2 Acids, Bases and Salts

IMPORTANT NOTES

1. **Acids** generally have a watery touch and sour taste. Some acids are highly corrosive in nature and can cause severe burns.
2. **Bases** generally have a soapy touch and bitter taste. Soluble bases have a corrosive action on the skin and can cause severe burns.
3. Aqueous solutions of acids and bases are good **conductors of electricity.**
4. **An acid** is a compound, which on dissolving in water gives hydronium ions or $H^+(aq)$ ions as the only positively charged ions.
5. **An alkali** is a compound, which on dissolving in water gives hydroxyl or OH^- (aq) ions as the only negatively charged ions.
6. An oxide or a hydroxide of a metal which reacts with acids to form salt and water as the only products, is called a **base.**
7. **All bases/alkalises** have a positively charged metallic ion except ammonium hydroxide [NH_4OH] which has a positive NH_4^+ radical.
8. The separation of $H^+(aq)$ ions from an acid takes place **only in the presence of water.** The separated $H^+(aq)$ ion can exist independently and hence combines with water molecule to form hydronium ion [H_3O^+].
9. An acid containing least possible amount of water is called a **concentrated acid.**
10. An acid containing fairly large amount of water is called a **dilute acid.**
11. The process of mixing water in an acid is called **dilution of acid.** While diluting an acid **always add acid slowly to water and continuously stir the mixture.** It is because the reaction is generally exothermic and can cause spurting.
12. An alkali containing least possible amount of water is called a **concentrated alkali.**
13. Dilution of an acid/ alkali, **lowers the concentration** of $H^+(aq)/OH^-(aq)$ ions per unit volume.
14. **pH scale** measures the concentration of $H^+(aq)$ ions in a particular solution. In the word pH, p stands for "potenz" meaning power and H for the $H^+(aq)$ ions.
15. On the pH scale, the **concentration of $H^+(aq)$ ions** is measured from 0 to 14. Zero (0) is for highly acidic solution and 14 is for highly alkaline solution.
16. pH of **distilled water and neutral salt solution** is 7.
17. If the pH of a solution is less than 7, then it is an **acidic solution.** When the pH of a solution decreases from 7 to 0, the concentration of $H^+(aq)$ ions in it goes on increasing and so does the acidic character of the solution.
18. If the pH of a solution increases from 7 to 14, the concentration of $H^+(aq)$ ions decreases and that of $OH^-(aq)$ ions increases. So, the neutral solution becomes more and more alkaline, till at pH 14 it is highly alkaline.
19. pH is generally measured by **pH paper**, which is prepared by impregnating a filter paper in a solution of universal indicator and then drying.
20. The colours produced on the pH paper at different values are listed below.

pH	Colour	pH	Colour
0	Dark red	8	Greenish blue
1	Red	9	Blue
2	Red	10	Navy Blue
3	Orange red	11	Purple
4	Orange	12	Dark Purple
5	Orange yellow	13	Violet
6	Greenish yellow	14	Deep violet
7	Green		

21. Acid-base indicators are organic dyes derived from plant materials which shows the presence of acids and bases.

22. Litmus is a natural indicator, extracted from a plant, belonging to the thallophyta family.

23. The dyes from the plants, such as red cabbage leaves, coloured petals of plants such as Petunia, and Turmeric are other natural indicators.

24. Phenolphthalein and methyl orange are synthetic indicators which show the presence of acids and bases.

25. Blue litmus solution turns red in acidic solutions, but is not affected in basic solutions.

26. Red litmus solution turns blue in basic solutions, but is not affected in acidic solutions.

27. Phenolphthalein solution turns pink in basic solutions, but turns colourless in acidic solutions.

28. Methyl orange solution is yellow in basic solutions and pink in acidic solutions.

29. Turmeric solution turns brown in basic solutions, but remains yellow in acidic solutions.

30. The substance whose smell changes in acidic or basic medium are called olfactory indicators.

31. Acids react with active metals to form the salts of the metals and liberate hydrogen gas. Active metals are sodium, potassium, calcium, magnesium, aluminium, zinc and iron.

Active metal + Acid $\longrightarrow$ Metal salt + Hydrogen(g)

32. Acids react with metal carbonates to form their respective metal salts, water and carbon dioxide gas.

Metal carbonate + Acid $\longrightarrow$ Metal salt + Water + Carbon dioxide gas.

33. Acids react with metal hydrogencarbonates (metal bicarbonates) to form their respective metal salts, water and carbon dioxide gas.

Metal hydrogencarbonate + Acid $\longrightarrow$ Metal salt + Water + Carbon dioxide.

