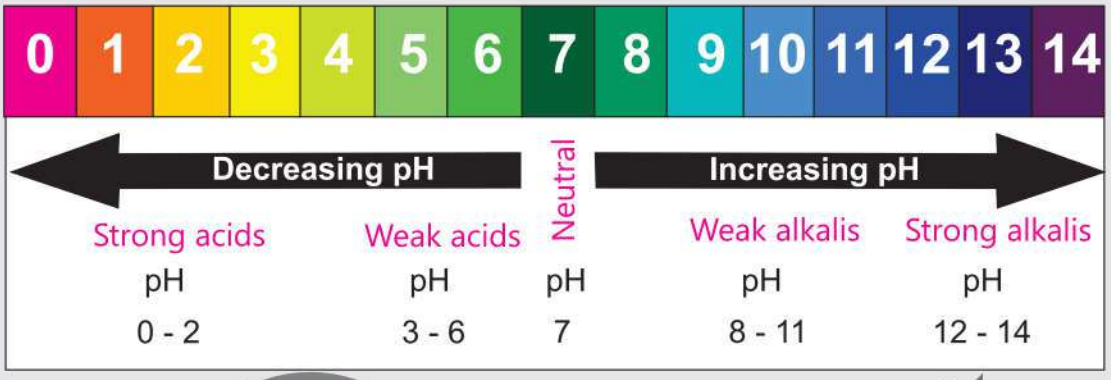

Where do we get HCl in our stomach from?

Why is wood ash used to wash utensils?

Which salts are present in drinking water?

07 Acids, Bases and Salts

Students' Learning Outcomes

After studying this chapter, students will be able to:

- Classify acids, alkalis, and salts and give examples of each.
- Identify the physical properties of acids, alkalis, and salts.
- Define pH and its ranges with reference to indicators.
- Interpret the pH scale and identify acids, alkalis, and describe neutralization reaction with real life examples.
- Observe and write the uses of acids, bases, and salts in daily life.

You have already read that a large number of compounds can be made by the combination of various elements. More than three million compounds are known to the scientists. It is practically impossible for anyone to learn about each of these compounds. Therefore, all these compounds are divided into different groups to make their studies easier. In this chapter, we will learn about acids, alkalis and salts, their properties and uses, pH, its range in aqueous medium and indicators.

7.1 ACIDS

The word **acid** is derived from Latin word 'acidus' means sour. In chemistry, the term acid has been used to name a group of compounds that have sour taste. Acids are defined as the compounds which produce hydrogen ions (H^+) in their aqueous solutions. Citrus fruits (Figure 7.1) have sour taste due to presence of citric acid. Hydrochloric acid is an important mineral acid. It is found in gastric juice of the stomach. It acts as an antiseptic and is helpful in digestion of proteins.

Figure 7.1 Citrus fruits

Sources of Common Acids

Generally, acids are obtained from two different sources. Some acids occur in plants and animals and are known as **organic acids** while others are obtained from minerals and are called **mineral acids**. Some common organic acids and their sources are given in Table 7.1.

Table 7.1 Some important acids obtained from animals or plants

Name	Source	Name	Source
Formic acid	Ant's sting	Tartaric acid	Tamarind, grapes
Acetic acid	Vinegar	Lactic acid	Yoghurt
Oxalic acid	Tomatoes	Maleic acid	Apples
Citric acid	Citrus fruit	Stearic acid	Fats

Some examples of the acids which are prepared from mineral elements are given in Table 7.2.

Table 7.2 Some important mineral acids and their formulae

Mineral acid	Formula
Hydrochloric acid	HCl
Nitric acid	HNO_3
Sulphuric acid	H_2SO_4
Phosphoric acid	H_3PO_4

Properties of Acids

Let us now study the properties which are common to all acids.

(i) All acids have a sour taste.

Activity 7.1

Apparatus / Material required:

Test tube, water, dilute acetic acid

Procedure:

- Take a clean test tube and fill it half with water.
- Add a few drops of vinegar in it.
- Close the mouth of the test tube with your thumb and shake it well.
- Taste the wet thumb.

How does it taste and why?

Warning

Don't taste the acids, bases and other chemical compounds without ensuring their harmless property.

(ii) All acids turn blue litmus solution and methyl orange solution red.

Activity 7.2

Apparatus / Material required:

Test tubes (3), dilute hydrochloric acid or dilute sulphuric acid, blue litmus, methyl orange, phenolphthalein

Procedure:

- Take a little quantity of dilute HCl or H_2SO_4 solution in three separate test tubes.
- Label them as 1, 2 and 3.
- Add two to three drops of blue litmus, methyl orange and phenolphthalein (indicators) in the test tubes 1, 2 and 3 separately.

What changes in the colour of the solution do you observe?

