

05 Acids and Bases

5.1 Identification of acids and bases

Did you ever think why fruits have different tastes?



Figure ▲ 5.1 Different types of fruits

Fruits have different tastes because they contain different chemical compounds. Fruits such as oranges, pineapples, lemon, tamarind and flavours such as vinegar, lime, tomatoes are sour in taste. The reason for this sour taste is containing **acids** in them.

Sodium bicarbonate is used as a treatment for bee sting. Milk of magnesia tablets are taken for gastritis. Lime is added to reduce the acidity of soil.

Sodium bicarbonate, milk of magnesia and lime contain chemical compounds called **bases**. Bases can be used to reduce the problems occurring due to acids. Bases have a soapy nature.

Water, alcohol, salt solution, kerosene do not show the properties of acids or bases. They are called **neutral substances**.

5.2 Acids and bases available in school laboratory and home

The substances, we use at home as well as the chemicals we use in the laboratory can be classified as acids, bases and neutral substances according to their properties.

Let's do Activity 5.1 to identify substances as acids, bases and neutral substances.



Activity 5.1

You will need :-

Some shoe flowers, lime juice, vinegar, soapy water, lime water, ash dissolved water, common salt solution, water

Method :-

- Boil the shoe flowers and prepare a solution.
- Put equal volumes (2 ml) of solutions given in the table below into separate test tubes.
- Put two drops of shoe flower boiled water into each test tube and shake well.
- Record your observations in the Table 5.1.



Figure ▲ 5.2

Table 5.1 ▼

| Solution | Acid/base/neutral | Colour given with shoe flower solution |
|----------------------|-------------------|--|
| Lime juice | acid | |
| Vinegar | acid | |
| Soap water | base | |
| Lime water | base | |
| Ash dissolved water | base | |
| Common salt solution | neutral | |
| Water | neutral | |

You will observe that acids give one colour while bases give another colour with shoe flower solution.

The solutions/things that give different colours with acids and bases are known as **indicators**.

Litmus is such an indicator that can be found in the laboratory. There are two types of litmus. They are red and blue.

Let's do Activity 5.2 to identify acids, bases and neutral substances using litmus.



Blue litmus

Red litmus

Figure ▲ 5.3



Activity 5.2

Use red litmus and blue litmus instead of shoe flower water with the solutions you used in activity 5.1. Record your observations in a table. Compare your observations with the following colours.

| Type of litmus | Colour with acids | Colour with bases | Colour with neutral substances |
|----------------|-------------------|-------------------|--------------------------------|
| Red litmus | | | |
| Blue litmus | | | |

In the presence of,

- acids, blue litmus turns into red and red litmus does not change the colour.
- bases, red litmus turns into blue and blue litmus does not change the colour.
- neutral substances, both blue and red litmus do not change the colour.

You can prepare indicators by using some materials in the natural environment. Given below are some of them.

- Shoe flower boiled water
- Extraction of “Girithilla” / “Seendukodi” flowers
- Extraction of “Nil katarolu” / “Nela Kakkattan” flowers
- Arecanut boiled water
- Turmeric boiled water
- Red cabbage boiled water

Let’s do Activity 5.3 by using some of the above indicators.



Activity 5.3

Prepare some of the above indicators. Add some drops of those indicators to the solutions given in the following table and record the colour you observe.

Table 5.2 ▼

| Liquids/ Solutions | Indicators prepared | | | |
|-----------------------|-----------------------|--|--|--|
| | Turmeric boiled water | | | |
| Lime juice | | | | |
| Vinegar | | | | |
| Lime water | | | | |
| Soap water | | | | |
| Shampoo | | | | |
| Soda water | | | | |
| Colourless soft drink | | | | |
| Common salt solution | | | | |
| Sugar solution | | | | |
| Glucose solution | | | | |
| Kerosene | | | | |

Classify the liquids/solutions as acids, bases and neutral substances depending on the colour change with the indicators.

Let’s do Assignment 5.1 to identify the acidic and basic substances in the school laboratory.



Assignment 5.1

With the help of your teacher observe the labels of the containers with acids and bases. Collect the information given in the labels. Then prepare a list of acids and bases that can be seen in the laboratory. Do not touch any acid or base. If touched accidentally wash yourself well with cool water.

Some acids that are used frequently in the laboratory are given below.



Some strong bases that are used frequently in the laboratory are given below.



Apart from litmus the following indicators can be used to identify acidic, basic and neutral substances in the laboratory.

1. pH papers
2. Phenolphthalein indicator
3. Methyl orange indicator

Table 5.3 shows the colour changes of the indicators with acids and bases.