34. Acids react with metal oxides to form their respective salts and water as the only products.

Metal oxide + Acid $\longrightarrow$ Metal salt + water.

35. Acids react with metal hydroxides to form their respective salts and water as the only product.

Metal hydroxide + Acid $\longrightarrow$ Metal salt + Water

36. Substances which react with acids to form salt and water as the only products are called basic substances. Thus, oxides and hydroxides of metals are bases.

37. A chemical reaction in which an acid reacts completely with a base to form salt and water as the only products, is called a neutralisation reaction.

38. All oxides of metals are insoluble in water.

39. All hydroxides of metals are insoluble in water, except the hydroxides of sodium, potassium, calcium and magnesium.

40. Soluble hydroxides of metals are called alkalises.

41. An acid solution which produces more $H^+(aq)$ ions for an aqueous solution of 1 molar concentration is called a **strong acid.**

42. An acid which produces few $H^+(aq)$ ions for an aqueous solution of 1 molar concentration is called a **weak acid.**

43. Sulphuric acid, hydrochloric acid, nitric acid and phosphoric acid are the examples of strong acids.

44. Carbonic acid, sulphurous acid, acetic acid, etc., are the examples of weak acids.

45. An alkali which produces more $OH^-(aq)$ ions in an aqueous solution of 1 molar concentration, is called a **strong alkali.**

Sodium hydroxide and potassium hydroxide are the examples of strong alkalies.

46. An alkali which produces few $OH^-(aq)$ ions for an aqueous solution of 1 molar concentration, is called a **weak alkali.**

Calcium hydroxide, magnesium hydroxide and ammonium hydroxide are examples of weak alkalies.

47. Some animals and plants employ acids/alkalises for their self defence.

48. An ionic compound containing a positive ion other than hydrogen ion and a negative ion other than hydroxyl ion is called a **salt.**

49. All the salts having the same negative ion/ radical, but different metallic ions is called a **family of salts.**

Conversely, all the salts having the same positive metallic ion and different non-metallic ions/radicals is called a **family of salts.**

50. The salts formed by the action of strong acids with strong bases, are called **normal salts**.

51. The salts formed by the action of strong acids and weak bases are called **acid salts.**

52. The salts formed by the action of weak acids and strong alkalises are called **basic salts.**

53. **Common salt** is the most important and most abundant salt in nature. In addition to its use as an edible salt it is also a raw material for producing chemicals, such as chlorine, hydrogen, sodium and hydrochloric acid.

54. When saturated common salt is electrolysed, the products are sodium hydroxide, hydrogen and chlorine gas.

55. **Hydrogen gas** is used in (i) oxy-hydrogen flame (ii) hydrogenating vegetable oils, (iii) manufacture of ammonia and hydrochloric acid, (iv) as a rocket fuel.

56. **Chlorine gas** is used in : (i) disinfecting water (ii) in the manufacture of bleaching powder, hydrochloric acid and pesticides (iii) in bleaching wood pulp and cotton fabrics (iv) in the manufacture of polyvinyl chloride and chlorofluorocarbons.

57. **Sodium hydroxide** is used : (i) in the manufacture of all kinds of soaps and detergents (ii) making paper pulp in paper industry (iii) making artificial fibres like rayon and nylon (iv) for de-greasing surface of metals (v) and making bleaching agents such as sodium hypochlorite.

58. **Bleaching powder** is prepared by passing chlorine gas through freshly prepared slaked lime paste, till it stops reacting.

59. **Bleaching powder is used :** (i) for bleaching cotton-fabrics and wood pulp (ii) making unshrinkable wool (iii) in the manufacture of chloroform (iv) in sterilisation of drinking water, and (v) in disinfecting laboratories, drains, ditches, etc.

60. **Baking soda is prepared industrially** from common salt, by passing carbon dioxide gas through saturated ammonical common salt solution.

$$NaCl_{(s)} + H_2O_{(l)} + NH_{3(g)} + CO_{2(g)} \longrightarrow NH_4Cl_{(aq)} + NaHCO_{3(s)}$$

61. **Baking soda is used :** (i) in making baking powder (ii) as a constituent of antacids and (iii) in fire extinguishers.

62. **Soda ash** (anhydrous sodium carbonate) is prepared by strongly heating baking soda.

$$2NaHCO_{3(s)} \xrightarrow{\text{heat}} Na_2CO_{3(s)} + H_2O_{(l)} + CO_{2(s)}$$

63. **Washing soda** (hydrated sodium carbonate) is prepared by dissolving soda ash in water and then crystallising it.

$$Na_2CO_{3(s)} + 10H_2O_{(l)} \longrightarrow Na_2CO_3.10H_2O.$$

64. **Washing soda and soda ash** is used (i) in softening of hard water (ii) in the manufacture of glass and dry soaps (iii) as a common cleansing agent in the household (iv) in the manufacture of caustic soda, boron and sodium phosphate.