Test tube	Acid solution	Original colour	Indicator used	Changed colour
1				
2				
3				

Activity 7.3

Apparatus / Material required:

Test tube, vinegar, blue litmus solution, sodium hydroxide solution

Procedure:

- Take 2cm^3 of vinegar in a test tube.
- Add two drops of blue litmus solution to it and observe the change, if any.
- Then add carefully sodium hydroxide solution drop by drop and observe the changes taking place in the solution.
- **What do you infer from this activity?**
- **Discuss your observation with your teacher?**

Conclusion: _____

_____

(iii) Strong acids are corrosive liquids. They burn skin and destroy fabrics and animal tissues.

(iv) Aqueous solutions of acids are good conductor of electricity.

(v) Acids react with reactive metals (Mg, Zn) to form salts and evolve hydrogen gas.

$$\underset{\text{Magnesium}}{Mg_{(s)}} + \underset{\text{Hydrochloric acid}}{2HCl_{(aq)}} \longrightarrow \underset{\text{Magnesium chloride}}{MgCl_{2(aq)}} + \underset{\text{Hydrogen}}{H_{2(g)}}$$

$$\underset{\text{Zinc}}{Zn_{(s)}} + \underset{\text{Sulphuric acid}}{H_2SO_{4(aq)}} \longrightarrow \underset{\text{Zinc sulphate}}{ZnSO_{4(aq)}} + \underset{\text{Hydrogen}}{H_{2(g)}}$$

Hydrogen gas produced in the reaction burns with pop sound (Figure 7.2). This is a test for identification of hydrogen gas.

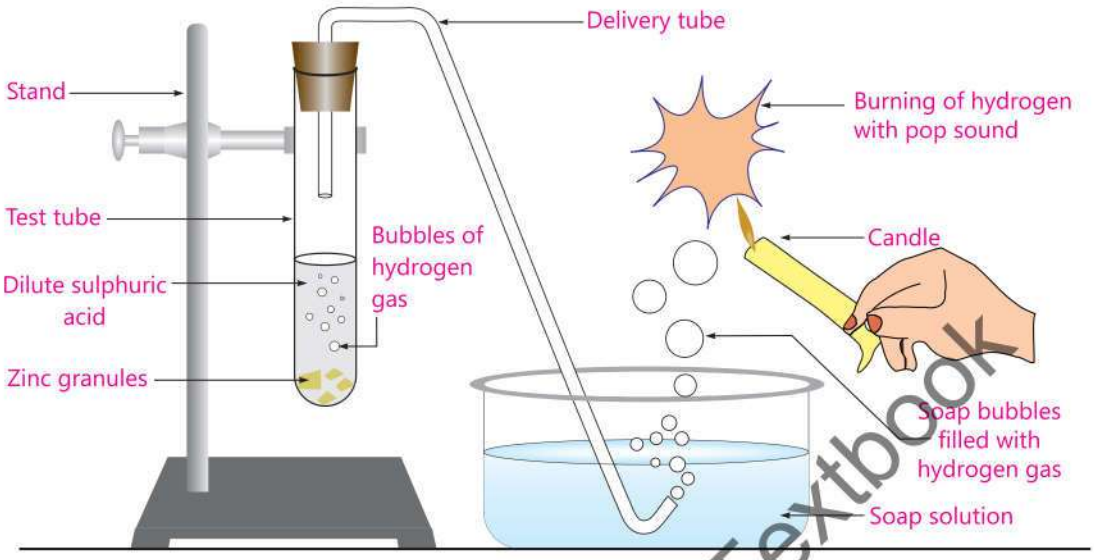

Figure 7.2 Reaction of zinc with dilute acid

(vi) Acids react with metal carbonates and metal hydrogen carbonates to liberate carbon dioxide.

$$\underset{\text{Calcium carbonate}}{CaCO_{3(s)}} + \underset{\text{Hydrochloric acid}}{2HCl_{(aq)}} \longrightarrow \underset{\text{Calcium chloride}}{CaCl_{2(aq)}} + \underset{\text{Water}}{H_2O_{(\ell)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}}$$

$$\underset{\text{Sodium hydrogen carbonate}}{NaHCO_{3(S)}} + \underset{\text{Acetic acid}}{CH_3COOH_{(aq)}} \longrightarrow \underset{\text{Sodium acetate}}{CH_3COONa_{(aq)}} + \underset{\text{Water}}{H_2O_{(\ell)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}}$$

Carbon dioxide produced in the reaction turns lime water milky (Figure 7.3). This is a test for identification of carbon dioxide gas.

