Chapter 5

Acids, Bases and Salts

Points to be studied

5.1 Acids and Bases
5.2 Indicators
- Natural Indicators and Artificial (Man made) Indicators.

5.3 Salts
5.4 Use of Acids, Bases and Salts in our daily life.
5.5 Examples of neutralisation in daily life.

5.1 Acids and Bases

You must have used food materials like lemon, tamarind, oranges, apples, sapodilla (chiku), sugar and salts etc. Do they have same taste? Let us compile the taste of food products in table 5.1

Table 5.1 Food products according to their taste.

S No.	Food Products	Taste (Sour/Sweet/Bitter/Any other)
1	Lemon Juice	Sour
2	Orange Juice	Sour
3	Amla	Sour
4	Tamarind	----------
5	Neem	----------
6	Sugar	----------
7	Salt	----------
8	Banana	----------
9	Butter	----------

On tasting these food products we get to know that some items are sour, some are sweet, some are bitter and some are salty in taste.

Acids

You will see that lime and orange juice, tamarind etc are sour in taste. Why these are sour in taste? The reason is acid that is present in these food products. What are acids? Let us know.

Acid word comes from a latin word 'Acidus', which means Sour. So we can say that the substances that are sour in taste are acids.

Natural Sources of Acids

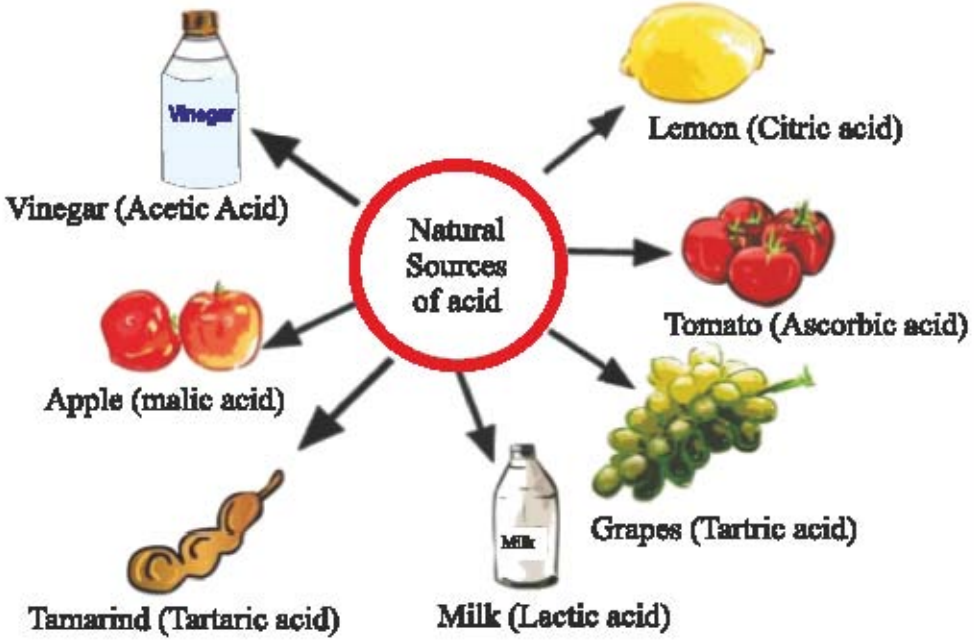


Fig. 5.1 Natural Sources of Acids

Acids are sour in taste.

Activity 2

Let us know about some other properties of acid by some experiments.

Take some baking soda in a glass. Add few drops of lime juice in it. What do you see? You will observe some bubbles in the glass.. A gas releases in this reaction which blows out on bringing a matchstick near the gas. Why matchstick blows out ? Acid on reaction with baking soda (Sodium bicarbonate) , forms CO_2 gas which blows out the matchstick.

