

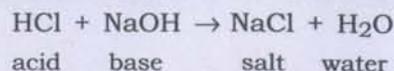
5 Acids, Bases and Salts

Lesson at a Glance

- **Acids:** The word 'acid' has been derived from a latin word 'acidus' which means 'sour'. Thus, all sour substances essentially contain acids. Hence acids are chemical substances which have sour taste and turn neutral litmus solution (sol. in distilled water which is purple in colour) into red. You may have tasted same food like, fruits, that taste sour. Other examples are unripe grapes, curd, vinegar, tarmarind and lemon—all contain acids.
- **Acidic substances:** The substances that taste sour because they contain acids, are said to be *acidic* in chemical nature.
- **Base:** The substances that are bitter in taste and feel soapy on touching are known as *bases*.
- **Basic substances:** The nature of substances which are bitter in taste and soapy in touch is said to be *basic in nature*.
- **Indicator:** The complex naturally occurring substances which change their colour on coming in contact with other substances are called *indicators*. For example, turmeric is an indicator. Some more examples of naturally occurring indicators are litmus, turmeric, china rose petals (Gudhal). Indicators show different colours in acidic, basic and neutral solutions.
- **Neutral substances :** Substances which are neither acidic nor basic are called *neutral substances*.
- **Neutralisation:** The reaction between an acid and a base is known as *neutralisation*. In the process of neutralisation, salt and water are produced with the evolution of heat.

Acid + Base \longrightarrow Salt + Water (Heat is evolved)

For example:



- **Salt:** The product formed (a new substance) by neutralisation reaction between an acid and a base is called *salt*.
- **Lichens:** An indicator, called Litmus, is extracted from *lichens*. Litmus has mauve (purple) colour in distilled water. In an acidic solution, it turns red. When it is added to basic solution, it turns blue. Usually it is available as red and blue litmus paper. When a red litmus paper strip dipped into basic solution it turns blue. When blue litmus paper dipped into acidic solution, it turns red in colour.
- Some of neutral acid–basic indicators are—
 - (i) Turmeric: It turns from yellow to red in alkaline (basic) solution.
 - (ii) China rose petal solution turns dark pink (magenta) in acidic solution and green in basic solution.
- **Synthetic Indicator:** Phenolphthalein and methyl orange are some examples of chemicals which act as acid–base indicator. For example, phenolphthalein solution becomes colourless in acidic medium. When the medium is basic, it turns pink in colour.
- **Acid Rain:** The rain becomes acidic when carbon dioxide, sulphur dioxide and nitrogen dioxide present in the atmosphere, dissolve in rain drops. These gases when dissolved in rain water drops form carbonic acid, sulphuric acid and nitric acid respectively. Acid rain may cause damage to historical monuments, plants and animals.
- **Ant sting:** The *ant sting* contains formic acid which when injected into the skin causes pain and irritation. By applying moist baking soda the effect of the sting can be neutralised.
- **Antacid:** *Antacid* are substances which are used to neutralise excessive acid release in our stomach. Milk of magnesia is an antacid which contains magnesium hydroxide.

■ TEXTBOOK QUESTIONS SOLVED ■

Q.1. State differences between acids and bases.

Acids	Bases
(i) Acids are sour to taste.	(i) Bases are bitter to taste.
(ii) Acid turns blue litmus to red.	(ii) Base turns red litmus to blue.
(iii) Acid is a substance which contains hydrogen ion (H^+).	(iii) Bases are substances which contain hydroxyl ion (OH^-).

Q.2. Ammonia is found in many household products, such as window cleaners. It turns red litmus blue. What is its nature?

Ans. Ammonia has basic nature.

Q.3. Name the source from which litmus solution is obtained. What is the use of this solution?

Ans. Litmus solution is extracted from lichens. It is used to determine whether the given solution is acidic or basic.

Q.4. Is the distilled water acidic/basic/neutral? How would you verify it?

Ans. Distilled water will be neutral. We can verify it by showing that neither blue nor red litmus paper changes its colour when dipped in it.

Q.5. Describe the process of neutralisation with the help of an example.

Ans. The reaction between an acid and a base is known as neutralisation. Salt and water are produced in this process with the evolution of heat.

Antacids like milk of magnesia (magnesium hydroxide), baking soda, etc. which contain a base are used for reducing acidity in stomach when excessive acid released by glands.