65. The fixed number of water molecules, which are in loose combination with one molecule of a salt, is called **water of crystallisation.**

66. **Plaster of Paris** is chemically calcium sulphate hemihydrate [$(CaSO_4)_2.H_2O$ or $CaSO_4.\frac{1}{2}H_2O$]. It is prepared by prolonged heating gypsum at a controlled temperature of 100°C.

$$CaSO_4.2H_2O_{(s)} \xrightarrow[100\ C]{\text{heat}} CaSO_4.\frac{1}{2}H_2O_{(s)} + \frac{3}{2}H_2O_{(g)}$$

67. **Plaster of Paris** reacts with water to give a hard mass called **gypsum**.

$$(CaSO_4)_2.H_2O_{(s)} + 3H_2O_{(l)} \longrightarrow 2CaSO_4.2H_2O_{(s)}$$

68. **Plaster of Paris is used :** (i) for keeping fractured bones in position (ii) in making decorative toys and panelling ceilings (iii) in making fire proof materials and (iv) in making blackboard chalk.

ASSIGNMENTS FOR SUMMATIVE ASSESSMENT

I. VERY SHORT ANSWER QUESTIONS (1 Mark)

A. IMPORTANT QUESTIONS

1. Blue and red litmus papers are placed simultaneously in a colourless aqueous solution. It is found that the colour of both litmus papers is red. What is the nature of the solution and why?

2. A strip of absolutely clear cloth is sprayed with onion juice. The strip is then rubbed with few drops of hydrochloric acid. Will the strip smell like onion? Give a reason for your answer. **[HOTS]**

3. Name two metals which react with concentrated sodium hydroxide solution to liberate hydrogen gas.

4. Write the general word equation for reaction between acids and bases.

5. Name an alkali solution which has no metallic ion.

6. What is the pH of a neutral solution?

7. What is a universal indicator?

8. What do you understand by the term salt?

9. Write fully balanced equation when carbon dioxide is passed through ammonical brine solution.

10. Name a carbonate of a metal which has cleansing properties.

11. Name the chemical which is used as a preservative in pickles and curing fish.

B. QUESTIONS FROM CBSE EXAMINATION PAPERS

1. Write the name and chemical formula of the products formed by heating gypsum at 373 K. **[2010 (T-I)]**

2. The pH of a sample of vegetable soup was found to be 6.5. How is this soup likely to taste? **[2010 (T-I)]**

3. Write the names and chemical formula of the products formed by the action of chlorine on slaked lime. **[2010 (T-I)]**

4. Write the name and chemical formula of the main product formed by heating baking soda. **[2010 (T-I)]**

5. Which one is a stronger acid, with pH = 5 or with pH = 2? **[2010 (T-I)]**

6. A compound which is prepared from gypsum has the property of hardening when mixed with proper quantity of water. Identify the compound and write its chemical formula. **[2010 (T-I)]**

7. Name the acid present in ant sting. **[2010 (T-I)]**

8. Name a salt which does not contain water of crystallisation. **[2010 (T-I)]**

9. Why is it advised not to use copper or brass vessels to store pickles or curd? **[2010 (T-I)]**

10. What happens when water is added to quick lime? **[2010 (T-I)]**

11. Which bases are called alkalises? Give an example of an alkali. **[2010 (T-I)]**

12. What would be the colour of litmus in a solution of sodium carbonate? **[2009]**

13. Why does tooth decay start when the pH of the mouth is lower than 5.5? **[2009]**

14. Which one of these has a higher concentration of H^+ ions?

1 M HCl or 1 M CH_3COOH **[2009]**

15. What effect does an increase in concentration of $H^+(aq)$ in a solution have on the pH of the solution? **[2009]**

16. Name the gas usually liberated when a dilute acid reacts with a metal. What happens when a burning candle is brought near this gas? **[2009]**

17. Name the gas evolved when dilute HCl reacts with sodium hydrogen carbonate. How is it recognised? **[2008]**

18. How will you test for a gas which is liberated when hydrochloric acid reacts with an active metal? **[2008]**

19. On adding dilute hydrochloric acid to copper oxide powder, the solution formed is blue-green. Predict the new compound formed which imparts blue-green colour to the solution. **[2008]**

