



2

ACIDS, ALKALI AND SALTS

We use various chemical substances in daily life. Many of these are also used in our kitchen. Salt and vinegar are used to make food tastier and to preserve pickle, that is, from spoilage. Eating soda is added to make peas, chickpeas, rajma etc. delicious and quick. Eating soda is also used to make bread, biscuits and cakes soft like sponges. Lemon and eating soda are used to treat indigestion. Washing soda is used in washing clothes.

Various substances are used in our daily life. Many of these substances can be divided into acids, bases and salts.

In this lesson, we will study the nature, properties and uses of acids, bases and salts.



OBJECTIVES

After reading this lesson you will be able to:

- understand acids, their properties and uses;
- understand alkali, their properties and uses; and
- understand salts and their uses.



Notes

2.1 ACIDS

Why is sea water saline?

You must have seen and eaten many such substances in your life, which have a sour taste. Some examples of these substances are lemon, tamarind, vinegar, orange and yogurt. Have you ever wondered why these substances are sour? Actually, the sour taste of these substances is due to the acids present in them. For example, citric acid is present in lemon and orange and acetic acid in vinegar. Even cold materials (Eg Coke, Pepsi, Campa etc.) also contain carbonic acid. When carbon dioxide present in these substances interacts with water, it results in carbonic acid. Acid is the word for acid in English. The word acid originates from the Latin word acidus. Acidus means 'sour'.

You will be surprised to know that our stomach also contains hydrochloric acid, which helps in digesting our food. Hydrochloric acid comes under the category of mineral acids. Mineral acids are acids that can be made from minerals. Sulfuric acid (sulfuric acid) and nitric acid are also mineral acids. How are these different acids different from each other?

Actually mineral acids are very strong acids and have very corrosive (smelting) properties. But the acids found in lemon, vinegar and other substances are very weak acids.

Let us now study some properties of acids. Specific properties of acid are as follows:



Properties of acids

1. Effect on litmus paper

(a) **Blue litmus:** If you take a few drops of any acid on blue litmus paper, you will see that the acid turns blue litmus red.

(B) **Red litmus:** But there is no change due to acid in the color of red litmus.

You can test this with the help of the following activities.



ACTIVITY 2.1

What you have to do: Find out the nature of lemon, orange, raw mango and amla.

What you need: Some seasonal fruits like lemon, orange, raw mango, tamarind, amla etc.

How to do you:

1. Cut a small piece of each fruit and grind it.
2. After that remove the juice from them.
3. Test these juices with red and blue litmus paper.

What you see:

S.N.	Substance	Effect on blue litmus	Effect on red litmus
1.	Lemon	The blue litmus turns red.	There is no change in the color of red litmus.
2.	Orange	Blue litmus turns red.	There is no change in the color of red litmus.



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|----|-----------|------------------------|--|
| 3. | Raw Mango | Blue litmus turns red. | There is no change in the color of red litmus. |
| 4. | Amla | Blue litmus turns red. | There is no change in the color of red litmus. |

What have you learnt? Lemon, orange, raw mango and amla are acidic in nature.

2. Effect on Metals

Acids react with many metals to form hydrogen gas. For example metals like zinc, magnesium, aluminum, etc. react with dilute hydrochloric acid to produce hydrogen gas. Such an experiment is shown in Figure 2. 1(a) You can see bubbles of hydrogen gas on a metal rod immersed in diluted hydrochloric acid in the picture.

But by putting copper rod in dilute hydrochloric acid, one can see bubbles of hydrogen gas on the metal rod immersed in hydrochloric acid.

3. Reaction with carbonate

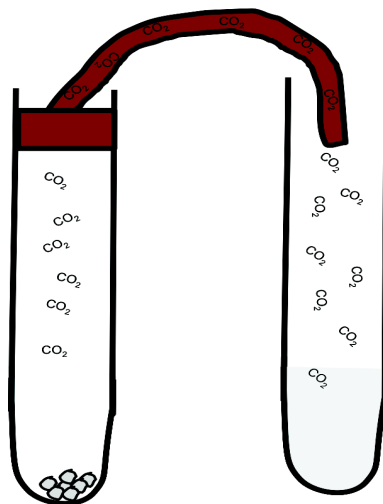


Fig. 2.1 Acid action on metals



You must have experienced that when we do whitewash in the houses and soak the kalai in the water at night, from which the gas comes out. Heat is also released. Acids also react with carbonates of metals such as calcium carbonate (marble pieces), sodium carbonate, or magnesium carbonate. This reaction produces carbon dioxide gas. Carbon dioxide (CO_2) gas is colorless and odorless and does not help in burning. The presence of this gas can be checked with lime water. When CO_2 gas flows into the lime water, it becomes milky. This experiment is shown in Figure 2.2. After studying the properties of acids, let us now get information about their uses.

