CHAPTER

2

ACIDS, BASES AND SALTS

CLASS 10TH

NCERT EXERCISE AND SOLUTIONS - SCIENCE

Q. 1. A solution turns red litmus blue; its pH is likely to be

(a) 1
(b) 4
(c) 5
(d) 10

ANSWER:-

(d) Bases change red litmus paper to blue. A basic solution has a pH greater than 7, so since the solution turns red litmus paper blue, its pH is likely around 10.

Q. 2. A solution reacts with crushed eggshells to give a gas that turns lime-water milky. The solution contains

(a) NaCl
(b) HCl
(c) LiCl
(d) KCl

ANSWER:-

(b) The solution contains HCl (an acid) that reacts with crushed egg shells, which contain calcium carbonate (a base), to produce a gas (carbon dioxide) that turns lime water milky.

The reaction can be represented as:

$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

Q. 3. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount HCl solution (the same solution as before) required to neutralise it will be

(a) 4 mL
(b) 8 mL
(c) 12 mL
(d) 16 mL

ANSWER:-

(d) 16 mL

10 mL of a NaOH solution neutralizes 8 mL of an HCl solution. Therefore, 20 mL of NaOH solution would neutralize:

$$\frac{10}{8} \times 20 = 16 \text{ mL of HCl solution.}$$

Q. 4. Which one of the following types of medicines is used for treating indigestion?

(a) Antibiotic
(b) Analgesic
(c) Antacid
(d) Antiseptic

ANSWER:-

(c) Antacids are commonly used to treat indigestion.

Q. 5. Write word equations and then balanced equations for the reaction taking place when

(a) Dilute sulphuric acid reacts with zinc granules.
(b) Dilute hydrochloric acid reacts with magnesium ribbon.
(c) Dilute sulphuric acid reacts with aluminium powder.
(d) Dilute hydrochloric acid reacts with iron filings.

ANSWER:-

(a) Word equation: Sulphuric acid + Zinc → Zinc sulphate + Hydrogen

Balanced equation: $H_2SO_{4(aq)} + Zn_{(s)} \rightarrow ZnSO_{4(aq)} + H_{2(g)}\uparrow$

(b) Word equation: Hydrochloric acid + Magnesium → Magnesium chloride + Hydrogen

Balanced equation: $2HCl + Mg_{(s)} \rightarrow MgCl_{2(aq)} + H_{2(g)}\uparrow$

(c) Word equation: Sulphuric acid + Aluminium Aluminium sulphate + Hydrogen

Balanced equation: $3H_2SO_{4(aq)} + 2Al_{(s)} \rightarrow Al_2(SO_4)_{3(aq)} + 3H_{2(g)}\uparrow$

(d) Word equation: Hydrochloric acid + Iron Ferric chloride + Hydrogen

Balanced equation: $6HCl + 2Fe_{(s)} \rightarrow 2FeCl_{3(aq)} + 3H_{2(g)}\uparrow$

Q. 6. Compounds such as alcohols and glucose also contain hydrogen but are not categorised as acids. Describe an Activity to prove it.

ANSWER:-

Activity:

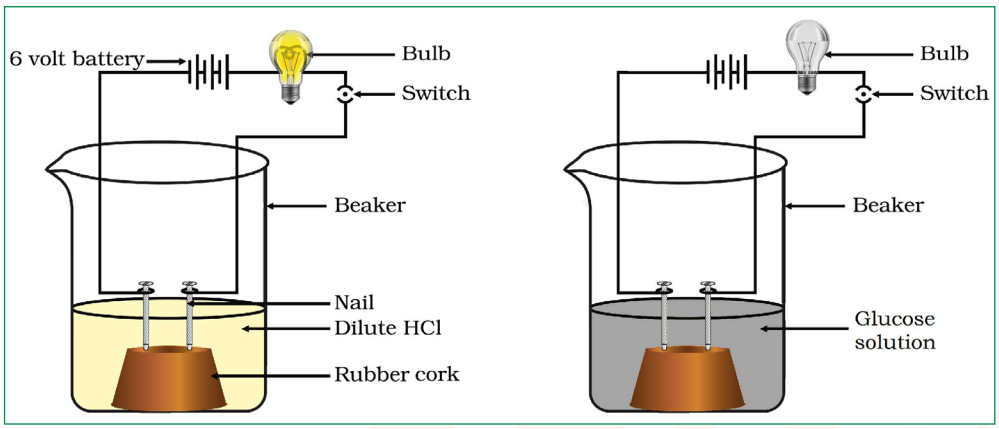
- Two nails are inserted into a cork placed in a 100 mL beaker.
- The nails are connected to the terminals of a 6-volt battery through a bulb and a switch.

