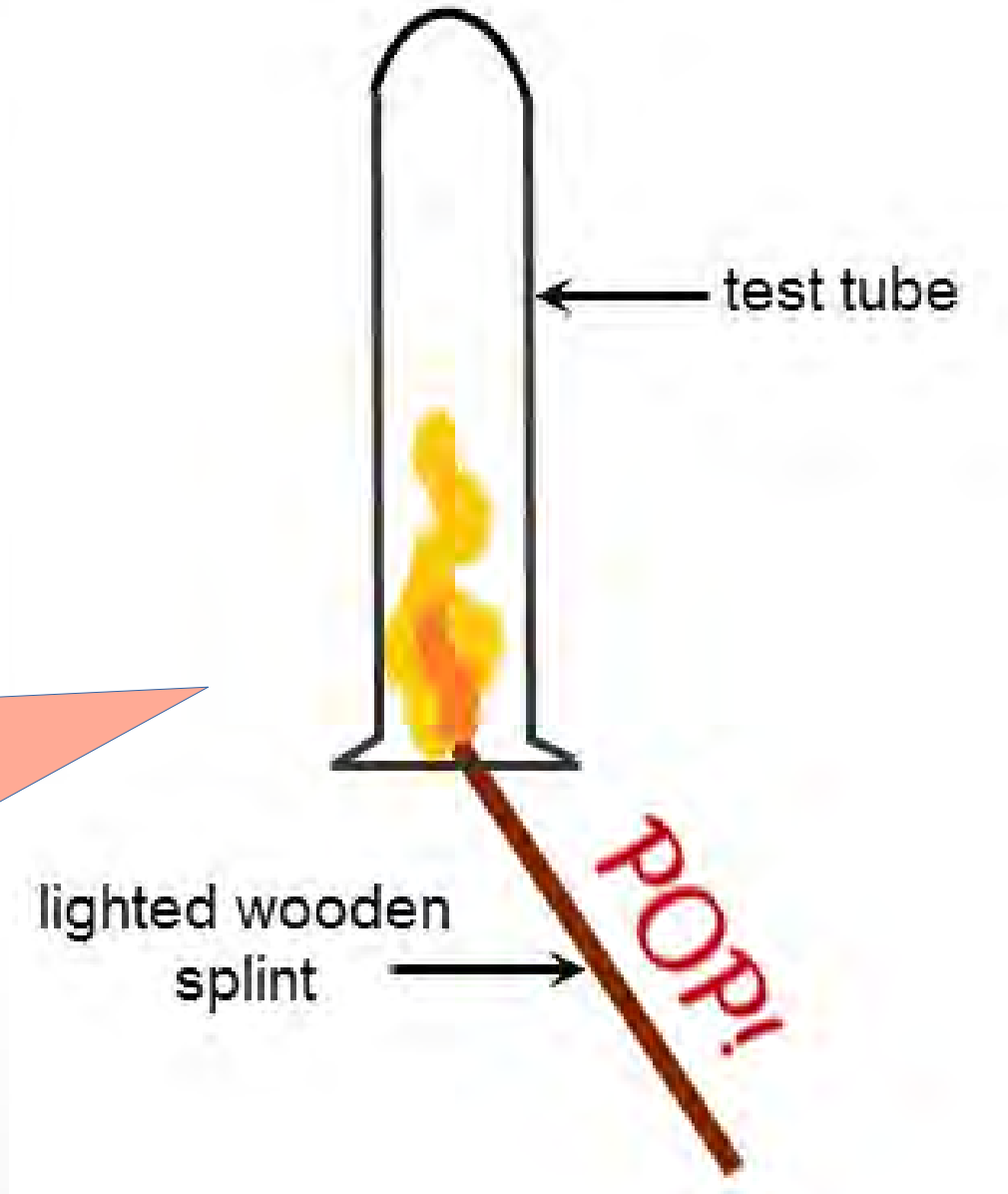
Don’t you see bubbles arise from it?