20. How does the flow of acid rain into a river make the survival of aquatic life in the river difficult? **[2008]**

21. How is the pH of a solution of an acid influenced when it is diluted? **[2008]**

22. How does the pH of the solution change when a solution of a base is diluted? **[2008]**

23. What is the role of acid in our stomach? **[2008]**

24. Choose strong acid and strong base from the following: **[2008]**

25. Dry ammonia gas has no action on litmus paper, but a solution of ammonia in water turns red litmus paper blue. Why is it so? **[2005]**

26. Write chemical equations to show the reactions taking place when a glass rod dipped in concentrated hydrochloric acid is introduced in a jar containing ammonia gas. **[2004]**

27. Write the name and the chemical formula of the organic acid present in vinegar. **[2004]**

28. Write balanced chemical equation for the reaction taking place when dry blue crystals of copper sulphate are dropped into concentrated sulphuric acid. **[2004]**

29. Which will be more acidic and why?
(i) A solution with pH value of 6.0 or
(ii) A solution with pH vlaue of 5.0. **[2004]**

II. SHORT ANSWER QUESTIONS–I (2 Marks)

A. IMPORTANT QUESTIONS

1. Why are all alkalis bases, but not all bases alkalises?

2. Why does nitric acid not produce hydrogen, when treated with metals?

3. Metal hydroxides and metal oxides are called bases. Explain and support your answer by balanced chemical equations.

4. Match the acids given in Column (A) with their correct sources given in Column (B). **[HOTS]**

Column A	Column B
(a) Lactic acid	(i) Tomato
(b) Acetic acid	(ii) Lemon
(c) Citric acid	(iii) Vinegar
(d) Oxalic acid	(iv) Curd

5. What happens when nitric acid is added to an egg shell? **[HOTS]**

6. Give two examples of : (i) soluble bases (ii) partially soluble bases (iii) insoluble bases.

7. Arrange the following solutions in order of decreasing $H^+(aq)$ ions concentration.
(i) ammonium hydroxide (ii) gastric juice
(iii) vinegar (iv) sodium hydroxide

8. Why does a bee sting cause pain and itching? What is the common remedy to overcome such a pain?

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

10. Two solutions R and Q are tested with universal indicator. The solution P turns red, whereas solution Q turns orange. Which solution : (i) is more acidic; (ii) has more pH.

11. Name the acid present in ant sting and give its chemical formula. Also give the common method to get relief from the discomfort caused by the ant sting. **[HOTS]**

12. How would you distinguish between baking powder and washing soda by heating? **[HOTS]**

13. A sulphate salt of Group 2 element of the Periodic Table is a white, soft substance, which can be moulded into different shapes by making its dough. When this compound is left in open for some time, it becomes a solid mass and cannot be used for moulding purposes. Identify the sulphate salt and why does it show such a behaviour? Give the reaction involved. **[HOTS]**

B. QUESTIONS FROM CBSE EXAMINATION PAPERS

1. A substance 'X' is used for white washing. **[2010 (T-I)]**
(i) Name 'X' and write its formula
(ii) Write reaction of substance 'X' with water

2. What is the colour of $FeSO_4.7H_2O$ crystals? How does this colour change upon heating? Give balanced chemical equation for the changes. **[2010 (T-I)]**

3. Classify the following salts into acidic, basic and neutral.

Potassium sulphate, ammonium chloride, sodium carbonate, sodium chloride. **[2010 (T-I)]**

4. For making cake, baking powder is taken. If at home your mother uses baking soda instead of baking powder in cake.

(a) How will it affect the taste of the cake and why?

(b) How can baking soda be converted into baking powder? **[2010 (T-I)]**

5. In one of the industrial processes used for manufacture of sodium hydroxide, a gas X is formed as by product. The gas X reacts with dry slaked lime to give a compound Y which is used as a bleaching agent in chemical industry. Identify X and Y. **[2010 (T-I)]**

6. How washing soda is prepared from baking soda. Write balanced chemical equation. Give two uses of washing soda. **[2010 (T-I)]**

7. What is amphoteric oxides? Give two examples of amphoteric oxide with balanced chemical equation. **[2010 (T-I)]**

8. Name two salts that are used in black and white photography. Give reactions when they are exposed to light. **[2010 (T-I)]**

9. While constructing a house, a builder selects marble flooring and marble table tops for the kitchen where vinegar and juices of lemon, tamarind, etc. are more often used for cooking. Will you agree to this selection and why?

[2010 (T-I)]

10. A knife, which is used to cut a fruit, was immediately dipped into water containing drops of blue litmus solution. If the colour of the solution is changed to red, what inference can be drawn about the nature of the fruit and why?