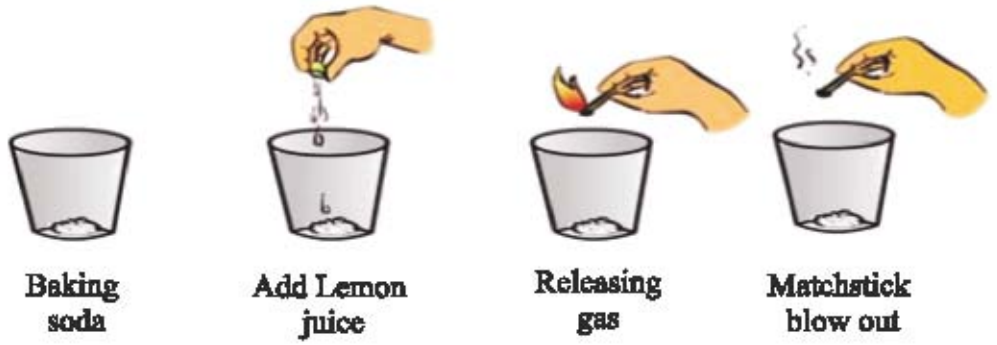


Fig. 5.2 Acid react with Sodium Bircarbonate

Acids react with Sodium bicarbonate and forms CO_2

Activity 3

Add a few drops of concentrated Sulphuric acid in a test tube and add Zinc granules in it. You will observe bubbles in the test tube. On bringing the matchstick flame near the mouth of the test tube, the flame burns with blue flame. So from above experiment we can say that acids evolve H_2 gas on reacting with metals.

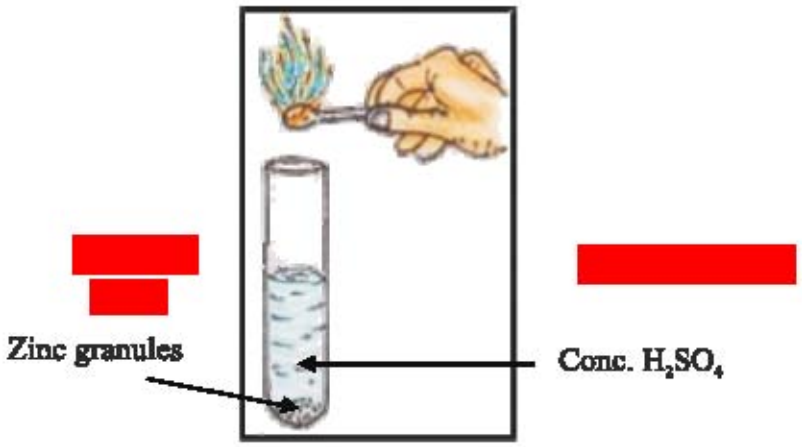


Fig. 5.3 Reaction of Acid with Metal

Acid forms Hydrogen (H_2) gas on reacting with metals.

Also know about it - In houses we do not use metal containers pickles, lemon juice, mango chutney because of the reason that acids are present in these food products which form poisonous substance on reacting with metals.

Activity 4

Take petals of blue colour flower and put term in a test tube filled with a small amount of acid. What do you observe? You will see that blue colour petals turn to red. So we can say that acids turn blue into red.