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

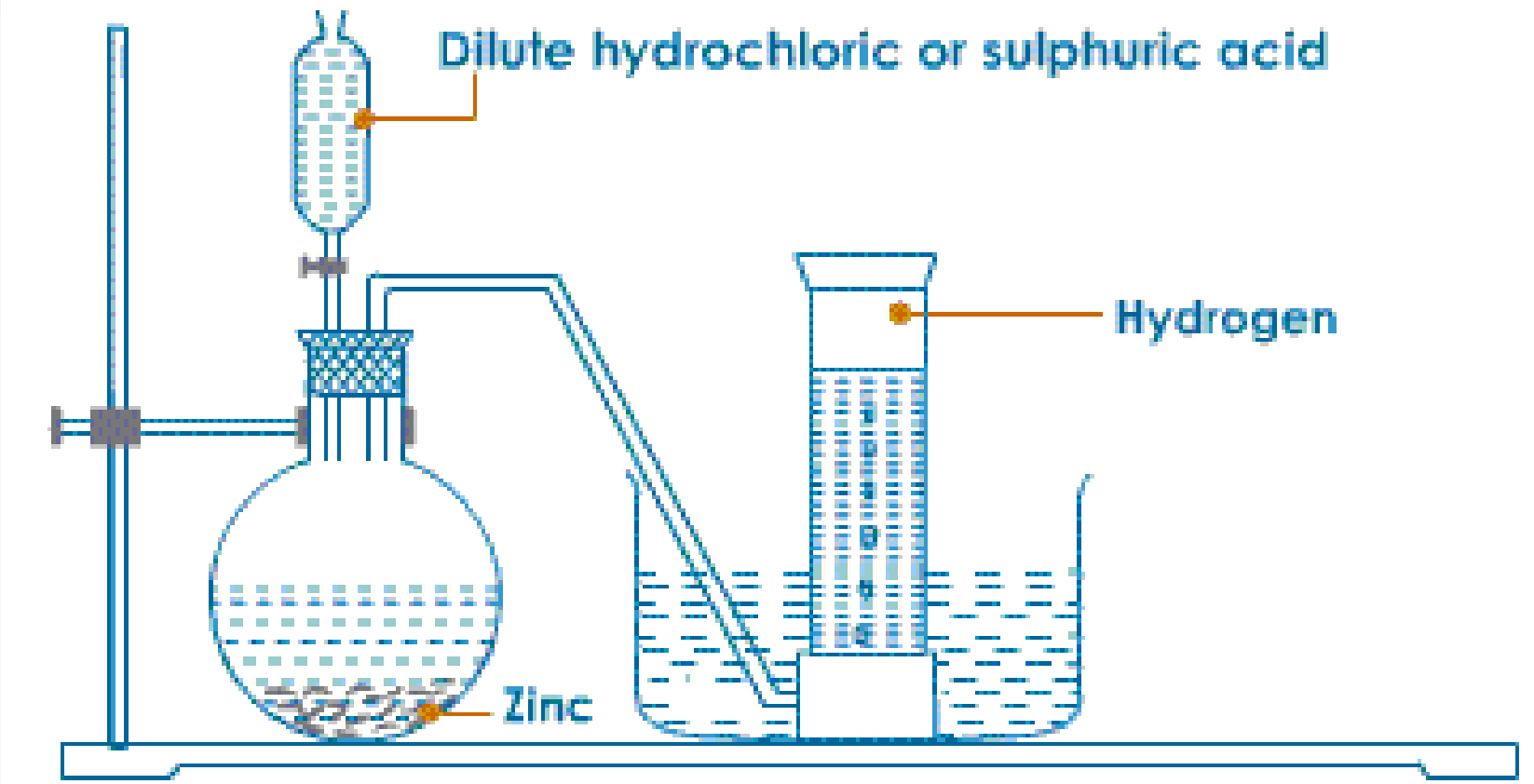
Acids react with metals to produce hydrogen

Behind hydrogen...

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

It was *Lavoisier* who named this gas as hydrogen

Let's make hydrogen...



Preparation of hydrogen from zinc with dilute acids

Find it out...