[2010 (T-I)]

11. A person is suffering from indigestion due to the intake of hot spicy food. What remedy you will prescribe to the patient? Give the name of a chemical that can give relief to him. **[2010 (T-I)]**

12. A white powder A is a mild non corrosive base and is used in the preparation of cakes. When the powder is heated it gives another powder B. The powder B is re-crystallised to get a substance C which has detergent properties. Identify A, B and C and also write balanced chemical equations for the conversions of A to B. **[2010 (T-I)]**

13. What are the three products of 'Chlor-alkali process'? Write one commercially or industrially important material each that can be prepared from each of these products? **[2010 (T-I)]**

14. When a drop of orange juice is added to pure water, how the pH value vary for water? If a drop of lemon juice is also added, will there be any more change in the pH value? **[2010 (T-I)]**

15. Fresh milk has a pH of 6. How do you think the pH will change as it turns in to curd? Explain?

[2010 (T-I)]

16. A milkman added a small amount of baking soda of fresh milk.

(a) Why does he shifted the pH of fresh milk to slightly alkaline?

(b) Why does this milk take a longer time to set as a curd? **[2010 (T-I)]**

17. HCl and HNO_3 show acidic characters in aqueous solution while alcohol and glucose solution do not. Give reasons. **[2010 (T-I)]**

18. Write the chemical formula for bleaching powder. How is bleaching powder prepared? For what purpose is it used in paper factories? **[2009]**

19. Write the name and chemical formula of the calcium compound used for disinfecting drinking water. How is this compound manufactured? **[2009]**

20. A compound which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound. Write the chemical equation for its preparation. For what purpose is it used in hospitals? **[2009]**

21. Describe an activity to show that acids produce ions only in aqueous solutions. **[2008]**

22. What is 'Baking Powder'? How does it make cakes soft and spongy? **[2008]**

23. How is Plaster of Paris obtained? What reaction is involved in the setting of a paste of Plaster of Paris? **[2007]**

24. (i) An aqueous solution has a pH value of 7.0. Is this solution acidic, basic or neutral?

(ii) Which has a higher pH value, 1 M HCl or 1 M NaOH solution? **[2006]**

25. Given below are the pH values of four different liquids: 7.0, 14.0, 4.0, 2.0.

Which of these could be that of

(i) lemon juice
(ii) distilled water
(iii) 1 m sodium hydroxide solution
(iv) tomato juice **[2006]**

26. A calcium compound which is a yellowish white powder is used as a disinfectant and also in the textile industry. Name the compound. Which gas is released when this compound is left exposed to air? **[2006]**

27. Name the gas evolved when dilute sulphuric acid acts on sodium carbonate. Write the chemical equation for the reaction involved. **[2005]**

28. "Sulphuric acid is a dibasic acid." Write two reaction equations to justify this statement and name the reaction products in the two cases. **[2005]**

29. What happens when crystals of washing soda are left open in dry air? What is this change named as? Name two industries based on the use of washing soda. **[2005]**

30. How is Plaster of Paris chemically different from gypsum? How may they be interconverted? Write one use of Plaster of Paris.

[2005, 2010 (T-I)]

31. State the chemical property in each case on which the following uses of baking soda are based : (i) as an antacid. (ii) as a constituent of baking powder. **[2004]**

32. How is chloride of lime chemically different from calcium chloride? Why does the chloride of lime gradually lose its chlorine when kept exposed to air? **[2004]**

33. What is meant by the term 'pH of a solution'? The pH of gastric juices extracted from the stomach of two persons A and B were found to be 1 and 3 respectively. The stomach juice of which person is more acidic? **[2004]**

III. SHORT ANSWER QUESTIONS–II (3 Marks)

A. IMPORTANT QUESTIONS

1. What will you observe when a spoonful of black copper oxide is placed in a beaker containing warm and dilute sulphuric acid? Write a balanced equation in support of your answer and state the nature of copper (II) oxide in this reaction.

2. In a test tube containing 4 ml of sodium hydroxide solution two drops of phenolphthalein and then hydrochloric acid is added drop by drop. State your observations and state the kind of reaction taking place.

3. A sodium salt is placed in a dry test tube. To this salt is added 5 ml of hydrochloric acid. Then a lot of effervescence takes place with the liberations of a colourless gas. The gas on passing through a colourless solution, turns it milky. Answer the following questions.