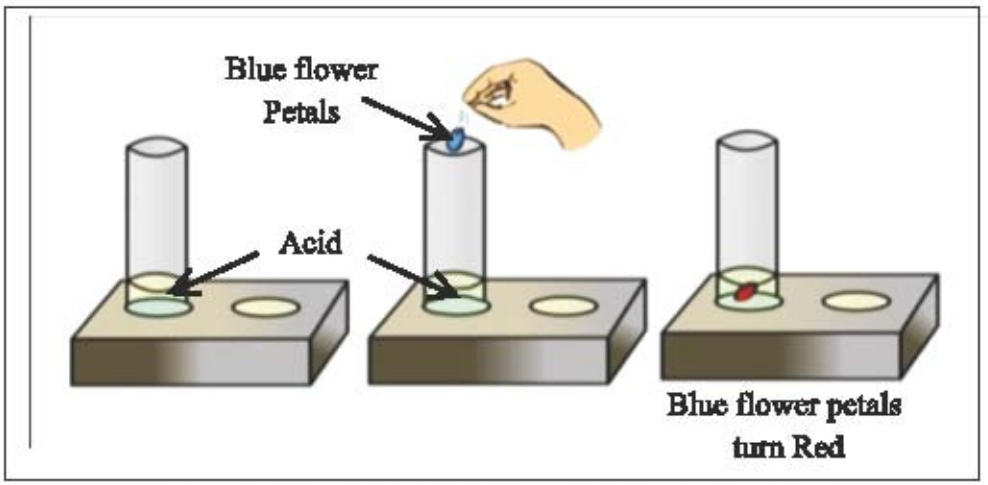


Fig. 5.4 Testing of Acid by vegetable dyes

Acids turn blue vegetable dyes to red.

Bases

You must have seen formation of khaman, dosa, biscuits, at your home. Baking Soda is used in this procedure. How does tastes (baking powder)? It is bitter in taste. Rub the solution of baking powder on your fingers. What do you feel? You will feel a soapy solution. So we can say that the substances that are bitter in taste and feel like soap on touching are bases.

Bases are bitter in taste and feel like soap on touching.

Table 5.2 Food products according to their taste.

S No.	Name of Substance	Name of Bases Present	Chemical Formula
1	Lime Water	Calcium hydroxide	$Ca(OH)_2$
2	Soap	Sodium hydroxide	NaOH
3	Milky Magnesium	Magnesium hydroxide	$Mg(OH)_2$

Let's know five other characteristics of bases by experiments.

Activity 5

Take petals of red colour flower in a test tube filled with base (lime water). You will see that red colour of petal turn to blue, so we can say that bases turn the red colour of vegetable dyes into blue.

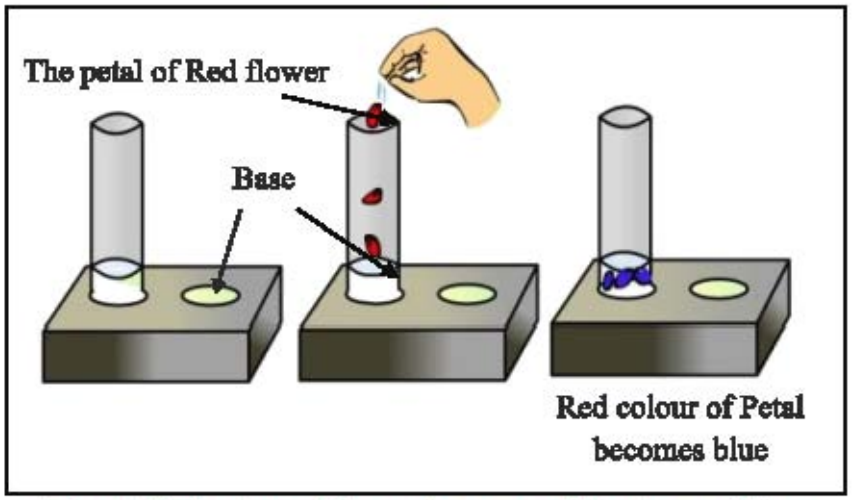


Fig. 5.5 Testing of Bases by vegetable dyes to blue

Bases Turn Red vegetative dies into blue

Substances that are bitter in taste and feel like soap on touching and turn red litmus to blue are called bases.

Neutral

substances that do not affect colour of blue or red litmus are called neutral. These substances are neither acidic nor basic e.g. Salt, NH_4Cl, Calcium Chloride, Sodium Carbonate, Sodium bicarbonate etc.

Do not touch or taste acids , bases and other chemicals present in laboratories as they can be poisonous and dangerous.

5.2 Indicators

Is it possible to identify the nature of substances by their taste? The answer is no, because it can be dangerous to touch or taste the unknown substances. To identify the nature of substance whether it is acidic or basic without touching or tasting, we use some special substances that are called indicators so indicators tell the nature of substances by changing its colour. i.e. turmeric, litmus, petals of china

rose etc. are natural indicators and phenophthalene and methyl orange are man made indicators.

