

Acids, Bases and Salts

1. You are given three test tubes. The three test tubes contain distilled water, 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.
- Solution of the test tube which do not change either red or blue litmus paper contain water.

NOTE: After immediate distillation, distilled water has a pH of 7. However, just 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 to poison which damage 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 $\rightarrow$ 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.

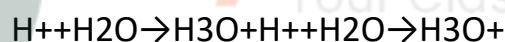
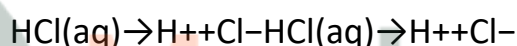
Solution: As metal compound released is Calcium Chloride the gas evolved here is CO₂. Hence metal A should be Calcium Carbonate. Hence the reaction between Calcium Carbonate and HCl is



in text questions set 3 Page number – 25

1. Why do HCl, HNO₃, HCl, HNO₃, etc., Show Acidic Characters in Aqueous Solutions While Solutions of Compounds Like Alcohol and Glucose Do Not Show Acidic Character?

Ans: The acidic character of any compound is due to the presence of the hydronium ions (H₃O⁺)(H₃O⁺) or hydrogen ions (H⁺)(H⁺) in any solution. In an aqueous solution HCl and HNO₃ gets dissociated and forms hydrogen ions. The hydrogen ions combine with H₂O to form hydronium ions. The reaction is as follows:



Due to the presence of hydronium ions HCl, HNO₃, HCl, HNO₃, etc., show acidic characters. However, the aqueous solutions of glucose and alcohol contain hydrogen, but it cannot dissociate in water to form hydrogen ions. Therefore, they do not show acidic character.

2. Why Does an Aqueous Solution of an Acid Conduct Electricity?

Ans: Acids have the tendency to dissociate into hydronium ions (H₃O⁺)(H₃O⁺) or hydrogen ions (H⁺)(H⁺) in an aqueous solution. Due to the movement of these ions, the solution can conduct electricity. Hence, an aqueous solution of an acid can conduct electricity.

3. Why Does Dry HCl Gas Not Change the Colour of the Dry Litmus Paper?

Ans: The acidic nature is due to the presence of hydronium (H₃O⁺)(H₃O⁺) or hydrogen (H⁺)(H⁺) ions in aqueous solution. Dry HCl gas does not contain hydronium or hydrogen ions as only in aqueous solution an acid can dissociate to give ions. The colour of the litmus paper is changed by the hydrogen ions. So,

in this case there will be no colour change due to dryness of the HCl gas and the litmus paper.

4. While Diluting an Acid, Why is It Recommended That the Acid Should Be Added to Water and Not Water to the Acid?

Ans: It is always recommended that acid should be added to water in order to dilute the acid; because the process of dissolving an acid in water is exothermic that releases heat. If water is added to the acid, then a large amount of heat is generated due to which the mixture spills out and causes burns and injuries that may cause accidents.

5. How is the Concentration of Hydronium ions (H_3O^+)(H_3O^+) Affected When a solution of an acid is Diluted?

Ans: When a solution of an acid is diluted, then water is added to that solution. Dilution results in the concentration of hydronium ions (H_3O^+)(H_3O^+) per unit volume to get decreased and thus the strength of the acid also decreases.

6. How is the Concentration of Hydroxide ions (OH^-)(OH^-) Affected When Excess Base is Dissolved in a Solution of Sodium Hydroxide?

Ans: When an excess of a base is dissolved in a solution, the solution becomes concentrated. This would result in the increase in the concentration of hydroxide ions (OH^-)(OH^-) per unit volume and the strength of the base will increase.

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

Solution : A pH value of less than 7 indicates an acidic solution, while greater than 7 indicates a basic solution. Therefore, the solution with pH = 6 is acidic and has more hydrogen ion concentration than the solution of pH = 8 which is basic.

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

Solution : concentration of H^+ (aq) can have a varied effect on the nature of the solution. With an increase in ion concentration, the solution becomes more acidic, while a decrease of H^+ ion causes an increase in the basicity of the solution.

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

Solution : Yes, basic solution also has H^+ (aq) ions. However, their concentration is less as compared to the concentration of OH^- ions that makes the solution basic.

14. 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 and improper for cultivation, then to increase the basicity of soil, the farmer would treat the soil with quicklime or slaked lime or chalk



15. What is the common name of the compound CaOCl_2 ?

Solution : Bleaching powder.

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

Solution : Slaked lime or calcium hydroxide.

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

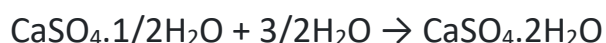
Solution : Sodium carbonate is used for softening hard water.

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

Solution : When a solution of sodium hydrocarbonate (sodium hydrogen carbonate) is heated, sodium carbonate and water are formed with the evolution of carbon dioxide gas.

19. 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



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

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

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

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

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

Solution: Answer is HCl.

Egg shells contains calcium carbonate, which on reaction with HCl liberates CO_2 gas which turn lime water to milky.

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

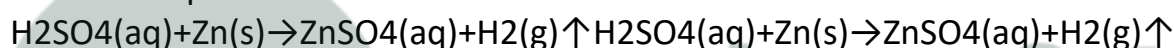
Solution: Since 10 ml of NaOH requires 8 mL of HCL, 20 ml of NaOH require $8 \times 2 = 16\text{mL}$ of HCL. Hence the answer is option d 16mL.