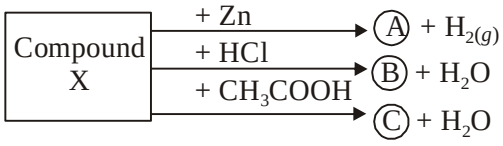
(i) Which gas is produced during the chemical reaction?

(ii) What is the colourless solution and why does it turn milky?

(iii) Why is effervescence produced during the chemical reaction?

4. Describe your observations and explain by writing chemical equations, when carbon dioxide gas is passed through limewater : (a) for a minute (b) for more than 5 minutes.

5. Identify the compound X on the basis of the reactions given below. Also, write the name and chemical formulae of A, B and C. **[HOTS]**



6. A metal carbonate X on reacting with an acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas (G) that is obtained at the anode during electrolysis of brine is passed on dry Y, it gives a compound Z, used for disinfecting drinking water. Identify X, Y, G and Z. **[HOTS]**

B. QUESTIONS FROM CBSE EXAMINATION PAPERS

1. 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 H-ion concentration. **[2010 (T-I)]**

2. What happens when chlorine is passed over dry slaked time? Write chemical equation of the reaction involved. Mention three properties of the product. **[2010 (T-I)]**

3. (i) What do you understand by the term hydrated salt?

(ii) Give two examples of hydrated salt which are white and state their chemical formula. **[2010 (T-I)]**

4. Your are given two solutions A & B. The pH of solution A is 6 and pH of solution B is 8

(a) Which solution is acidic and which is basic?

(b) Which solution has more H^+ ion concentration?

(c) Why is HCl a stronger acid than acetic acid? **[2010 (T-I)]**

5. (a) An element 'X' on reacting with oxygen forms an oxide X_2O. The oxide dissolves in water and turns blue litmus red. Predict the nature of the element whether metal or non-metal?

(b) A solution of copper sulphate was kept in an iron pot. After few days, the pot developed some holes in it. How will you account for this.

6. Fill in the missing data in the following table **[2010 (T-I)]**

Name of the salt	formula	Salt obtained from	
		Base	Acid
(i) Ammonium chloride	NH_4Cl	NH_4OH	—
(ii) Copper sulphate	—	—	H_2SO_4
(iii) Sodium chloride	NaCl	NaOH	—
(iv) Magnesium nitrate	$Mg(NO_3)_2$	—	HNO_3
(v) Potassium sulphate	K_2SO_4	—	—
(vi) Calcium nitrate	$Ca(NO_3)_2$	$Ca(OH)_2$	—

7. A student prepared solutions of (i) an acid and (ii) a base in two separate beakers. She forgot to label the solutions and litmus paper is not available in the laboratory. Since both the solutions are colourless, how will she distinguish between the two? **[2010 (T-I)]**

8. Tooth enamel is one of the hardest substance in our body. How does it undergo damage due to the eating of chocolates and sweets? What should we do to prevent it? **[2010 (T-I)]**

9. (a) What do you mean by Olfactory indicators?

(b) Zinc is an amphoteric metal. Justify with reaction. **[2010 (T-I)]**

10. You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution respectively. If you are given only red litmus paper, how will you identify the contents of each test tube? **[2010 (T-I)]**

11. A gas is produced when conc. H_2SO_4 is added to solid sodium chloride taken in a test tube. The gas coming out through the delivery tube is passed over a dry blue litmus paper and then over a moist blue litmus paper. Record your observations and explain reason with the help of chemical equation. **[2010 (T-I)]**

12. Crystals of copper sulphate are heated in a test tube for some time.

(a) What is the colour of copper sulphate crystals (i) before heating and (ii) after heating

(b) What is the source of liquid droplets seen on the inner upper side of the test tube during the heating process?

13. What is meant by water of crystallisation in a substance? How would you show that copper sulphate crystals contain water of crystallisation? **[2008]**

14. (a) Why does an aqueous solution of an acid conduct electricity?

(b) How does the concentration of hydronium ions (H_3O^+) change when a solution of an acid is diluted?

(c) Which has a higher pH value, a concentrated or dilute solution of hydrochloric acid? **[2008]**

15. What is observed when

(i) dilute sulphuric acid is added to solid sodium carbonate?

(ii) hot concentrated sulphuric acid is added to sulphur?

(iii) sulphur dioxide is passed through lime water? **[2007]**

Also write chemical equations to represent the chemical reactions taking place in each case.

16. (i) Name the raw materials used in the manufacture of sodium carbonate by Solvay process.

(ii) How is the sodium hydrogen carbonate formed during Solvay process separated from a mixture of NH_4Cl and $NaHCO_3$?