Natural Indicators

Litmus: This is the most common natural indicator which is used to identify acids and bases. Litmus is obtained from lichen (algae). It is present in forms of solution and paper strips. These paper sheets are known as litmus papers.

Litmus are of two types: - Red and Blue.

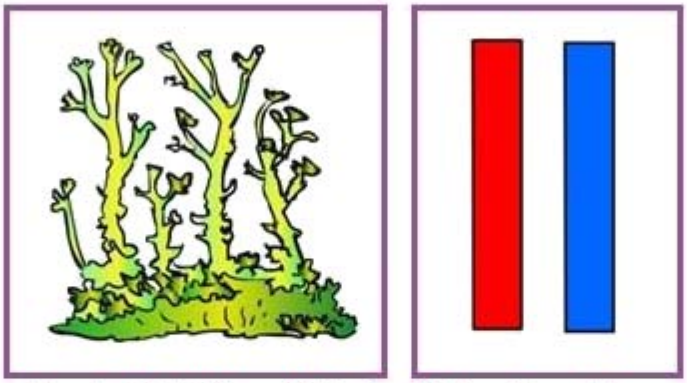


Fig. 5.6 (a) Lichen (b) Red and Blue litmus Paper

Activity 6

Turmeric: - Take turmeric powder in a tea-spoon. Make a paste by adding few drops of water. Now spread this paste on a thick white sheet. Cut this sheet into small pieces on drying. Now add few drops of lime water on this turmeric paper. What do you observe? The yellow colour turns into red.

Test the following solution given in table and note the observation in table 5.3 and conclude the results.

Table 5.3 Test of Solution from Turmeric Paper

S.No.	Test Solution	Effect of turmeric paper on solution	Conclusion (Solution is Acidic or Basic)
1	Amla Juice	.....	.....
2	Lemon Juice	.....	.....
3	Lime Water	.....	.....
4	Curd	.....	.....
5	Milky Magnesuim	.....	.....

China rose petals

Activity 7

Take petals of China rose in a beaker and add a small quantity of hot water in it. Keep it for few minutes until the colour of solution turns to light pink. This is china rose flowers indicator. Indicator of China rose flower makes acidic solution dark pink and basic solutions green.