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

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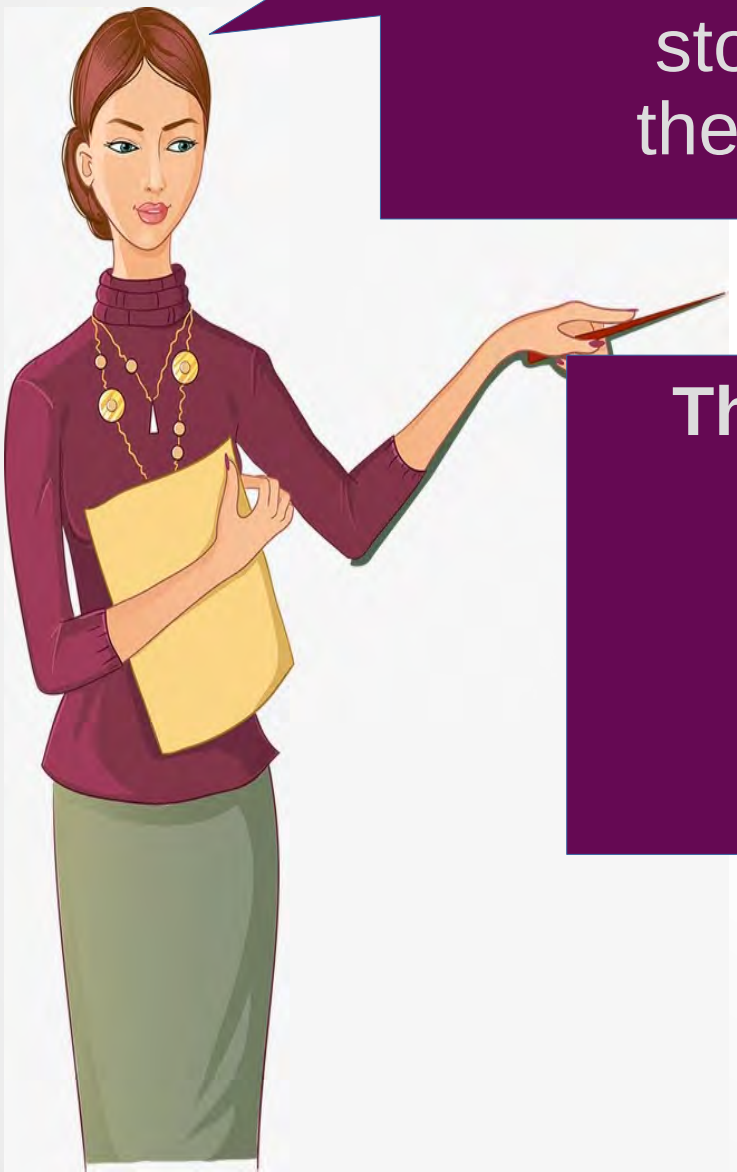
Check your answer...



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 ?

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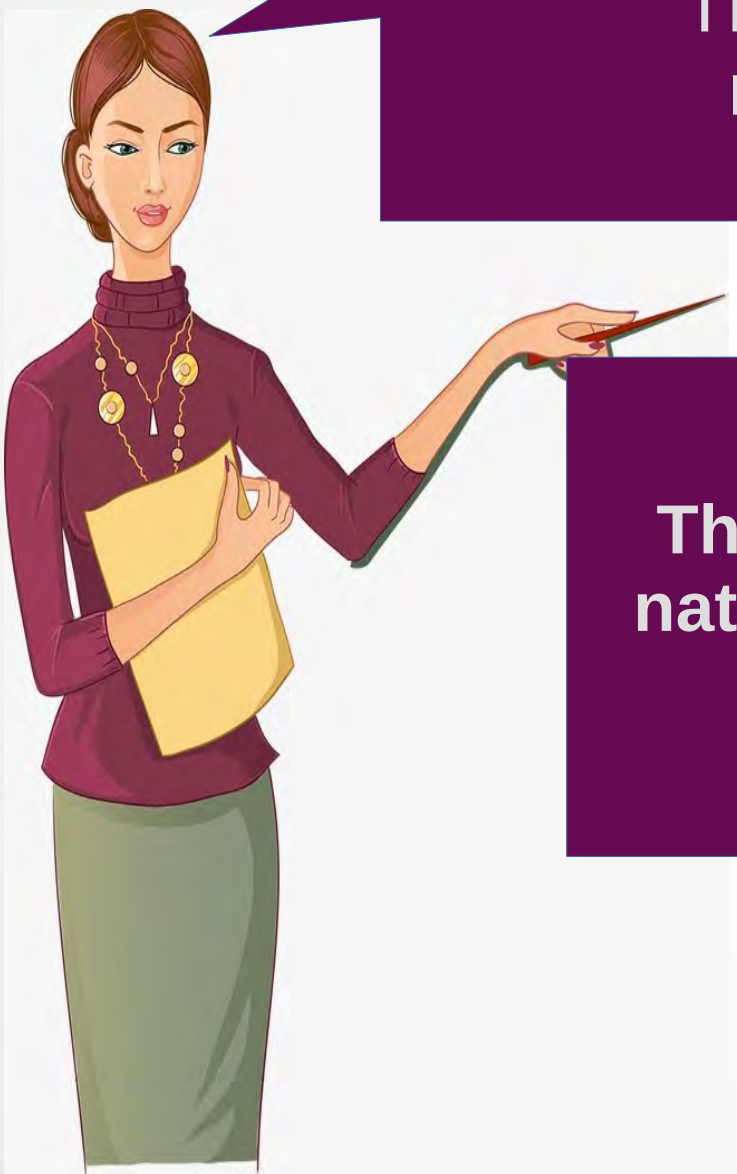
Check your answer...



