

- **Introduction**

You all know that lemon, tomato, oranges tastes sour. You also know that all of them contains citric acid. This is the best natural example to prove that acids are sour in taste.

On the other hand, you all know that increased amount of baking soda makes the cake taste bitter. This is because baking soda is a base and hence tastes bitter.



Fig. lemon (acidic) and baking soda (basic)

So we conclude that acids can be easily pointed out by their sourness whereas bases can be easily pointed out by their bitterness.

- **Acids and bases**

The substances that taste sour are called acid and their nature is acidic. The term acid is derived from a Latin word **acere** which means sour. Examples of acidic substances are Curd containing lactic acid, lemon juice and tomato containing citric acid, and vinegar containing acetic acid.



Fig. Lemon juice, tomato, vinegar

The substances that taste bitter are called base and their nature is basic. They are soapy to touch.

Example: baking soda containing sodium hydrogen carbonate, Milk of magnesia, Soaps, Lime water containing calcium hydroxide, Household cleaners.



Fig. Baking soda, milk of magnesia

- **Some natural acids and bases and their sources**

Natural acids	Found in
Citric acid	Lemon, orange, sweet lime
Tartaric acid	Tamarind, grapes, unripe mango
Lactic acid	Yoghurt, buttermilk
Acetic acid	Vinegar
Formic acid	Ant's sting
Ascorbic acid (vitamin C)	Cabbage and citrus fruits

Bases	Found in
Calcium hydroxide	Lime water
Magnesium hydroxide	Milk of magnesia
Sodium hydroxide	Caustic soda used in manufacturing of soap, textiles and paper
Potassium hydroxide	Caustic potash used in manufacturing of soap
Ammonium hydroxide	Household and glass cleaners

- **Indicators**

Substances that are used to indicate whether a substance is acid or a base are known as indicators. They change their colour on addition of a solution containing an acidic or a basic substance.

In our day to day life we get to see many examples where indicators change their colour when comes in contact with acid or base.

For instance, while washing clothes if a shirt having a spot of curry turns to reddish brown when comes in contact with the detergent soap but soon disappears when washed thoroughly. This is due to the presence of base in detergent that changes the colour of the turmeric indicator.

There are several types of indicators used in our day to day life. Some of them are litmus paper or solution, phenolphthalein, China rose

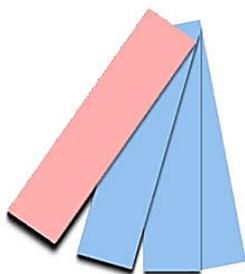


Fig. Litmus paper



Fig. China rose



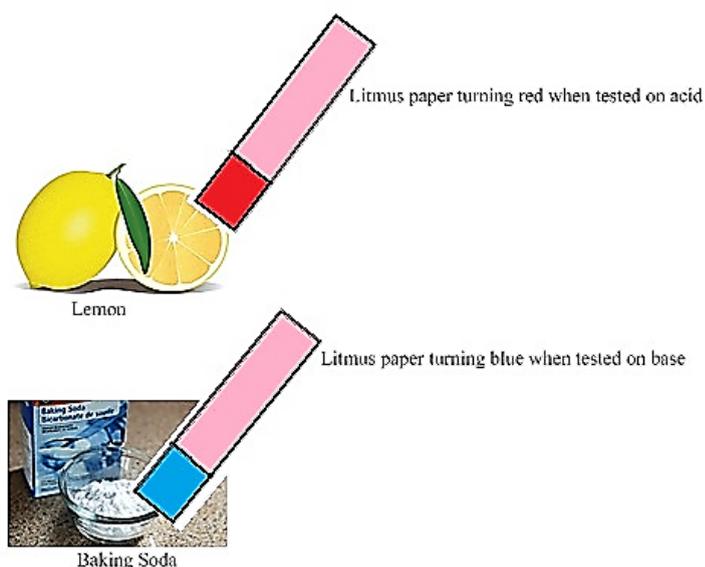
Fig. Turmeric

- Natural indicators

- Litmus Test

Litmus is the most commonly used natural indicator available as strips of paper or solution.

It is extracted from lichens. It turns to red on addition of an acidic solution and turns blue on addition of a basic solution.



- China rose indicator

Another natural indicator used to determine whether a substance is acidic or basic is China rose which turns acidic solutions to dark pink or magenta colour and basic solutions to green colour.

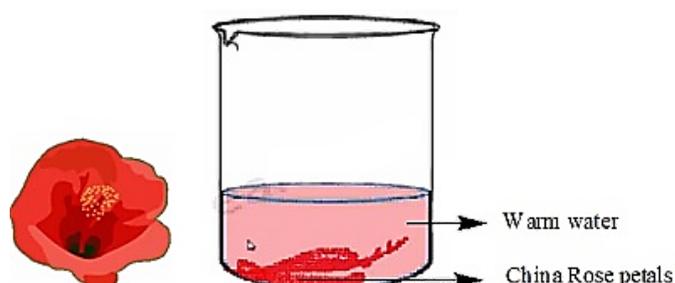
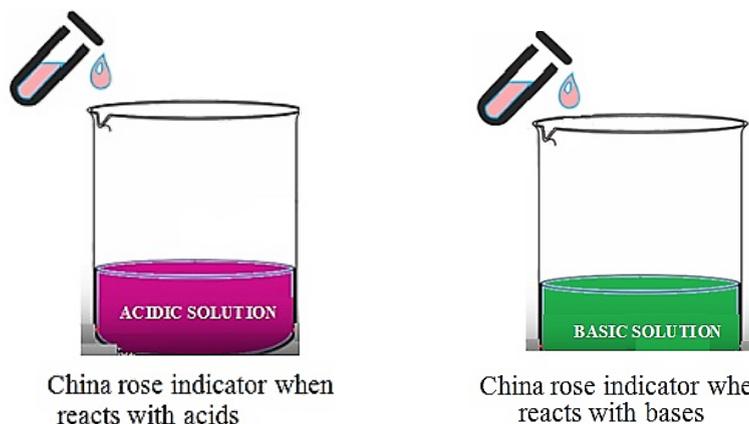