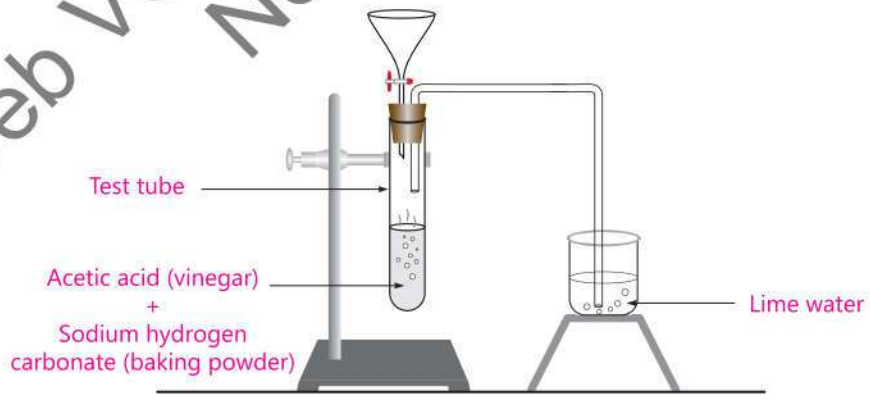

Figure 7.3 Reaction of acetic acid with sodium hydrogen carbonate

(vii) Acids react with bases to form salt and water. This process is called neutralization.

$$\underset{\text{Sulphuric acid}}{H_2SO_{4(aq)}} + \underset{\text{Sodium hydroxide}}{2NaOH_{(aq)}} \longrightarrow \underset{\text{Sodium sulphate}}{Na_2SO_{4\ (aq)}} + \underset{\text{Water}}{2H_2O_{(\ell)}}$$

Uses of Acids

Important uses of mineral acids are given below:

Hydrochloric Acid

Hydrochloric acid is used :

(i) for cleaning rust from the surface of metals.
(ii) for purification of common salt (NaCl).
(iii) to make Aqua Regia ($3HCl + HNO_3$) used to dissolve noble metals such as gold for their purification.
(iv) for making glucose from starch.
(v) for the proper digestion of food in our stomach.

Can you tell?

Which acid is added to produce fizz in soft drinks?

Nitric Acid

Nitric acid is used:

(i) in the manufacture of fertilizers like ammonium nitrate.
(ii) for the manufacture of explosives.
(iii) in the manufacture of dyes, plastics and artificial silk.
(iv) for etching designs on metals like copper, brass and bronze.

Sulphuric Acid

Sulphuric acid is used:

(i) as a dehydrating agent.
(ii) in the manufacture of fertilizers like ammonium sulphate, calcium ammonium phosphate, calcium super phosphate, etc.
(iii) in the manufacture of celluloid plastic, artificial silk, paints, drugs and detergents.
(iv) in petroleum refining, textile, paper, and leather industries.
(v) in lead storage batteries.

The uses of sulphuric acid are shown below.

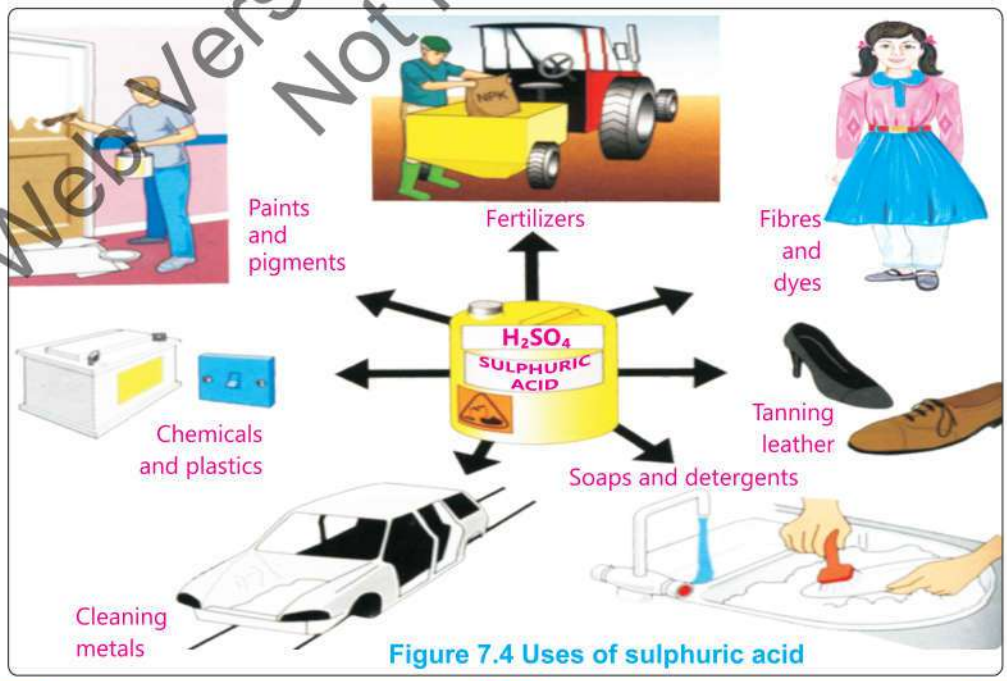

Figure 7.4 Uses of sulphuric acid

Acetic Acid

Acetic acid is used:

(i) in the preparation of pickles. (ii) in the manufacture of synthetic fibre.

7.2 BASES / ALKALIS

Many compounds have properties which are contrary to acids. Such compounds are termed as **bases**. The bases which are soluble in water are called **alkalis**. The word alkali has been taken from Arabic word "qali" which means "from ashes". Alkalis are obtained from the ashes of plants.