Man Made Indicators

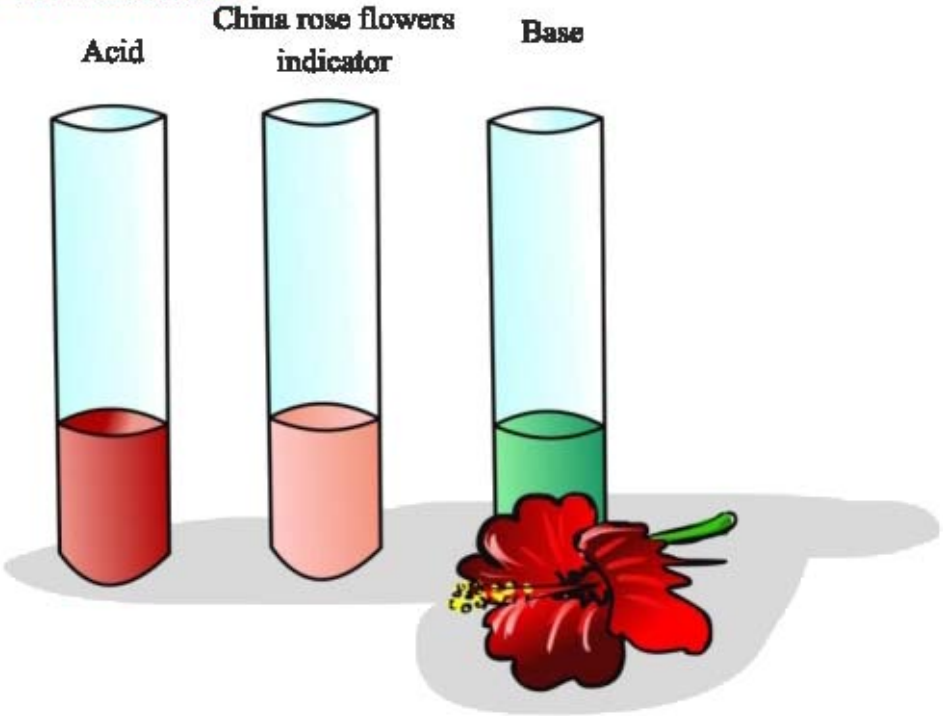


Fig. 5.7 China rose flower and prepared indicator

Some substances other than natural indicators act like indicators penopthalemic methyl orange are examples of man made indicators.

Activity 8

Take two test tubes and label them as A and B. Now add NaOH in test tube A and HCL in test tube B. Add phenopthalene in test tube A and Methyle orange in test tube B. Solution of test tube A turns to pink and of test tube B turns to red. So we can say that phenphtalene and methyl orange act like artificial (man made) indicators.

Now add phenophthalene into concentrated HCL solution and methyle orange into NaOH solution and observe the change of colour.

5.3 Salts

What are Salts? Let us know-

Activity 9

Make solution of caustic soda(NaOH) in test tube. On addition of 2-3 drops of phenophthalene indicator the solution turns to pink. Now add HCl with the help of dropper. We observe that an appropriate amount of acid make solution colourless. Why this happens. Sodium hydroxide reacts with HCl and forms Sodium chloride and water as product. In this reaction heat is released. This is called **neutralisation.**

Those reactions in which addition of appropriate amount and volume forms salt and water and energy releases are called neutralisation.

$$\underset{\text{Base}}{NaOH} + \underset{\text{Acid}}{HCl} \longrightarrow \underset{\text{Salt}}{NaCl} + \underset{\text{Water}}{H_20} + \text{Energy}$$

Reaction of acid and base make a new product other than water, That is known as salt e.g.:- Sodium chloride , Sodium carbonate , Sodium bicarbonate etc. Test these solutions with litmus paper. You will see that these solutions do not affect litmus paper so these are neutral in nature.

Properties of Salts:-

(i) Salts are solid in nature.

(ii) Generally salts are neutral in nature.

(iii) Solutions of salts are good conductors of electricity.

5.4 Uses of Acids, Bases and salts in our daily life

(A) Uses of Acids

(i) **Sulphuric Acid:** - The chemical formula of sulphuric acid is H_2SO_4. It is used in industries for formation of fertilisers like formation of ammonium sulphate and in batteries, dyes, clothes and paper industries.

(ii) **Nitric Acid:** - Its chemical formula is HNO_3. It is used in industries for making fertilisers like ammonium nitrate, in purification of gold and silver and in making of crackers and other explosives like TNT, dynamite etc.

(iii) **Hydrochloric Acid:** -It is also called namak ka amle Its chemical formula is HCL. It is used in toilet cleaners and purification of salt at industrial level.

(Iv) **Acetic Acid** - It is also called vineger. Its chemical formula is CH_3COOH . It is used in making pickles in houses, in making medicines and in maling celulose acetate (photo film) in industries and in making white lead.

(B) Use of Bases

(i) **Sodium Hydoxide** - It is often called caustic soda. Its chemical formula is NaOH. It is used in houses for cleaning of utensils and for making soaps in industries.

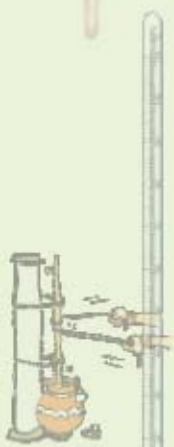
(Ii) **Calcium Oxide**- It is often called Bina Booja Choona. Its chemical formula is CaO. It is used in houses for white washing and treating wounds and for making ammonia and extraction of iron in industries.