- Dilute HCl is poured into the beaker, and the current is turned on.
- The same experiment is repeated using glucose solution and alcohol solution.

Observations: The bulb glows in the HCl solution but does not glow in the glucose or alcohol solution.

Result: In aqueous solution, HCl dissociates into H^+ and Cl^- ions, which conduct electricity, causing the bulb to glow. However, glucose and alcohol do not dissociate into ions in solution, so the bulb does not glow.

Conclusion: While all acids contain hydrogen, not all hydrogen-containing compounds are acids. For example, alcohols and glucose contain hydrogen but are not classified as acids.



Q. 7. Why does distilled water not conduct electricity, whereas rainwater does?

ANSWER:-

Distilled water is pure and free from ionic species, which is why it does not conduct electricity. In contrast, rainwater is impure and contains various ionic species, such as acids, allowing it to conduct electricity.

Q. 8. Why do acids not show acidic behaviour in the absence of water?

ANSWER:-

Acids can only dissociate in aqueous solution to release hydrogen ions, which are responsible for their acidic properties. Without water, acids do not exhibit acidic behaviour, as the dissociation of hydrogen ions from an acid occurs only in the presence of water.

Q. 9. Five solutions A,B,C,D and E when tested with universal indicator showed pH as 4,1,11,7 and 9, respectively. Which solution is

(a) Neutral?
(b) Strongly alkaline?
(c) Strongly acidic?
(d) Weakly acidic?
(e) Weakly alkaline?

Arrange the pH in increasing order of hydrogen-ion concentration.

ANSWER:-

a. Neutral: Solution D with pH = 7
b. Strongly alkaline: Solution C with pH = 11
c. Strongly acidic: Solution B with pH = 1
d. Weakly acidic: Solution A with pH = 4
e. Weakly alkaline: Solution E with pH = 9

The pH values can be arranged in increasing order of hydrogen ion concentration as:
$1 < 4 < 7 < 9 < 11$.

Q. 10. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH3COOH) is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube will the fizzing occur more vigorously and why?

ANSWER:-

Fizzing is more intense in test tube A, where hydrochloric acid (HCl) is added. This is because HCl is a stronger acid than acetic acid (CH_3COOH) and releases more hydrogen ions (H^+). As a result, HCl generates hydrogen gas at a faster rate, leading to stronger fizzing.

Q. 11. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

ANSWER:-

Fresh milk has a pH of 6. When it turns into curd, the pH decreases due to the presence of lactic acid, which lowers the pH level.

Q. 12. A milkman adds a very small amount of baking soda to fresh milk.

(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?
(b) Why does this milk take a long time to set as curd?

ANSWER:-

(a) In an alkaline environment, milk does not readily turn into curd because lactic acid formation occurs more effectively in acidic conditions.
(b) Since this milk is slightly more basic than normal milk, the acids responsible for curd formation are neutralized by the added base. As a result, the curd takes longer to set.

Q. 13. Plaster of Paris should be stored in a moisture-proof container. Explain why?

ANSWER:-

Plaster of Paris (POP) should be stored in a moisture-proof container because it is a dry powder that can absorb moisture, leading to its conversion into a hard solid mass called gypsum. The reaction occurs as follows:

Plaster of Paris + Water → Gypsum (hard solid)

$$CaSO_4\frac{10}{8}H_2O+H_2O\rightarrow CaSO_4\cdot 2H_2O)$$

Q. 14. What is a neutralisation reaction? Give two examples.

ANSWER:-

A neutralization reaction occurs when an acid and a base react to form salt and water.

Examples include:

i. Reaction between NaOH and HCl :

$NaOH+HCl\rightarrow NaCl+H_2O$

(Base + Acid → Salt + Water)

ii. Neutralization in indigestion:

Excess stomach acid causes indigestion, which is relieved by taking an antacid like milk of magnesia (a base). The antacid neutralizes the excess acid, providing relief.

$Mg(OH)_2+2HCl\rightarrow MgCl_2+2H_{-2}O$

Q. 15. Give two important uses of washing soda and baking soda.

ANSWER:-

Uses of Washing Soda:

(a) It helps in removing permanent hardness from water.

(b) It is widely used in the glass, soap, and paper industries.

Uses of Baking Soda:

(a) It is a key ingredient in baking powder, which is a mixture of baking soda and tartaric acid. Baking powder helps make bread and cakes fluffy.

(b) It is used in soda-acid fire extinguishers.