Alkalis/bases are the compounds which produce hydroxide ions (OH^-) in their aqueous solutions. Sodium hydroxide (NaOH), potassium hydroxide (KOH), calcium hydroxide $Ca(OH)_2$, etc., are the examples of bases / alkalis. Some important alkalis and their formulae are given in Table 7.3.

Table 7.3 Some common alkalis and their formulae

Alkali	Formula
Sodium hydroxide	NaOH
Potassium hydroxide	KOH
Calcium hydroxide	$Ca(OH)_2$
Ammonium hydroxide	NH_4OH
Magnesium hydroxide	$Mg(OH)_2$

Commonly used alkalis as laboratory reagents are shown below in reagent bottles (Figure 7.5).

Figure 7.5 Common alkalis used in laboratory

? Do you know?

All alkalis are bases but all bases are not alkalis.

Properties of Bases / Alkalis

(i) Aqueous solution of a base has a soapy touch.

Activity 7.4

Apparatus / Material required:

Test tube, sodium hydroxide, water, etc.

Procedure:

- Take 10 cm^3 of water in a test tube.
- Add a few pellets of sodium hydroxide and shake it.
- Touch the solution with your fingers.

How do you feel?

(ii) Bases turn red litmus blue, colourless phenolphthalein pink and methyl orange yellow. They turn turmeric paper brown.

(iii) Aqueous solutions of bases are good conductor of electricity.

(iv) Bases react with acids to form salts and water. The reaction is called neutralization reaction.

$$\underset{\text{Sodium hydroxide}}{NaOH_{(aq)}} + \underset{\text{Hydrochloric acid}}{HCl_{(aq)}} \longrightarrow \underset{\text{Sodium chloride}}{NaCl_{(aq)}} + \underset{\text{Water}}{H_2O_{(\ell)}}$$

Activity 7.5

Apparatus / Material required:

Test tube, sodium hydroxide solution, dilute hydrochloric acid, phenolphthalein, etc.

Procedure:

- Take 3 cm^3 of sodium hydroxide solution in a test tube.
- Add a drop of phenolphthalein solution to it. It turns pink.
- To this, add dilute hydrochloric acid slowly until the colour is discharged. Transfer the solution to a china dish and evaporate it to dryness.

What do you observe?

(v) Alkalis when heated with ammonium salts produce ammonia gas (Figure 7.6). We can identify ammonia gas by its pungent smell. Ammonia also turns moist red litmus paper blue.

$$\underset{\text{Calcium hydroxide}}{Ca(OH)_{2(aq)}} + \underset{\text{Ammonium chloride}}{2NH_4Cl_{(aq)}} \xrightarrow{\text{heat}} \underset{\text{Calcium chloride}}{CaCl_{2(aq)}} + \underset{\text{Water}}{2H_2O_{(\ell)}} + \underset{\text{Ammonia}}{2NH_{3(g)}}$$

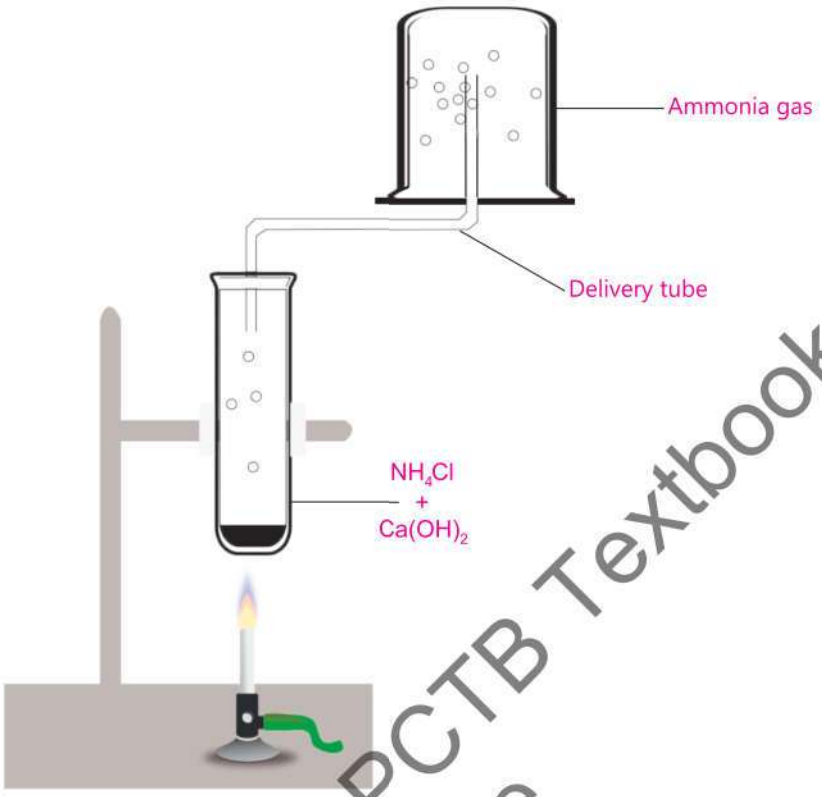

Figure 7.6 Reaction of calcium hydroxide with ammonium chloride

(vi) Alkalis react with fats to form soap and glycerine.