The pickles are not kept in metal containers. Why ?

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

Experiment .....

Take dilute sulphuric acid in a test tube. Add pieces off egg shell into it. Bring a lighted match stick above the test tube.

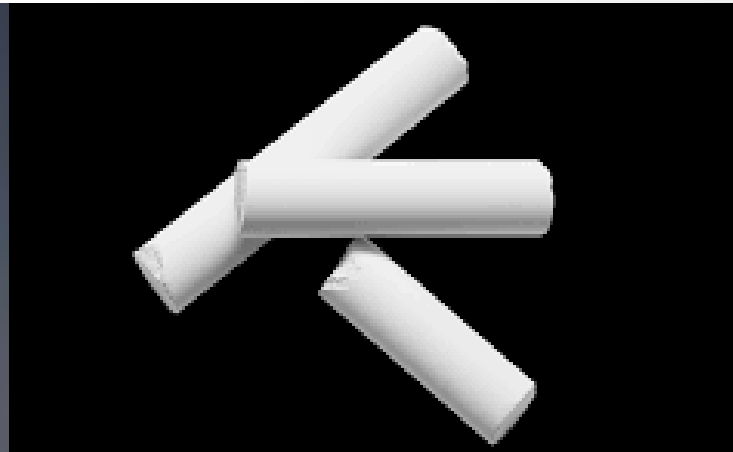
What happens ?

Which is the gas that snuffed out the flame ?

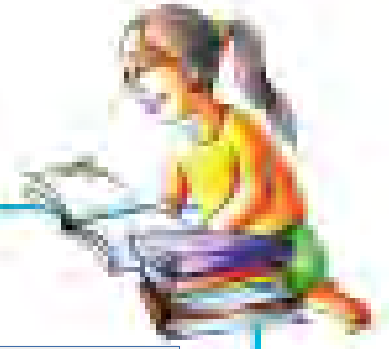
Carbon dioxide....

Egg shell, chalk, marble..etc. contain calcium carbonate. When acids react with carbonates, carbon dioxide is produced.

Carbon dioxide is a gas which extinguishes fire



When ants bite.....



When ants bite, a small amount of *formic acid* enters our body,
This is why it pains.

Fire extinguisher

- Fire extinguisher is an active fire protection device used to control small fires.
- Water, powder, wet chemicals, $co_{2..}$etc are used in fire extinguishers

How can make a fire extinguisher..?

Materials :- bottle, tubes, vinegar, baking soda, funnel, candle, match box.

Fix the tubes airtight into the bottle through the cap in a way that first one should reach the bottom while the other should remain just beneath the cap.

Fill baking soda and vinegar respectively through the first tube by using the funnel after closing the free end of the second tube.

Open the closed end of the tube towards a lighted candle.

The flame will turn off.

Why does it happen ?

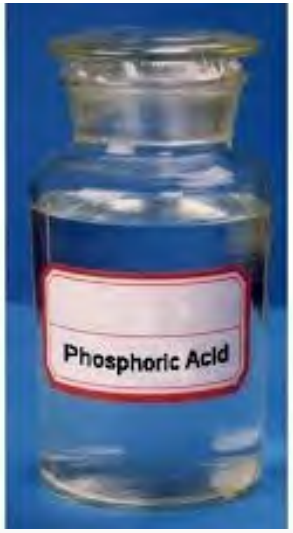
Vinegar is acetic acid and baking soda is sodium bicarbonate.

When they react together carbon dioxide is formed.