(iii) How is sodium carbonate obtained from sodium hydrogen carbonate? **[2007]**

17. What are the salts among chemical substances? Give an example of a salt derived from a strong acid and a weak base. State the behaviour of the aqueous solution of this salt towards litmus solution. **[2006]**

18. (i) What is the action of litmus on
(a) Dry ammonia gas.
(b) Solution of ammonia gas in water

(ii) State the observations you would make on adding ammonium hydroxide to aqueous solutions of (a) Ferrous sulphate (b) Aluminium chloride **[2006]**

19. (i) Differentiate between 'strong' and 'weak' electrolytes.

(ii) Select the strong electrolytes from amongst the following:

molten NaCl, glacial CH_3COOH, strong NH_4OH solution, dil. HCl. **[2006]**

20. Identify the compound of calcium which is yellowish white powder and is used for disinfecting drinking water. How is it manufactured? Write the chemical equation for the reaction involved. What happens when it is left exposed to air? **[2005]**

21. A compound X of sodium forms a white powder. It is a constituent of baking powder and is used in some antacid prescriptions. When heated, X gives out a gas and steam. The gas forms a white precipitate with limewater. Write the chemical formula and name of X and the chemical equation for its decomposition on heating. What is its role in baking powder and in antacids? **[2005, 2010 (T-I)]**

IV. LONG ANSWER QUESTIONS (5 Marks)

A. IMPORTANT QUESTIONS

1. (i) What do you understand by the term hydrated salt?

(ii) Give two examples of hydrated salts which are coloured and state their chemical formula.

(iii) Give two examples of hydrated salts which are white and state their chemical formula.

2. Explain, why a solution of zinc sulphate or a solution of ammonium chloride is acidic in nature.

3. Zinc granules are heated with conc. sodium hydroxide solution and the gas evolved is passed through soap solution, then the tiny bubbles of soap float up in the air. Answer the following questions.

(a) Which gas is evolved in the above reaction?

(b) Why do the soap bubbles rise up in the air?

(c) Write a word equation, and a fully balanced equation for the above reaction.

(d) Name three more metals which will show similar reaction as above.

4. A drop of water is poured over a white powdery substance. Then it is observed that the substance turns blue. Answer the following questions :

(i) What is the white powdery substance?

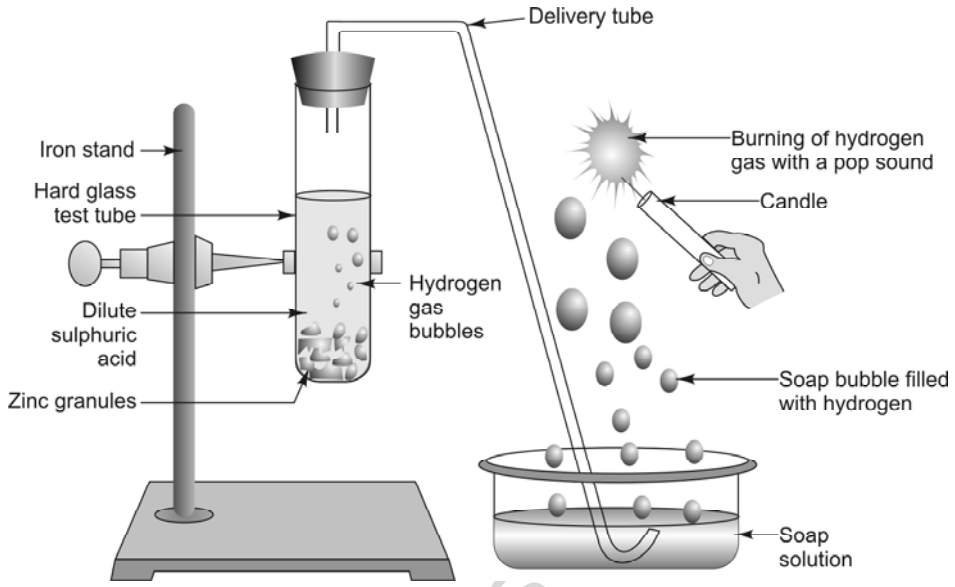
(ii) Why does the substance change to blue colour?

(iii) Write the chemical formula of the blue substance.

(iv) Is the blue substance an acidic salt or a basic salt?

(v) Give a reason for your answer in (iv)

5. In the following schematic diagram for the preparation of hydrogen gas as shown, what would happen if the following changes are made? **[HOTS]**



(a) In place of zinc granules, same amount of zinc dust is taken in the test tube.

(b) Instead of dilute sulphuric acid, dilute hydrochloric acid is taken.