Uses of Bases / Alkalis

Some common uses of bases are:

Sodium hydroxide (NaOH)

Sodium hydroxide is largely used in:

(i) soap, textile and plastic industries.
(ii) petroleum refining.
(iii) making rayon.
(iv) the manufacture of paper pulp and medicines.
(v) opening blocked drains

Calcium hydroxide

Calcium hydroxide is called slaked lime. It is used:

(i) in the manufacture of bleaching powder.
(ii) as a dressing material for acid burns.
(iii) in making lime sulphur sprays to be used as fungicide.
(iv) as a water softener.

(v) for neutralizing acidity present in soil.

Ammonium hydroxide

Ammonium hydroxide is used:

(i) to remove grease from window panes.

(ii) to remove ink spots from clothes.

(iii) as a reagent in laboratory.

(iv) for the treatment of bees' stings.

7.3 SALTS

A **salt** is a compound formed by the neutralization of an acid with a base.

A large variety of compounds exists as salts.

Sodium chloride is a common salt which we use in our food.

Some common salts and their formulae are given in Table 7.4 and shown in Figure 7.7.

Figure 7.7 Some common salts

Table 7.4 Some common salts and their formulae

Salt	Formula	Salt	Formula
Sodium chloride	NaCl	Sodium nitrate	$NaNO_3$
Potassium chloride	KCl	Potassium nitrate	KNO_3
Ammonium chloride	NH_4Cl	Ammonium nitrate	NH_4NO_3
Calcium chloride	$CaCl_2$	Calcium sulphate	$CaSO_4$
Sodium carbonate	Na_2CO_3	Calcium carbonate	$CaCO_3$
Sodium hydrogen carbonate	$NaHCO_3$	Copper sulphate	$CuSO_4$

Properties of Salts

(i) Salts exist in solid state. They are found in crystalline or in powder forms. They have high melting and boiling points.

(ii) Generally, salts are soluble in water. However, the salts like calcium carbonate, lead chloride and cadmium sulphate, etc., are insoluble in water.

(iii) Aqueous solutions of metal salts or their molten forms conduct electricity.

(iv) Many of the salts contain water molecules in their crystals which are responsible for the shape of the crystals.

(v) Carbonates and bicarbonates react with acids to liberate carbon dioxide gas.

$$\underset{\text{Sodium carbonate}}{Na_2CO_{3(s)}} + \underset{\text{Hydrochloric acid}}{2HCl_{(aq)}} \longrightarrow \underset{\text{Sodium chloride}}{2NaCl_{(aq)}} + \underset{\text{Water}}{H_2O_{(\ell)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}}$$

(vi) When salts of heavy metals react with alkalis, precipitates of heavy metal hydroxides are formed in the reaction mixture. Precipitates are the substances which appear as solid insoluble product in the liquid reaction mixture.

$$\underset{\text{Ferric chloride}}{FeCl_{3(aq)}} + \underset{\text{Sodium hydroxide}}{3NaOH_{(aq)}} \longrightarrow \underset{\text{Ferric hydroxide}}{Fe(OH)_{3(ppt)}} + \underset{\text{Sodium chloride}}{3NaCl_{(aq)}}$$

(vii) The chemical reaction of water with a salt produces an acid and a base and the reaction is called hydrolysis.

$$\underset{\text{Sodium carbonate}}{Na_2CO_{3(s)}} + \underset{\text{Water}}{2H_2O_{(\ell)}} \longrightarrow \underset{\text{Sodium hydroxide}}{2NaOH_{(aq)}} + \underset{\text{Carbonic acid}}{H_2CO_{3(aq)}}$$

Uses of Salts

(i) Role of salts in human body

Salts of sodium, potassium, calcium, magnesium and iron are needed for the normal working of our body (Figure 7.8). They perform the following functions:

(a) Sodium and potassium salts are needed for the proper functioning of muscles and the nervous system.