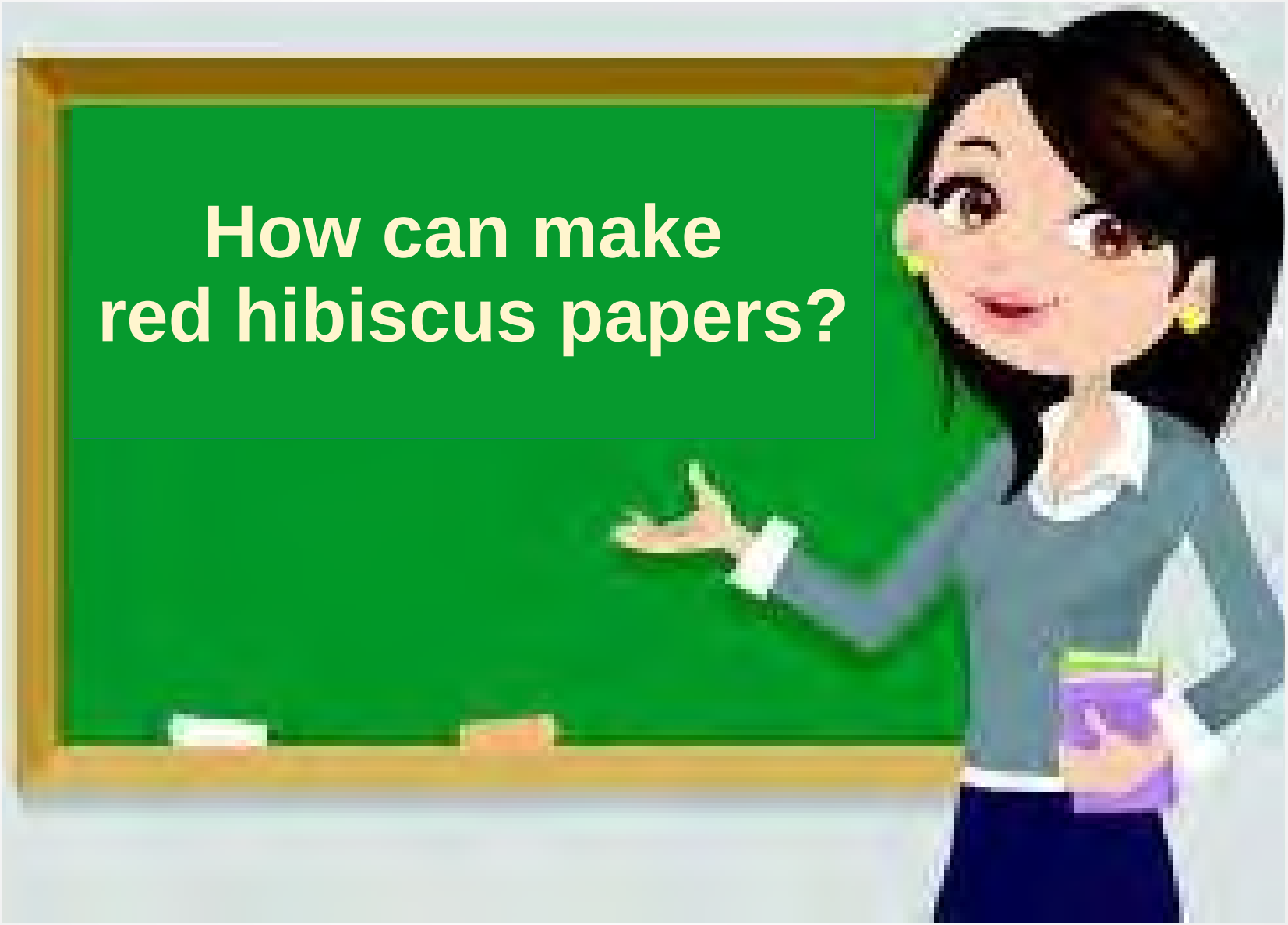
The fire extinguisher works on this principle.

Common properties of acids

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



Let’s think.....



Check your answer...

Dip the hibiscus papers in any acidic solution and then dry them. We will get red hibiscus papers.

Experiment

Dip red hibiscus paper or litmus paper in the solutions shown in the table and note down the colour change you have observed....

Substance	Colour change
Buttermilk	.....
Soap solution	.....
Salt solution	.....
Lime water	.....
Clear ash suspension	.....

Let’s check....

Substance	Colour change
Buttermilk	No change
Soap solution	Blue
Salt solution	No change
Lime water	Blue
Clear ash suspension	Blue

What are the common properties of the liquids in which red hibiscus paper turns blue ?

Alkalis

The substances which turn red litmus blue are called alkalis. They have a bitter taste and are slimy.

Calcium hydroxide (lime water)
Sodium hydroxide (caustic soda)
Potassium hydroxide (caustic potash)
Ammonium hydroxide (liquor ammonia dissolved in water)

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 alkali and tabulate the colour change that you have observed.***

Table of observation

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

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

Let’s name them...

Indicators

The substances that help us to distinguish between acids and alkalis through colour-change are called indicators. The parts of certain plants can be used as indicators. Litmus paper is an indicator used in the laboratories.

Find it out...

