In-text questions set 1 **Page number 18**

1. You are given three test tubes. The three test tubes contain distilled water, an acidic solution and the basic solution, respectively. There is only red litmus paper available in order to identify what is there in each test tube. How will you find out what is in each of the test tubes?

Solution: We can identify the content in each of the test tubes using red litmus paper. This can be done by noticing the colour change of the red litmus paper.

- On litmus paper, the three solutions in the test tubes are poured separately.
- The solution which turns red litmus to blue contains a basic solution.
- Divide the formed blue litmus paper into two parts.
- The solution from the test tube, which turns blue litmus paper to red, will be the acidic solution.
- The solution of the test tube, which does not change either red or blue litmus paper, contains water.

NOTE: After immediate distillation, distilled water has a pH of 7. However, within a few hours after distillation, it absorbs carbon dioxide from the atmosphere and turns slightly acidic with a pH of 5.8.

In-text questions set 2 **Page number 22**

1. Why should curd and sour substances not be kept in brass and copper vessels?

Solution: Curd and sour food substances contain acids; these acidic substances combine with metal. This reaction turns food into poison, which damages people's health.

2. Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas?

Solution: When an acid reacts with any metal, salt and hydrogen gas are formed.

Metal + Acid → Salt + Hydrogen gas

3. Metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.

Solution: As the metal compound released is Calcium Chloride, the gas evolved here is CO_2. Hence, metal A should be Calcium Carbonate. Hence, the reaction between Calcium Carbonate and HCl is

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

In-text questions set 3 **Page number – 25**

1. Why do HCl, HNO3, etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show an acidic character?

Solution: Release of H^+ ion in water will make a compound acidic or non-acidic. Acids are substances which, upon dissociating with water, resulting in the production of Hydrogen ions. Some compounds show an acidic character as they dissociate in the aqueous solution, which results in the production of hydrogen ions (acids like HCl, HNO_3).

Compounds similar to glucose or alcohol do contain a hydrogen element, but they do not show signs of acidic nature. The fact is that the hydrogen in them will not separate from like the hydrogen in the acids. They will not separate to become hydrogen ions, on dissolving in the water.

2. Why does an aqueous solution of acid conduct electricity?

Solution: Charged particles are responsible for the conductance of electricity in an acid. These charged particles, called ions, are the reason behind the conductance of electricity in acid.

3. Why does dry HCl gas not change the colour of the dry litmus paper?

Solution: HCl does not give out Hydrogen ions; therefore, HCl does not show any acidic behaviour, and the colour of the litmus paper remains the same on reacting with HCl gas.

4. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

Solution: While diluting an acid, it is recommended that the acid should be added to water and not water to the acid because if water is added to a concentrated acid, it releases a huge amount of heat which may result in an explosion and can cause acid burns on the face, clothes and body parts. Hence, it is safe to add acid to water but not water to acid.

5. How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted?

Solution: When acid is added to water, there will be a fixed amount of hydronium present in the fixed volume of the solution. If we dilute the solution, hydronium ions per volume of the solution decrease, and this, in turn, decreases Hydronium concentration in the solution.

6. How is the concentration of hydroxide ions (OH^-) affected when excess base is dissolved in a solution of sodium hydroxide?

Solution: When a base is dissolved in sodium hydroxide solution, its hydroxide ions increase, but it will reach saturation at some point. After saturation point, hydroxide ion concentration is not affected even after adding base further.

In-text questions set 4 **Page number – 33**

1. You have two solutions, A and B. The pH of solution A is 6, and the pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of these is acidic, and which one is basic?

Solution: In order to find the hydrogen ion concentration, we can use the rule that states, "The pH of any solution is inversely proportional to the hydrogen ion concentration." Therefore, it means that the solution that has a lower pH number will have a higher hydrogen ion concentration. Hence, solution A will have a higher hydrogen ion concentration. In addition, solution B will be basic, and A will be acidic.