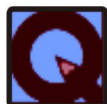
Use of acids

Acids are mostly used in laboratories and industries.

1. Sulfur acid is used in making artificial fertilizers, soaps, pigments (dyes) etc. The acid of sulfur is also called the king of acids.
2. Nitric acid is used in making pigments, medicines, explosives and synthetic fertilizers.
3. Hydrochloric acid is used to remove rust and impurities from the outer layers of objects made of iron and steel. These metals can then be galvanized. Galvanization is the chemical method in which a layer of zinc is applied to iron objects. This process keeps utensils clean and lasts most of the day.
4. Vinegar is used in the preservation of raw foods such as pickles, salads, etc.



5. Lemon juice and tamarind solution is used to clean things made of utensils and brass.



INTEXT QUESTIONS 2.1

Enter the appropriate word in the following blanks -

1. Acids turn blue litmus into
2. Zinc reacts with dilute hydrochloric acid to remove gas.
3. Dilute acids react with carbonates to remove gas.
4. The sour taste of tamarind is due to its presence in
5. Lemons and oranges containsacid.

2.2 ALKALI

In your daily life, you use different types of soaps and detergents. Washing and cleaning clothes are done with their help. These substances contain alkalis, which are chemically hydroxides or oxides of metals and react with water to form hydroxides. Oxide compounds are formed by the reaction of elements with oxygen. Hydroxides of metals are compounds in which one or more hydroxyl (-OH) groups are attached to the metal. Metallic oxide can be represented by $M(OH)_n$ in which n is the valence of metal M .

Common examples of alkalis are sodium hydroxide (caustic soda), calcium hydroxide, and magnesium hydroxide. You would love to know that ammonium hydroxide contains ammonium ion which is the metal hydroxide, but it does not contain metal.



Let us now study the properties of alkalis:

Properties of alkalis -

1. Smooth on touch: You must have noticed that soap and detergents appear smooth on touching. In fact, this is the common property of alkalis, due to which they appear smooth on the sieve.
2. The taste of alkalis is bitter.
3. Effect on litmus:
 - (a) Blue litmus: There is no color change in the litmus when the blue litmus of alkali is processed. (See Figure 2.3 (a)).
 - (b) Red litmus: Red litmus turns blue under the influence of alkalis. (See Figure 2.3 (b)).
4. Effect on phenolphthalein solution: Pink color is obtained by adding a few drops of phenolphthalein indicator in an alkaline solution. Indicators are substances that give different colors with acids and bases.
5. Effect on Methyl Orange 5 Methyl Orange is another indicator. It has no effect on the color of alkaline solution.

Activity 2.2

What you need to do: To check for the presence of alkali.

What you need: turmeric, a pinch of detergent (or a vial of soap), a piece of cloth or paper

How to do:



1. Put a pinch of turmeric on a paper or cloth.
2. Prepare a solution of soap or detergent in water.
3. Put a few drops of soap or detergent mixture on turmeric powder and mix them both.

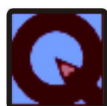
What do you see: The yellow color of turmeric has changed to red.

What you learned: Turmeric powder is used as an indicator to determine the presence of alkali.

Let us now read about their uses after learning the properties of alkalis.

Uses of alkalis

1. Caustic soda or is used in soap making, paper making and petroleum refining.
2. Lime (calcium oxide) is used to neutralize (eliminate) the acidic soil properties. It is also used in whitening.
3. Ammonium hydroxide is used in the laboratory. It is also used in dry cleaning to remove dark stains from clothes.



INTEXT QUESTIONS 2.2

Fill in the blank with appropriate words in the following sentences:

1. Sodium hydroxide is also known as
2. By alkalis does not change the color of litmus.
3. By alkali changes from colorless to pink.



2.3 SALTS

Have you ever wondered what our food would taste like without salt? Common salt is one of the common salts that is used mainly in our daily life.

The chemical name of common salt is sodium chloride (NaCl). Another such salt is- Soda, which is chemically named sodium bicarbonate (NaHCO_3).

Now you might be wondering what are salts and how are their names given? Let us know the answers to these questions.

You read about the properties of acids and bases in parts 2.1 and 2.2. Let us find out what happens by mixing acid and alkali?