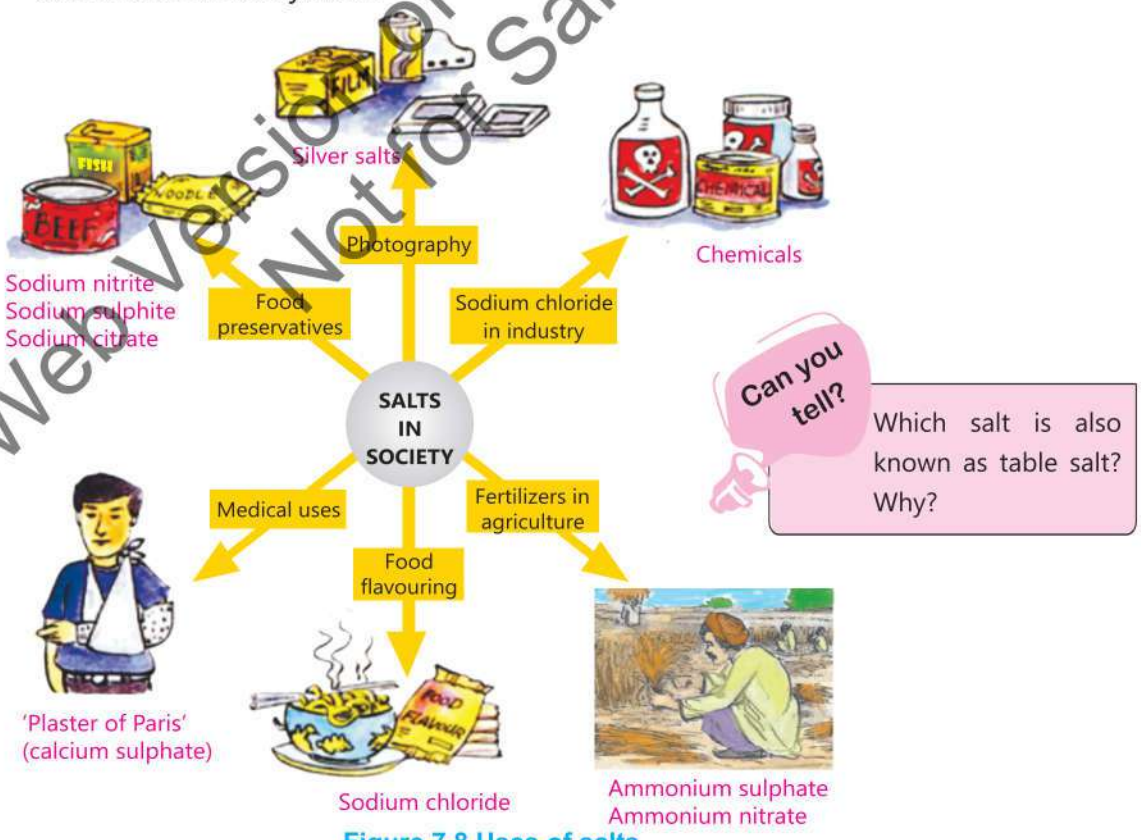

Figure 7.8 Uses of salts

Can you tell?

Which salt is also known as table salt? Why?

(b) Salts of calcium are present in bones. They are responsible for the strength of bones. These salts are responsible for preventing heart attacks. Plaster of Paris ($CaSO_4 . ½H_2O$) is used for broken limbs.

(c) Potash alum is used to coagulate the blood coming out of a wound. It is also used for the purification of water.

(d) Salts of iodine are needed for the proper functioning of thyroid glands. They are also used for the treatment of goiter.

(ii) Uses of salts in our daily life

(a) In our daily life, we use common salt for seasoning food. It is also used as a preservative for fish and pickles.

(b) Baking soda is used for giving softness to bread and cake.

(c) Washing soda is used for washing clothes.

(d) Sodium potassium tartrate is used as a laxative.

(iii) Uses of salts in industries

(a) Sodium chloride is used for the manufacture of chlorine, hydrogen chloride, caustic soda, washing soda and sodium hydrogen carbonate.

(b) Sodium carbonate is used for softening hard water and for the manufacture of glass and soap.

(c) Potassium nitrate is used for the preparation of gun powder and fireworks. It is also used as a fertilizer.

(d) Potash alum is used for purification of water, in dyeing cloth and for tanning hides.

(e) Copper sulphate is used as a fungicide, in calico printing and in electroplating.

7.4 pH SCALE

The scale which is used to measure the strength of acidic or alkaline solution is known as **pH scale**. The pH of a solution can be determined with the help of universal indicator or pH paper. A universal indicator paper has a mixture of several dyes coated on it. It shows different colours for different pH values of the solutions. In an acidic solution, colour changes from yellow to orange and then red as the pH decreases. The colour changes from indigo to violet when pH changes from 7 to 14.

Activity 7.6

Apparatus / Material required:

pH paper, sodium hydroxide, ammonium hydroxide, vinegar solution, dilute hydrochloric acid

Procedure:

- Add separate strips of pH paper in different solutions.
- Observe the change in colour of the strips and record your observations.

You will observe that different shades of colour appear on each strip of pH paper. By comparing the colours with the chart provided with the pH paper you can find the pH of different solutions. Strong acids have pH value 0 to 2. pH of weak acids is in between 3 and 6. pH of weak alkalis is 8 to 11. pH of strong alkalis is 12 to 14.

Activity 7.7

Material required: Universal indicator paper, dilute NaOH, dilute NH_4OH, dilute HCl, dilute H_2SO_4, vinegar, distilled water

Procedure:

- Take 1cm^3 of dilute HCl, dilute H_2SO_4, dilute CH_3COOH (vinegar), dilute NaOH, dilute NH_4OH solutions prepared in distilled water in different test tubes.
- Add 1.5 cm^3 of distilled water.
- Dip separate universal indicator paper strips in each tube and match the colour with colour given on the strip.
- Note the observations.