Q.6. Mark 'T' if the statement is true and 'F' if it is false:

- (i) Nitric acid turns red litmus blue. (T/F)
 (ii) Sodium hydroxide turns blue litmus red. (T/F)

(iii) Sodium hydroxide and hydrochloric acid neutralise each other and form salt and water. (T/F)

(iv) Indicator is a substance which shows different colours in acidic and basic solutions. (T/F)

(v) Tooth decay is caused by the presence of a base. (T/F)

Ans. (i) F (ii) F (iii) T
 (iv) T (v) F

Q.7. Dorji has a few bottles of soft drink in his restaurant. But, unfortunately, these are not labelled. He has to serve the drinks on the demand of customers. One customer wants acidic drink, another wants basic and third one wants neutral drink. How will Dorji decide which drink is to be served to whom?

Ans. Dorji can decide with the help of litmus paper:

- (i) The drink which would turn a red litmus blue would be basic.
 (ii) If the drink turns a blue litmus to red would be acidic.
 (iii) The drink which would not affect both red and blue litmus would be neutral.

Q.8. Explain why:

- (a) An antacid tablet is taken when you suffer from acidity.
 (b) Calamine solution is applied on the skin when an ant bites.
 (c) Factory waste is neutralised before disposing it into the water bodies.

Ans. (a) We take an antacid such as milk of magnesia to neutralises the excessive acid released in stomach.
 (b) Ant injects an acidic liquid (Formic acid) into the skin on biting which causes inflammation to the skin. The effect of the acid can be neutralised by rubbing. Calamine solution which contains zinc carbonate which is very weak base and causes no harm to the skin.
 (c) The wastes of factories contain acids. If acids are disposed off in the water body, the acids will harm the organisms. So factory wastes are neutralised by adding basic substances.

Q.9. Three liquids are given to you. One is hydrochloric acid, another is sodium hydroxide and third is a sugar solution. How will you identify them? You have only turmeric indicator.

Ans. Name of the substances Effect on turmeric indicator

- | | |
|----------------------|----------------|
| 1. Hydrochloric acid | Yellow to blue |
| 2. Sodium hydroxide | Yellow to red |
| 3. Sugar solution | No change |

Q.10. Blue litmus paper is dipped in a solution. It remains blue. What is the nature of the solution? Explain.

Ans. (i) It can be identified on the basis of the following observations : Bases change the colour of litmus paper to blue. As the colour of blue litmus paper is not affected, the solution must be basic.

(ii) If the solution is neutral, even then colour of litmus will not change.

Q.11. Consider the following statements:

- Both acids and bases change colour of all indicators.
- If an indicator gives a colour change with an acid, it does not give a change with a base.
- If an indicator changes colour with a base, it does not change colour with an acid.
- Change of colour in an acid and a base depends on the type of the indicator.

Which of these statements are correct?

- (i) All four (ii) (a) and (d) (iii) (b) and (c)
(iv) only (d)

Ans. (ii) (a) and (d)

EXTENDED LEARNING — ACTIVITIES AND PROJECTS

Q.1. Using the knowledge of acids and bases, write a secret message with the help of baking soda and beet root. Explain how it works.

(Hint: Prepare baking soda solution in water. Use this solution to write the message on a sheet of white paper with a cotton bud. Rub a slice of fresh beet root over the message.)

Ans. Prepare baking soda solution in water. Use this solution to write the message on a sheet of white paper with a

cotton bud. We observe that we can not read the message and can not see it. Now rub a slice of fresh beet root over the message then we can see it and read it. It becomes visible but before the rubbing of beet root it was hidden. Therefore, it is a secret message. Actually, baking soda solution is basic in nature. It reacts with beet root juice (indicator) and words become visible.

Q.2. Prepare red cabbage juice by boiling a piece of red cabbage in water. Use it as an indicator and test the acidic and basic solutions with it. Present your observations in the form of a table.

Ans. We prepare the indicator by boiling a red cabbage piece. Now we observe its effect on following substances.

S. No.	Substance	Colour on using Indicator	Nature of the Substance
1.	Lemon juice	Pink	Acidic
2.	Orange juice	Pink	Acidic
3.	Baking soda	Green	Basic
4.	Curd	Pink	Acidic
5.	Lime water	Green	Basic

Q.3. Bring the soil sample of your area, find out if it is acidic, basic or neutral. Discuss with farmers if they treat the soil in any manner.

Ans. Take the samples of soil from a field of your areas. Mix the soil with water in a beaker. Stir well the mixture. Filter the mixture and take the filtrate in another beaker. Test it with litmus paper. If it converts blue litmus into red then its nature is acidic. If it converts red litmus into blue then it is basic. If there is no effect on litmus paper then it is neutral. This is the best way and easiest way to test the nature of soil by the farmers.

Q.4. Visit a doctor. Find out the medicines, he prescribes to treat acidity. Ask him how acidity can be prevented.

Ans. These medicines prescribed by the doctors are basic in nature and are called antacids. These medicines neutralise the acidic effect of acids.