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

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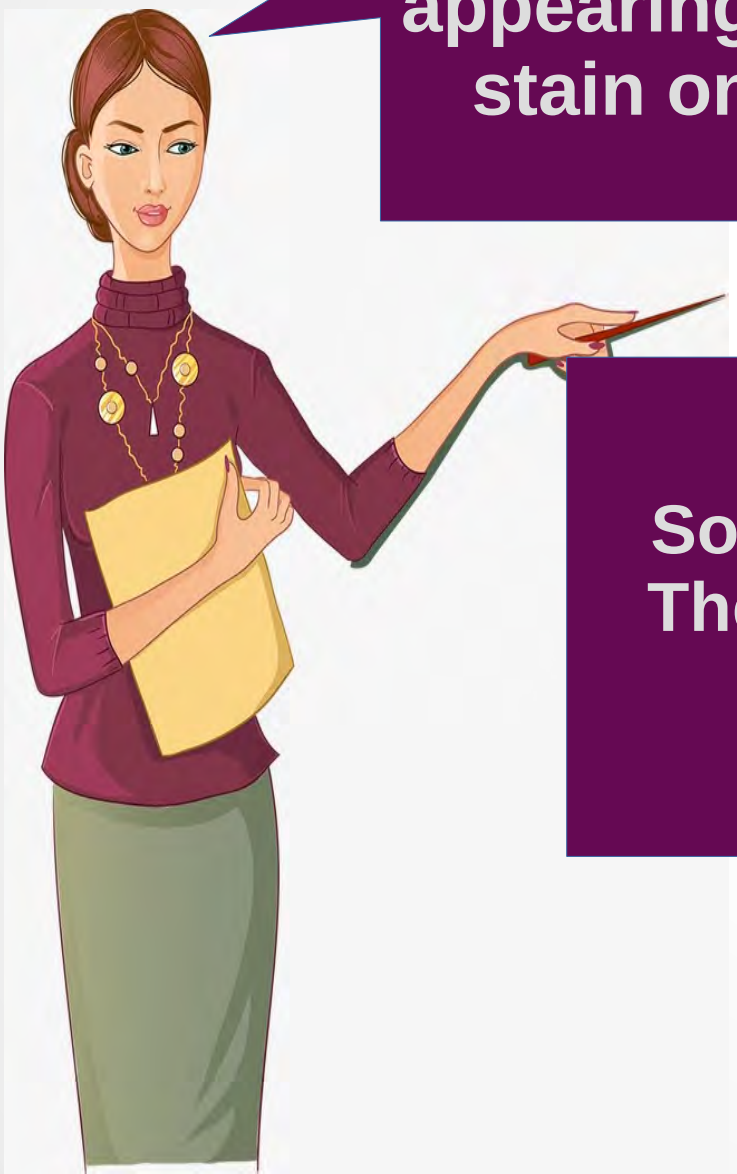
Check your answer...



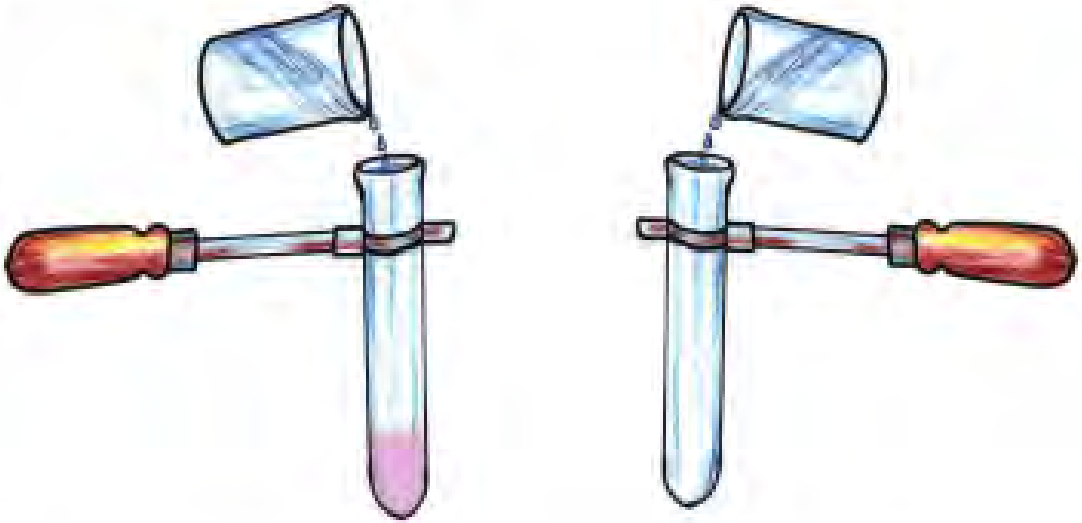
What could be the reason for red colour appearing on clothes when the turmeric stain on them is washed with soap ?