Table 5.3 ▼ Colour changes of the indicators with acids and bases

| Indicator | Nature of the indicator | Colour with acidic substances | Colour with basic substances |
|-----------------|---|-------------------------------|------------------------------|
| Blue litmus | a kind of blue coloured paper strips | red | blue (no colour change) |
| Red litmus | a kind of red coloured paper strips | red (no colour change) | blue |
| pH papers | A kind of yellow coloured paper strips | Red, orange, yellow | Dark green, blue, violet |
| Phenolphthalein | A kind of white powder. This powder is dissolved in ethanol or surgical spirit. The solution is colourless. | colourless | pink |
| Methyl orange | A kind of yellow powder. This powder is dissolved in water. The solution is yellow in colour. | red | yellow |

- pH papers

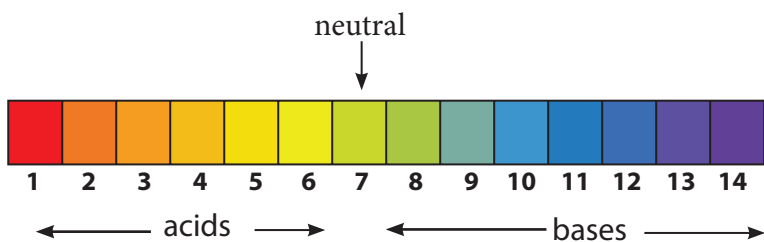
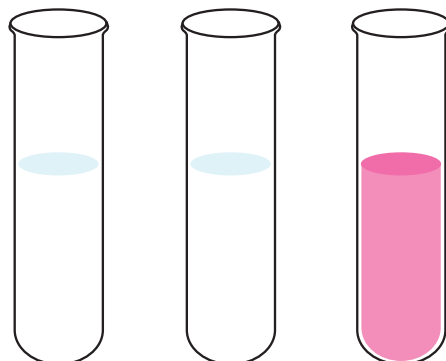


Figure 5.6 ▲



Phenolphthalein powder



Phenolphthalein solution

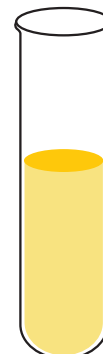
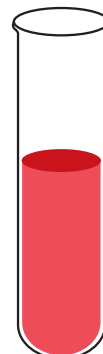
colour with acids

colour with bases

Figure 5.7 ▲



Methyl orange powder



Methyl orange solutions

colour with acids

colour with bases

Figure 5.8 ▲

Let's do Activity 5.4 to identify acidic, basic and neutral substances using pH papers.



Activity 5.4

You will need :-

pH papers, the solutions used in Activity 5.3.

Method: -

- Dip the pH papers in the solutions and compare the colours with the given code. Arrange the solutions according to the consequent numbers.

- Acidic substances show in the range of 1-6 colours
- Bases or basic substances show in the range of 8-14 colours
- Neutral substances show the colour 7 of the pH paper



Activity 5.5

You will need :-

Dilute Hydrochloric acid, dilute sulphuric acid, dilute sodium chloride solution, dilute calcium hydroxide solution

Method :-

Use pH papers, red litmus, blue litmus, phenolphthalein, methyl orange indicators with above solutions to identify the acids and bases. Get the help of your teacher.



Summary

- We use acidic, basic and neutral substances regularly in our day-to-day activities and also in the laboratory.
- Identifying acidic and basic substances makes our day-to-day activities easier.
- Different kinds of indicators are used to identify acidic, basic and neutral substances.
- Lemon, vinegar, tamarind, gambodge are some of the acids that can be found at home.
- Sulphuric acid, hydrochloric acid, acetic acid are some of the acids that can be found in the laboratory.

- Soap, lime water, shampoo, ash are some of the basic substances that we use at home.
- Sodium hydroxide, calcium hydroxide are some of the basic substances that can be found in the laboratory.
- Sugar, common salt, kerosene, glucose are some neutral substances that are used at home.

Exercise

- Select the correct answer for the questions given below.

(01) Which answer contains only acidic substances?

- 1) lemon, soap, common salt
- 2) lime water, common salt, vinegar
- 3) vinegar, lemon, tamarind
- 4) Common salt, vinegar, lemon

(02)turns red litmus into blue.

- 1) Common salt solution
- 2) Lime water
- 3) Orange juice
- 4) Water

(03) An indicator that is used in the laboratory is

- 1) Sodium hydroxide
- 2) Methyl orange
- 3) Sulphuric acid
- 4) Calcium hydroxide

(04) What is the colour of pH papers that are used to identify the acidic and basic substances?

- 1) Yellow
- 2) Blue
- 3) Red
- 4) Violet

(05) What is the solution that turns phenolphthalein into pink?

- 1) Dilute Sulphuric acid
- 2) Sodium hydroxide
- 3) Dilute Nitric acid
- 4) Soda water

- Three containers named as A, B and C contain an acidic, a basic and a neutral solution. The following table shows the resulting colours of red litmus and blue litmus when they are dipped in these solutions.

| | Solution A | Solution B | Solution C |
|-------------|------------|------------|------------|
| Blue litmus | blue | blue | red |
| Red litmus | red | blue | red |

- 1) Which solution shows acidic properties?
- 2) Which solution shows basic properties?
- 3) Which solution shows neutral properties?
- 4) If one vessel contained water, what is the letter of the solution?

Technical Terms

| | | |
|-------------------|------------------------|------------------------|
| Acid | - அமிலம் | - அமிலம் |
| Base | - காரம் | - காரம் |
| Neutral substance | - நடு நிலைப் பொருள்கள் | - நடு நிலைப் பொருள்கள் |
| Indicator | - காட்டி | - காட்டி |
| Medium | - ஊடகம் | - ஊடகம் |