Sample	Colour of univeral indicator paper	pH of the solution
Dilute HCl		
Dilute H_2SO_4		
Dilute CH_3COOH		
Dilute NaOH		
DiluteNH_4OH		
Distilled H_2O		

7.4.1 pH and its Range (0 –14) in Aqueous Medium

Pure water ionizes very slightly into hydrogen (H^+) and hydroxide (OH^-) ions. However, the concentrations of hydrogen ions (H^+) and hydroxide ions (OH^-) in pure water are equal. Hydrogen ion concentration increases, when acids are dissolved in water. Alkalis on dissolving in water decrease the concentration of hydrogen ions in water as compared to hydroxide ions. The greater the concentration of hydrogen ions (H^+) in a solution, the stronger the acid is. The lesser the concentration of hydrogen ions as compared to hydroxide ions in a solution, the stronger the alkali is.

Hence, the scale which is used to measure the strength of an acid or alkali in an aqueous solution is based on the concentration of hydrogen ions (H^+) which is termed as pH.

pH values range from 0 – 14 (Figure 7.9). The solutions having equal concentrations of hydrogen ions (H^+) and hydroxide ions (OH^-) are neutral solutions. They have pH = 7. pH = 7 is the mid point of the pH scale.

The solutions with higher concentration of hydrogen ions will have lower than 7 value of pH. The solutions with lower concentration of hydrogen ions than that of hydroxide ions will have greater than 7 value of pH. Solution with lower pH values are stronger acids. The solutions with higher pH values are stronger alkalis. The higher the pH value of the solutions, the stronger the alkalis they are.

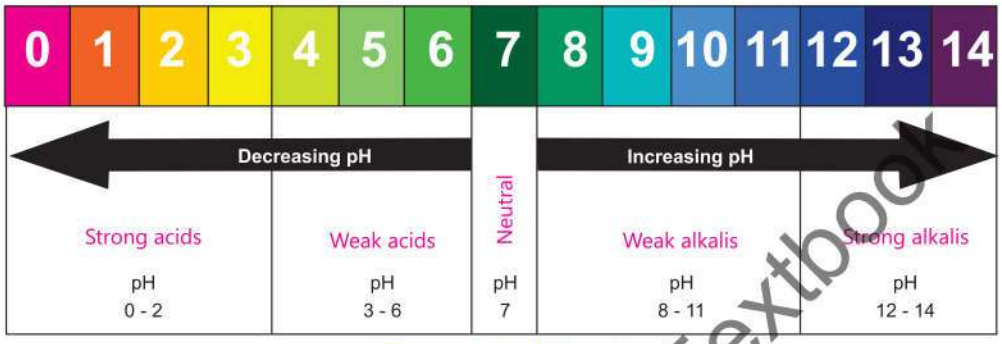

Figure 7.9 pH Scale

pH values of some common substances are given in Table 7.5.

Table 7.5 pH values of some common substances

Substance	pH	Substance	pH
Pure sulphuric acid	0	Pure water	7
Gastric juice in the stomach	1	Cleaning fluid	9
Lemon juice	2	Baking powder	10
Vinegar	3	Milk of magnesia	11
Tomato juice	4	Household ammonia	12
Acid rain	5	Strongest alkalis such as potassium hydroxide	14

PH Meter

The instrument which is used to measure the exact pH of the solutions is called pH meter (Figure 7.10). When the electrode of pH meter is dipped in the solution, the reading of its pH appears on the digital display of pH meter.

Figure 7.1 pH meter

7.5 INDICATORS

Majority of acids and alkalis are colourless. It is not possible to identify them by their appearance. In order to identify whether a substance is an acid or an alkali, indicators are used.

An indicator is a substance that shows different colours in acidic and basic solutions (Table 7.6). Some examples of indicators are phenolphthalein, methyl orange, litmus, turmeric, china rose and red cabbage.

Table 7.6 Indicators and their colours in acidic and alkaline solutions

Indicator	Original colour	Colour in acid	Colour in base
Litmus	Violet	Red	Blue
Phenolphthalein	Colourless	Colourless	Pink
Methyl orange	Orange	Red	Yellow

Activity 7.8

Apparatus / Material required:

Dilute HCl, soap solution, lemon juice, tap water, sodium hydroxide, ammonia solution and household bleach.

Procedure:

- Put the above samples separately in clean test tubes.
- Add a few drops of red and blue litmus solution in separate test tubes containing the same solution.
- Record your observations in the following Table.

Sample	Colour change		Nature of solution
	Red litmus	Blue litmus	
Dil HCl	Remains red	Turns red	Acidic
Soap solution			
Tap water			
Sodium hydroxide	Turns blue	Remains blue	Basic
Household bleach			
Ammonia solution			

Test the above samples with methyl orange and phenolphthalein and record the observation.

7.5.1 Natural Indicators

Red cabbage, turmeric, china rose and litmus.

Turmeric (Haldi Powder)

Activity 7.9

Apparatus / Material required:

Turmeric powder, water, filter paper, different solutions as in the activity 7.8.