Soap solution is alkaline. The colour of turmeric in alkali is red.

Other indicators...

Take small quantities of caustic soda solution and vinegar in two separate test tubes. Add two drops of phenolphthalein to each test tube. Do you see any colour change?

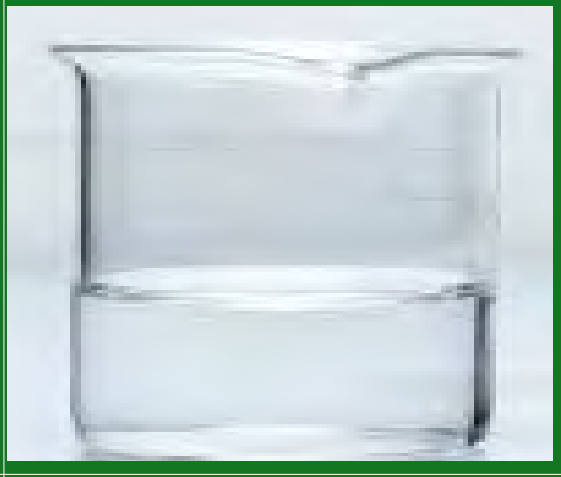
- Can phenolphthalein be used as an indicator to distinguish between acid and alkali?



Repeat the experiment using methyl orange instead of phenolphthalein.

Record the findings in your science diary.

Let’s tabulate...

Indicator	Colour in acid	Colour in alkali
		
		

Let's analyse...

Substance used	Colour in acid	Colour in alkali
Blue litmus paper	Red	Blue
Chilly powder	Pale red	Pale red
Red litmus paper	Red	Blue
Hibiscus paper (blue)	Red	Blue
Phenolphthalein	Colourless	Pink
White paper	White	White
Carbon powder	Black	Black
Methyl orange	Pale pink	Pale yellow
Liquid blue	Blue	Blue
Turmeric	Yellow	Red

What are the substances that can be used as indicators to identify acids ?

What are the substances that can be used as indicators to identify alkalis ?

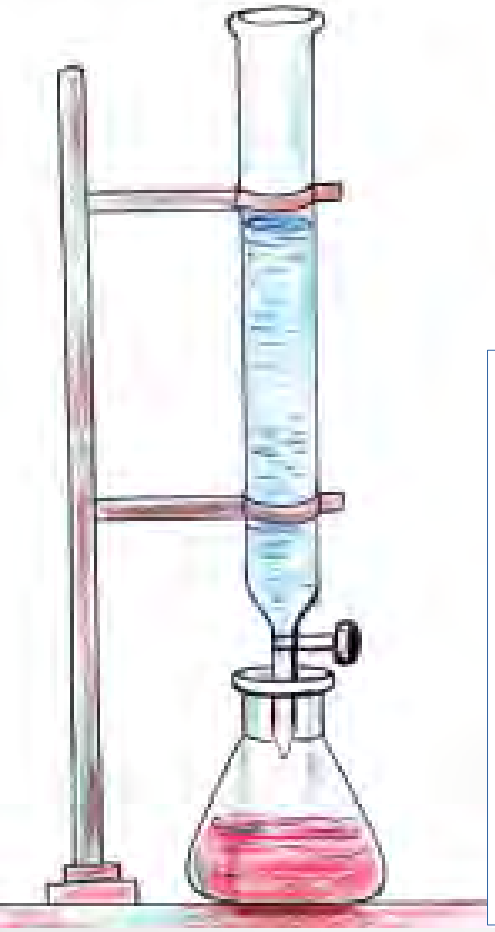
Universal indicator

Universal indicator

Universal Indicator is a mixture of different indicators. Depending on the strength of the acidic or the alkaline nature of solution, universal indicator gives different colours. These colours can be compared with the colour chart affixed outside the bottle.

When acid and alkali mix together

Take dilute hydrochloric acid in a burette. Add 20 ml caustic soda solution into a conical flask using a pipette. Add two drops of phenolphthalein into the flask and stir well. Place the conical flask below the stopcock of the burette. Open the stopcock slowly and add the acid, drop by drop, into the conical flask while swirling it continuously.



Close the stopcock when the colour of alkali in the conical flask just disappears. Examine whether the colourless solution in the conical flask is acidic or alkaline, using both red and blue litmus papers.