5. Write Word Equations and Then Balanced Equations for the Reaction Taking Place When –

a) Dilute Sulphuric Acid Reacts with Zinc Granules.

Ans: Word equation: Sulphuric acid + Zinc $\rightarrow$ Zinc sulphate + Hydrogen

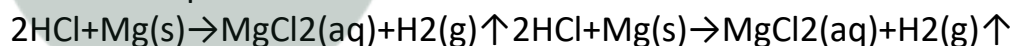
Balanced equation:



b) Dilute Hydrochloric Acid Reacts with Magnesium Ribbon.

Ans: Word equation: Hydrochloric acid + Magnesium $\rightarrow$ Magnesium chloride + Hydrogen

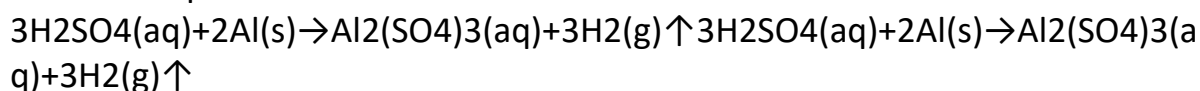
Balanced equation:



c) Dilute Sulphuric Acid Reacts with Aluminium Powder.

Ans: Word equation: Sulphuric acid + Aluminium $\rightarrow$ Aluminium sulphate + Hydrogen

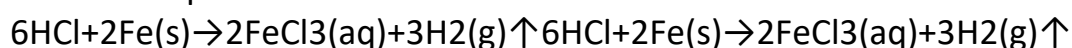
Balanced equation:



d) Dilute Hydrochloric Acid Reacts with iron Filings.

Ans: Word equation: Hydrochloric acid + Iron $\rightarrow$ Ferric chloride + Hydrogen

Balanced equation:



6. Compounds Such As Alcohols and Glucose Also Contain Hydrogen but Are Not Categorized As Acids. Describe an Activity To Prove It.

Ans:

Activity:

- a. Two nails are fitted on a cork kept in a 100 mL beaker.
- b. The nails are then connected to the terminals of a 6-volt battery through a bulb and a switch.
- c. Some dilute HCl is poured in the beaker and the current is switched on.
- d. The same experiment is then performed with glucose solution and alcohol solution.

Observations:

The bulb glows in the HCl solution and does not glow in the glucose or alcohol solution.

Result:

In aqueous solution, HCl dissociates into H^+ and Cl^- ions. These ions conduct electricity in the solution resulting in the glowing of the bulb. On the other hand, the glucose or alcohol solution does not dissociate into ions. Therefore, the bulb does not glow.

(Image will be uploaded soon)

Conclusion:

All acids contain hydrogen but not all compounds containing hydrogen are acids.

So, alcohols and glucose contain hydrogen, but they are not categorised as acids.

7. Why Does Distilled Water Not Conduct Electricity, Whereas Rain Water Does?

Ans: Distilled water is a pure form of water which is free from ionic species. Therefore, it does not conduct electricity. Rain water is an impure form of water that contains many ionic species like acids and thus, it conducts electricity.

8. Why Do Acids not Show Acidic behaviour in the Absence of Water?

Ans: Acids can only dissociate in aqueous solution to liberate hydrogen ions which are responsible for the acidic behaviour. Acids do not show acidic behaviour in the absence of water because the dissociation of hydrogen ions from an acid occurs in the presence of water only.

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

a) Neutral

Ans: Solution D with pH=7

b) Strongly Alkaline

Ans: Solution C with pH=11

c) Strongly Acidic

Ans: Solution B with pH=1

d) Weakly Acidic

Ans: Solution A with pH=4

e) Weakly Alkaline

Ans: Solution E with pH=9

f) Arrange the pH in Increasing Order of Hydrogen-ion Concentration.

Ans: The pH can be arranged in the increasing order of the concentration of hydrogen ions as:

$$11 < 9 < 7 < 4 < 111 < 9 < 7 < 4 < 1$$

30. 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?

Solution : HCl is stronger acid than CH₃COOH. Therefore, H⁺ ions concentration in test tube A will be more than that in test tube B. hence, reaction will take place faster in test tube A than in test tube B. so, fizzing will occur more vigorously in test tube B.

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

Solution : The pH of milk is 6. As it changes to curd, the pH will reduce because curd is acidic in nature. The acids present in it decrease the PH.

32. 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) The milkman shifts the pH of the fresh milk from 6 to slightly alkaline because in alkaline condition, milk does not set as curd easily.

(b) Since this milk is slightly basic than usual milk, acids produced to set the curd are neutralized by the base. Therefore, it takes a longer time for the curd

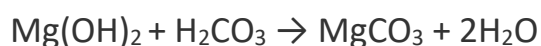
to set. **13. Plaster of Paris should be stored in a moisture-proof container. Explain why?**

Solution: Plaster of Paris should be stored in moisture-proof container because moisture can affect 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 as neutralization reaction.

Examples:



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 water softener for laundry.	2. If used on washing car then it will remove dead bug bodies without damaging the colour or the paint on the car.