Procedure:

- Make a paste of turmeric powder with water.
- Apply the paste on the filter paper and allow it to dry.
- Remove the dry powder from the filter paper.
- Cut the filter paper into small strips.
- Pour different solutions separately on the strips and note the colour changes.
- Record the observations in tabular form as in the activity 7.8.

You will observe that:

Turmeric paper remains yellow in acidic and neutral solutions but turns brown in alkaline solution.

Red cabbage

Activity 7.10

Material required:

Red cabbage, water, filter paper, different solutions

Procedure:

- Put some chopped red cabbage in hot water for sometime.
- Filter the coloured solution.
- Purple coloured cabbage indicator is ready for use.
- Test the sample of activity 7.8 with this indicator and record the results.

You will observe that:

The purple colour of cabbage indicator turns red in acidic solutions and green in basic solutions. Neutral solutions do not change the colour of red cabbage indicator.

KEY POINTS

- Acids are substances which have sour taste. They change blue litmus red. They also react with active metals producing salts and hydrogen gas.
- Acids act on metal carbonates and hydrogen carbonates liberating carbon dioxide.
- Acids neutralize bases to form salts and water.
- Acids have many uses in laboratories and industries.
- Hydroxides like NaOH, KOH, $Ca(OH_2)$, NH_4OH are examples of alkalis.
- Alkalis have bitter taste and turn red litmus blue, colourless phenolphthalein to pink.
- Alkalis neutralize acids to form salts and water.
- Alkalis have many uses in laboratories in homes and in industries.
- Many salts are commonly used in our daily life.

QUESTIONS

1. Encircle the correct option.

(i) The king of chemicals is:

(a) KOH (b) HCl

(c) H_2SO_4 (d) NaCl

(ii) Sodium hydroxide solution in water will:

(a) turn blue litmus red

(b) give pink colour with phenolphthalein

(c) give red colour with methyl orange

(d) not affect the phenolphthalein indicator

(iii) When carbon dioxide gas is passed through lime water, the milkiness is due to the compound:

(a) $Ca(HCO_3)_2$ (b) $CaCO_3$

(c) H_2CO_3 (d) CaO

(iv) Lactic acid is found in:

(a) grapes (b) tomatoes

(c) ant's string (d) yogurt

(v) Sodium carbonate is an important salt used for many purposes in industries. Which acid is reacted with sodium hydroxide to get it?

(a) Oxalic acid (b) Citric acid

(c) Carbonic acid (d) Acetic acid

2. Write short answers.

(i) Define an acid.

(ii) Name three mineral acids.

(iii) State three properties of acids.

(iv) Mention the uses of two salts in industries.

(v) Name a salt which can reduce the acidity in our stomach.

(vi) What happens when a salt like copper sulphate reacts with water?

(vii) Is soda water acidic or basic?

(viii) Which alkali is commonly used to open a drain?

(ix) Write down the chemical equation showing the reaction of ammonia and water.

(x) How is litmus solution prepared?

3. Mention the sources of the following.

(i) Citric acid (ii) Tartaric acid

(iii) Acetic acid

4. Describe how are salts useful for the human body.

5. What happens when:

(i) magnesium reacts with dilute HCl?

(ii) sodium hydrogen carbonate reacts with dilute H_2SO_4?

(iii) copper oxide reacts with dilute sulphuric acid?

(iv) sodium reacts with chlorine?

6. Why are the aqueous solutions of $NaHCO_3$ and Na_2CO_3 basic in nature?

7. How does the soil become acidic?

8. Sulphuric acid (H_2SO_4) molecule can give two protons in water whereas hydrochloric acid molecule can give only one proton. Does that mean sulphuric acid is twice as strong acid as hydrochloric acid?

9. Indicate in front of each salt the acid and the base which have been used to prepare them.

Name of salt	Acid	Base
Calcium acetate		
Potassium hydrogen sulphate		
Magnesium nitrate		
Ammonium oxalate		
Sodium potassium tartarate		
Ferric chloride		

10. Constructed response questions

(i) Keeping in view the definitions of acids and bases why water is called a neutral compound?

(ii) Suppose your garden soil is acidic and you want to grow vegetables which do not grow very well in an acidic soil. How will you make your soil fit for growing vegetables?

(iii) Citric acid, tartaric acid and acetic acid are used in food items whereas hydrochloric and sulphuric acid are very dangerous for human health. Give reason.

11. Investigate

(i) Sodium bicarbonate ($NaHCO_3$) is used as baking soda. Can potassium bicarbonate ($KHCO_3$) be used for baking cakes?

(ii) Which common salt of copper is used to kill fungus and algae in plants and trees?

(iii) Why common salt found in Khewra mines is pink in colour?

(iv) With the help of pH paper find out the pH of following liquids:

Milk, cooking oil, common salt solution and vinegar

Project

Some times when you water the plants in your kitchen garden white crystals of salts appear on the surface of the soil. This problem is called salinity of soil and the plants do not grow very well in such a soil. With the help of your teacher and your friends find out a method to overcome this problem.