(C) Uses of Salts

(i) **Sodium Chloride**- It is also called table salt. It chemical formula is NaCl. It is used in houses in food and for making chlorine in industries.

(Ii) **Sodium Carbonate** - It is often called washing soda. Its chemical formula is Na_2CO_3.It is used in houses for washing clothes and for softening of water in industries.

(iii) **Sodium bicarbonate** - It is often called baking soda. Its chemical formula $NaHCO_3$. It is used in houses for making baking powder, in making beverages, breads, cake etc. And for making sodium carbonate and for making digestive substances in industries.



5.5 Examples of Neutralisation in daily life.

Treatment of Acidity- Hydrochloric acid found in our stomach his helpful for digestion but presence of acid in more than the required amount causes indigestion. This is called acidity. To get rid of it we use milky magnesium (magnesium hydroxide). This neutralises effect of excess acid.

Soil Treatment - Excess Use of chemical fertilisers in fields turns the soil acidic. Which is harmful for growth of plants? Soil being more acidic or basic

reduces the fertility of soil hence when soil is more acidic Quick lime is mixed which is basic in nature and reduces acidity of soil. When the soil is basic then fertilisers are mixed in soil which reduces the basicity of soil.

Waste of Industries- Acidic materials are present in waste of industries. If this waste is directly released to water reservoirs then it is dangerous for fishes, marine plants and water bodies. Hence this waste is first neutralised with bases and then released to the water reservoirs so that water bodies are protected from being destroyed.

What have you learnt

- Salts are sour in taste and turn blue litmus red.
- Bases are bitter in taste and turn red litmus blue.
- Acids react with metals to form hydrogen.
- Appropriate amount of Acids and bases undergo continuous reaction and form salt and water with the release of heat . This reaction is called neutralisation
- Salts are solid in state and show neutral properties.
- Acidic, basic and neutral properties of substances can be known with the help of Indicators.
- Turmeric, litmus petals of China rose etc. are some of natural indicators and phenophthalene and methyle orange are man made indicators.

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Exercise

Choose the correct option:-

1. Acid present in tamarind -

   (a) Lactic Acid (b) Cytric Acid

   (c) Tartaric Acid (d) Acetic acid ( )

2. Choose base from the following compounds -

   (a) Salt (b) Acid of salt

   (c) Washing soda (d) Malic acid ( )

3. Gas formed by the reaction of acid and Zn.

   (a) Hydrogen (b) Nitrogen

   (c) CO_2 (d) Oxygen ( )

4. Which of the following is Nitric acid -?

(a) HNO_3 (b) H_2SO_4

(c) HCl (d) CH_3COOH

Fill in the blanks -

(1) Bases turn Red litmus to _____.

(2) Reaction of acid with base forms _____.

(3) Acid reacts Sodium bicarbonate and evolves _____gas.

(4) $HCl + NaOH \longrightarrow$ _____ + _____.

Match Column A and Column B.

	Column A		Column B
(1)	Sodium Chloride	(a)	H_2SO_4
(2)	Acid of Sulphur	(b)	$NaHCO_3$
(3)	Baking Soda	(c)	NaCl
(4)	Vinegar	(d)	CaO
(5)	Quick Lime	(e)	CH_3COOH

Short answer type questions:-

(1) Write the names of any two natural indicators.

(2) In which reaction do acids and bases react to form salt and water?

(3) Write three properties of bases.

(4) A blue litmus is dipped in a solution. It becomes red. Write the nature of the solution. Explain it.

(5) What is acidity? Write its treatment.

(6) What happens if waste material of industries is drained off without treatment?

(7) Why do we not use metal container to keep lemon juice?

Long type Questions

(1) What are indicators? Name any two indicators. Explain the effect of these indicators on acids and bases?

(2) Write three differences between acids and bases.

(3) Write uses of the following

(a) Washing Soda (b) Sodium Chloride (c) Sulphuric acid

(d) Calcium Oxide (e) Acetic acid.

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