When any acid and alkali are added, we get it as a salt and water product.

Acid - Alkali - Saline - Water

This reaction is called a neutralization reaction. Determination of alkali with acid or repeating acid with alkali is called neutralization. Let us now write various neutralization reactions:

Acid	Alkali	Salt	Water
hydrochloric acid (acid)	sodium hydroxide (alkali)	sodium chloride (ordinary salt)	water
nitric acid (acid)	sodium hydroxide (alkali)	sodium nitrate	water
nitric acid (Acid)	Potassium Hydroxide (Alkali)	Potassium Nitrate (Eating Soda)	Water



Notes

You have noticed that the salt is named after its acid and alkali, which are formed by mixing it.

As you have seen, acids and bases destroy each other's effect when salts are formed. From this, what can you guess about the properties and nature of salts? Let us study the effect of some salts on litmus.

Effect of salts on litmus

Salts	Effect on blue litmus	Effect on red litmus	Conclusions
Sodium chloride	No change in color	No change in color	Indifferent
Sodium bicarbonate		The Color turns blue	Alkaline
Sodium carbonate		The color turns blue	alkaline

From the above experiment we see that sodium chloride has no effect on red or blue litmus. Its opinion is that its nature is neither acidic nor alkaline so ordinary salt is neutral. But you see that the other two salts are not indifferent. Therefore, we can say that salts can be neutral, alkaline or acidic, which you will study in the next classes.

Let us now study the uses of some salts.

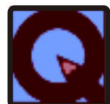
Uses of Salts

1. Sodium Chloride (NaCl): It is also called normal salt, which is used in foods.
2. Sodium carbonate: It is also known as washing soda.

3. Sodium Bicarbonate (NaHCO_3): It is also called baking soda.
4. Copper sulphate (Cu_4SO_4): It is also colloquially called blue stone or vitriol of copper.



Notes



INTEXT QUESTIONS 2.3

Fill in the blanks in the sentences given below -

1. Salts are obtained by the reaction of and
2. Eating soda is
3. Copper sulphate is used in agriculture as
4. Sodium chloride is in nature.



WHAT HAVE YOU LEARNT

- Acids are substances that turn blue litmus red.
- When reacting with active metals such as zinc, magnesium and copper acids, the hydrogen gas is released.
- Acid neutralizes alkali.
- The acid is used in laboratories and industries.
- The bases turn the red litmus blue.
- Alkalis are used in laboratories, homes and industries.
- Normal salt is used to make food delicious, which is a salt.



- Copper sulphate is used in fields as a fungicide
- Baking soda makes the cake lighter and spongy.
- Washing soda is used to make glass.

Let's learn by doing some activity 5.3

1. Collect water from various sources like well, tap, river, lake, tubewell. Examine their acidic, alkaline or neutral nature.
2. Take soil from different areas and see it with the help of litmus paper to find out its nature, which is acidic, alkaline or neutral, and also get information about the crops grown in them. Can you find any relation between the type of soil and the crops grown in it?
3. Grind some colorful flower petals and beetroot and black carrots. Make a solution with water and test them by adding a few drops of acid or alkali in their solutions and note the changed color.

Can these substances be used to test acid and alkali instead of litmus?

4. Collect rainwater from your area and industrial area and test its acidic or alkaline nature. What do you conclude?
5. Get information about the source of common salt. How is its refining and packing done before being sold in the market.



TERMINAL QUESTIONS



Notes

1. Name any three acids.
2. State two simple properties of acids.
3. Which of these acids are used to make the following substances -
 - (i) dyes
 - (ii) explosive substances
 - (iii) detergents
4. Which metal does not react with acid to produce hydrogen gas?
5. Which litmus does not change color in acid?
6. Why are raw mangoes sour and ripe sweet?
7. Write the names of any two bases.
8. Which alkali is not a metallic hydroxide?
9. What is the color of turmeric in an alkaline solution?
10. Which alkali is used in making soap?
11. Why is sea water salty?
12. What is a neutralization reaction?
13. Classify the following into acids, bases and salts:
lime, sodium chloride, vinegar, sodium hydroxide, copper sulfate, sodium bicarbonate, lemon juice



Notes

**ANSWERS TO INTEXT QUESTIONS****2.1**

1. Red
2. Hydrogen
3. Carbon dioxide
4. acid
5. Citric acid

2.2

1. caustic soda
2. Blue
3. Phenolphthalein

2.3

1. acids, alkalis
2. Sodium bicarbonate
3. Fungus Killer
4. indifferent