Fig. China rose indicator solution



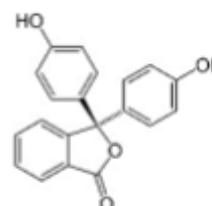
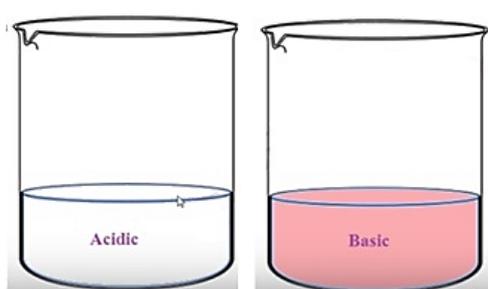
- **Turmeric**

Turmeric is a natural indicator. When it is added to a base, turmeric changes its colour to red. Its colour remains unchanged when it is added to an acid. The soap solution being basic in nature changes to red when it comes in contact with turmeric on our clothes

- **Synthetic indicators**

- **Phenolphthalein**

Phenolphthalein is another indicator giving a pink colour in case of basic solution and remaining colourless in case of acidic solution.



Chemical structure of phenolphthalein

Fig. Phenolphthalein in case of acidic solution and basic solution

- **Universal indicator**

Universal indicator is a solution of many compounds. It can be used to identify any substances whether acidic, basic or neutral. Universal indicator shows a series of colour changes which are useful in finding out the strength of various acids and bases.

The colours from yellow to red indicate that a solution is acidic, red being the strongest acid.

The colours from light blue to dark blue indicate that a solution is basic, dark blue being the strongest acid.

Green colour indicates that the solution is neutral.

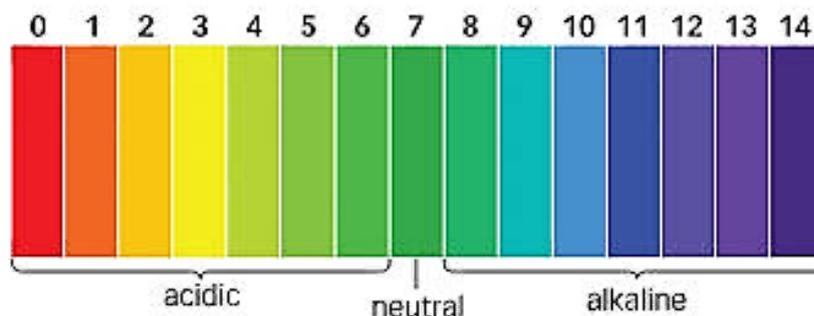


Fig. Universal Indicator

- **Neutralisation**

The reaction between an acid and a base to give a salt and water is known as a neutralisation reaction. Acids and bases react with each other to nullify the effect of each other.

Let us consider a simple reaction.

Take a sample of NaOH which is a base and add drops of dilute HCl.

The reaction will be as follows:



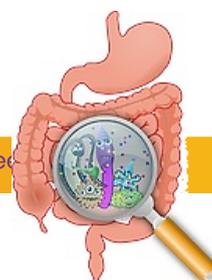
Therefore, while suffering from acidity it is prescribed to take antacid which are bitter in taste i.e. they are base. And on entering the body the base neutralise the excess acid released into the stomach and convert it into salt and water.

- **Commonly used salts**

Salts	Uses
Sodium chloride	Common salt, used in food to impart taste and as preservative
Sodium carbonate	Washing soda to soften hard water
Sodium bicarbonate	Baking soda used to bake breads and cakes
Copper sulphate	Used in insecticides and as a laboratory reagent

- **Neutralisation in everyday life**

- **Indigestion**



The stomach contains hydrochloric acid that helps to digest food. But presence of too much acid in the stomach may lead to indigestion that can be relieved by taking an antacid such as milk of magnesia containing magnesium hydroxide and effective in neutralising the effect of excessive acid.

- **Ant bite**

Ant bites inject formic acid present in its sting, into our body. The effect of the formic acid injected into our body can be nullified by rubbing moist baking soda i.e. sodium hydrogen carbonate or calamine solution, containing zinc carbonate.



- **Soil treatment**

Excessive use of chemical fertilisers results in increased acidity of the soil which is not at all suitable for proper plant growth. Plants cannot even grow well when the soil is too basic.



Too much acidity of soil is neutralised using bases like quick lime (calcium oxide) or slaked lime (calcium hydroxide).

Whereas too much basicity of soil is neutralised by using Organic matter that releases acids and thereby neutralises the basic nature of the soil.

- **Tooth decay**

The acids present in the food items can erode the protective covering of our teeth, which leads to tooth decay. Toothpaste is basic in nature so the neutralise these acids and prevent tooth decay.

- **Factory wastes**

The wastes excreted out of factories are highly acidic and causes threat to the survival of the marine ecosystem. Release of these acidic wastes into the water bodies, kills fish and other organisms. Due to which the factory wastes are properly neutralised by adding basic substances.