Neutralisation

When definite amount of acid and alkali are mixed, their acidic and alkaline nature are lost and salt and water are formed. This is called neutralisation.

Acid + Alkali ⟶ Salt + Water

pH value

pH value is a measure of acidity or alkalinity of water soluble substances.

(pH stands for 'potential of Hydrogen’)

A pH value is a number from 1 to 14, with 7 as the middle (neutral) point.

Values below 7 indicate acidity which increases as the number decreases, 1 being the most acidic.

Values above 7 indicate alkalinity which increases as the number increases, 14 being the most alkaline.

pH value

A colour chart is available with pH paper.

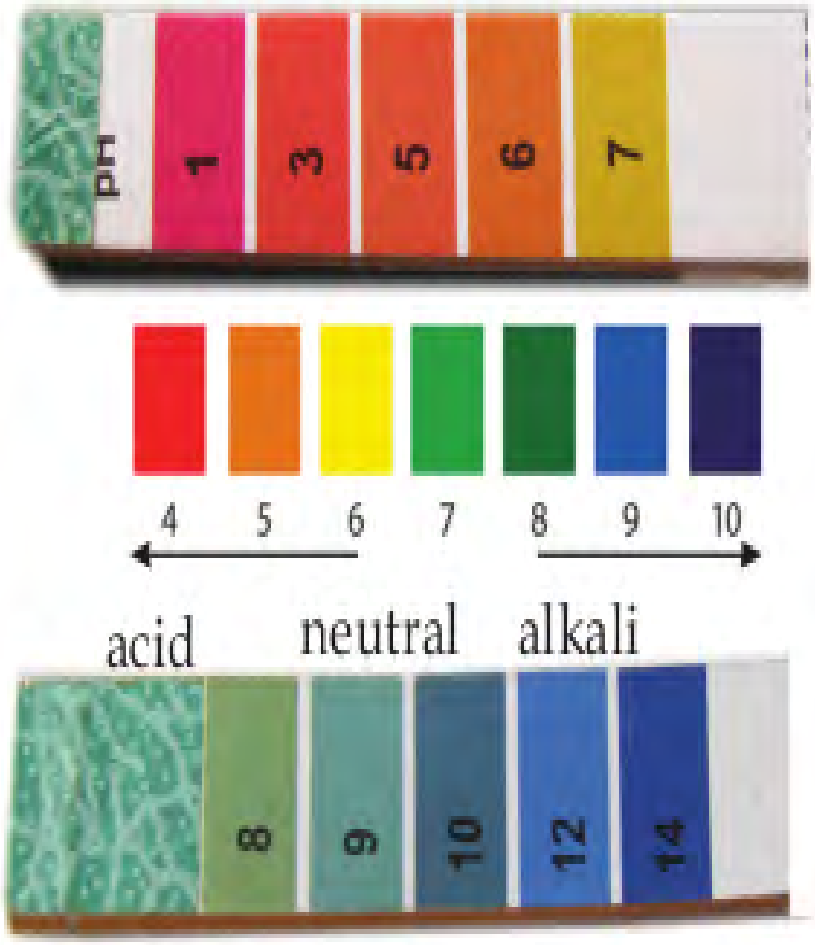
The colour change of pH paper in a solution is compared with the colour chart to find its pH value.

Let’s find out the pH values of various solutions...

pH of soil..

Let us find the pH of soil

Take a glass and fill it half with soil. Pour water till the soil is immersed completely and stir well. Tilt the glass and collect the oozing water. When the water clears, dip a pH paper into it. Compare the colour change of the pH paper with the colour chart and find the pH of the soil.



Alkali as medicine..

Acidity

Acid is produced in the stomach to support the digestion of food. At times, when food is not taken properly or when enough water is not consumed and unhealthy food habits are followed, the amount of acid increases in the stomach. This is called *acidity*. Doctors prescribe medicines containing alkali to overcome this.

Uses of acids

- ***For the preparation of food,***
- ***Preservation of food substances,***
- ***Manufacture of chemical fertilizers,***
- ***Production of paint, dyes, ink, leather ..etc,***
- ***In automobile batteries.***
- ***For dissolving noble metals. ... etc.***

Uses of alkalis

- ***Manufacture of soap,***
- ***Manufacture of detergents and ceramic materials,***
- ***Purification of water,***
- ***In tooth pastes,***
- ***As cleaners,***
- ***In medicines,***
- ***Industrial purposes. ...etc***

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.