2. What effect does the concentration of H^+(aq) ions have on the nature of the solution?

Solution: Hydrogen ion concentration decides the nature of the solution. If Hydrogen ion concentration increase, then the solution turns acidic and similarly, if Hydrogen ion concentration decreases, then the solution turns basic.

3. Do basic solutions also have H^+(aq) ions? If yes, then why are these basic?

Solution: Basic solutions have H^+ ions, but hydroxide ions present in basic solution are more in basic solution. Hence, Hydroxide ions turn the solution into basic.

4. Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide), or chalk (calcium carbonate)?

Solution: If the soil is acidic in nature (PH below 7), then such fields should be treated with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate).

In-text questions set 5 **Page number – 34-35**

1. What is the common name of the compound $CaOCl_2$?

Solution: The common name of $CaOCl_2$ is bleaching powder.

2. Name the substance, which on treatment with chlorine, yields bleaching powder.

Solution: The substance, which on treatment with chlorine, yields bleaching powder is Calcium hydroxide.

3. Name the sodium compound which is used for softening hard water.

Solution: Sodium carbonate is the compound which is used for softening hard water.

4. What will happen if a solution of sodium hydrocarbonate is heated? Give the equation of the reaction involved.

Solution: Heating sodium hydrocarbonate yields sodium carbonate, and carbon dioxide gas is liberated in the process.

$$2NaHCO_3 \xrightarrow{heat} Na_2CO_3 + H_2O + CO_2$$

5. Write an equation to show the reaction between Plaster of Paris and water.

Solution: The chemical equation for the reaction of Plaster of Paris and water is

$CaSO_4.1/2H_2O + 3/2H_2O \rightarrow CaSO_4.2H_2O$

Exercise questions **Page number – 33**

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

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

Solution: The answer is 10 because litmus paper turns blue when the solution reacts with a basic solution (PH more than 7). Hence, 10 is the answer.

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

Solution: The answer is HCl.

Eggshells contain calcium carbonate, which on reaction with HCl, liberates CO_2 gas, which turns lime water into milky.

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

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 of 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

Solution: Since 10 ml of NaOH requires 8 mL of HCL, 20 ml of NaOH requires 8 x 2 = 16mL of HCl. Hence, the answer is option (d) 16mL.

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

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

Solution: Indigestion is due to the excess production of acid in the stomach. Medicines used to treat indigestion is called Antacid.

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.

Solution:

(a) Dilute sulphuric acid reacts with zinc granules.

=> Dilute sulphuric acid + zinc → Zinc Sulphate + Hydrogen Gas

=> $H_2SO_4(aq) + Zn \rightarrow ZnSO_4(aq) + H_2(g)$

(b) Dilute hydrochloric acid reacts with magnesium ribbon.

=> Dilute Hydrochloric + Magnesium → Magnesium Chloride + Hydrogen Gas

=> $2HCl(aq) + Mg \rightarrow MgCl_2(aq) + H_2(g)$

(c) Dilute sulphuric acid reacts with aluminium powder.

=> Dilute Sulphuric Acid + Aluminium → Aluminium Sulphate + Hydrogen Gas

=> $3H_2SO_4(aq) + 2Al(s) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$

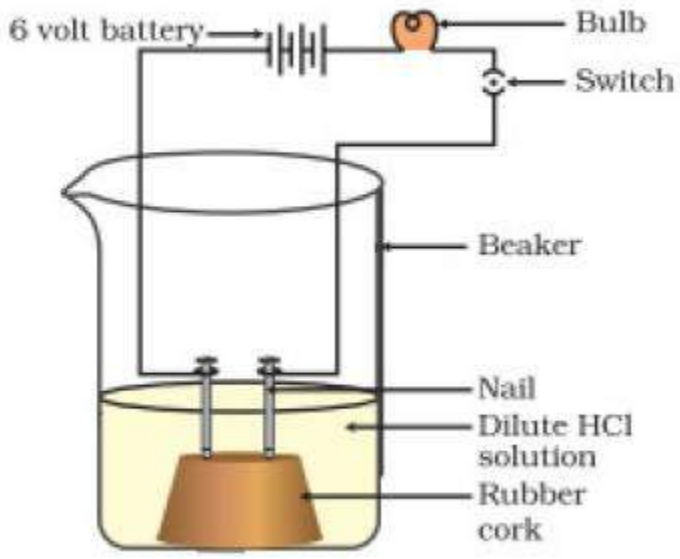
(d) Dilute hydrochloric acid reacts with iron filings.

=> Dilute Hydrochloric Acid + Iron → Ferrous Chloride + Hydrogen Gas

=> $6HCl(aq) + 3Fe(s) \rightarrow 3FeCl_2(aq) + 3H_2(g)$

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

Solution: Insert two nails into the wooden or rubber cork and place them on a beaker, as shown in the figure. Connect the iron nail to a bulb, a 6-volt battery and a wire connected to the switch. Pour some alcohol or glucose so as to dip the nails in glucose or alcohol. Turn the switch on, and you see the bulb not glowing despite of connection to the switch. Now empty the beaker and add the HCL solution. This time, the bulb glows. This proves acid can conduct electricity, but alcohol and glucose do not conduct electricity.



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

Solution:

- Distilled water does not contain any ionic compounds in it.
- Whereas rainwater has a lot more compounds.
- Rainwater has dissolved acidic gas, such as carbon dioxide from the air, and that forms carbonic acid. This means that it has hydrogen ions and carbonate ions. Therefore, with the presence of acids, rainwater can conduct electricity.

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

Solution: The acidic behaviour of acids is because of the presence of hydrogen ions. Hydrogen ions can only be produced in the presence of water, and therefore, water is definitely needed if acids are to show their acidic behaviour.

9. Five solutions, A, B, C, D and E, when tested with a 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?

Solution: In increasing order of hydrogen ion concentration,

pH 11(C) < pH 9(E) < pH 7 (D) < pH 4 (A) < pH 1 (B)

PH11 – Strongly alkaline

pH9 – Weakly alkaline

PH7 – Neutral

pH4 – Weakly acidic

pH1 – Strongly acidic

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 (CH_3COOH) is added to test tube B. Amount and concentration taken for both the acids are the same. In which test tube will the fizzing occur more vigorously and why?

Solution: HCl is a strong acid, whereas acetic is a weaker acid. Fizzing occurs because of the production of the hydrogen gas obtained due to the reaction of the acid on the magnesium ribbon. Since HCl is a very strong acid, there is a lot of liberation of hydrogen gas from test tube A. Therefore, more fizzing takes place in test tube A.

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

Solution: Fresh milk is turned to curd due to the production of lactic acid. Lactic acid reduces the pH of the milk.

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?

Solution: (a) He shifted the pH of the fresh milk from 6 to slightly alkaline to prevent milk from getting sour due to the production of lactic acid.

(b) This milk takes a long time to set into curd because the lactic acid produced here first neutralises the pH, and then the pH is reduced to turn the milk into curd.

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

Solution: Plaster of Paris should be stored in a moisture-proof container because moisture can affect the Plaster of Paris by slowing down the setting of the plaster because of hydration. This will turn plaster useless.

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

Solution: The reaction of the acid + base gives a product of salt + water, which is considered a neutralisation reaction.

Examples:

$NaOH + HCl \rightarrow NaCl + H_2O$

$Mg(OH)_2 + H_2CO_3 \rightarrow MgCO_3 + 2H_2O$

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

Solution:

Washing soda	**Baking soda**
1. It is used as an electrolyte	1. It can be used to test the garden soil for acidity. If bubbles are developed, then the soil is too acidic
2. It can be used domestically as a water softener for laundry.	2. If used on washing the car, then it will remove dead bug bodies without damaging the colour or the paint on the car.