(c) In place of zinc, copper turnings are taken.

(d) Sodium hydroxide is taken in place of dilute sulphuric acid and the tube is heated.

B. QUESTIONS FROM CBSE EXAMINATION PAPERS

1. (i) Account for the following.

(a) Dry HCl gas does not change the colour of dry blue litmus paper.

(b) Antacid tablets are used by a person suffering from stomach pain.

(c) Toothpaste is used for cleaning teeth.

[2010 (T-I)]

2. (i) What are strong acids and weak acids? Give an example for each. **[2010 (T-I)]**

(ii) While diluting an acid, why is it recommnended that the acid should be added to water and not water to acid.

(iii) A dry pellet of a common base 'B' when kept in open absorbs moisture and turns sticky. The compound is also formed by Chloralkals process. Identify B. What type of reaction occurs when B is treated with dilute hydrochloric acid? Write the chemical equation.

ASSIGNMENTS FOR FORMATIVE ASSESSMENT

A. Group Activities

1. Objective

To prepare an indicator solution from red cabbage and use it to test common acids and alkalises.

Materials Required :

● 100 g of red cabbage ● a sharp knife ● boiling pot with a handle ● 250 cc beaker ● solution of vinegar ● solution of fresh lemon ● solution of soap ● solution of washing soda ● solution of caustic soda (sodium hydroxide) ● a rack of clean test tubes ● a clean dropper.

1. Pour about 150 ml of water in the boiling pot and put it to boil. Chop the red cabbage finely. When the water starts boiling, pour the chopped cabbage in it and at the same

time stop heating. Allow the contents to cool.

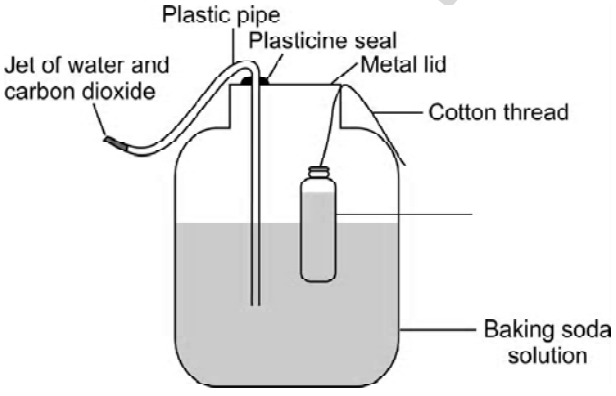
2. On cooling pour out the clear liquid in a beaker. This liquid is dark reddish purple in colour. This is your indicator.
3. Take five clean test tubes. Pour about 2 cc of vinegar in the first test tube, 2 cc of lemon solution in the second test tube, 2 cc of soap solution in the third test tube, 2 cc of washing soda in the fourth test tube and 2cc of caustic soda solution in the fifth test tube.
4. Now pour 4 drops of indicator in each of the test tubes and shake well. You will observe :
   (i) In case of vinegar and lemon solution the colour changes to red, thereby showing the presence of acid.
   (ii) In case of soap solution and washing soda solution, which are weak alkalises, the colour changes to blue.
   (iii) In case of caustic soda solution, which is a strong alkali, the colour changes to green.

2. Objective

To prepare a soda acid fire extinguisher.

Material Required :

(i) an empty and clean ½ litre jam jar with a metal lid, (ii) a small bottle, (iii) a plastic tube about 1 m long and 5 mm diameter, (iv) plasticine (v) baking soda, (vi) vinegar, (vii) a cotton thread and (viii) water. Proceed as follows :



1. Remove the metal lid from the empty jam jar and in the middle of it make a hole with the help of a nail and a hammer, such that the size of the hole is just equal to the diameter of the plastic pipe.
2. Pass the plastic pipe through the hole in the lid, such that, when the lid is placed on the jar, the pipe close to the base. Apply plasticine on the upperside of the lid to make it air tight.
3. Make a solution of baking soda by dissolving about 30 g of it in 300 cc of water. Pour the solution in the jar.
4. Take a small glass bottle (such as an inkpot) and tie a loop around its neck with a long cotton thread. Fill ¾ of the bottle with vinegar.
5. Suspend the glass bottle in the jar by holding the cotton thread, such that a part of it is above the baking soda solution.
6. Fix the lid on the jar. The lid will hold the cotton thread. Now, your working model of the fire extinguisher is ready.
7. In order to use it, lift the lid for a moment. The glass bottle will fall in the baking soda solution. As the vinegar mixes with baking soda solution, it produces carbon dioxide gas, which forces out the contents of the bottle.

B. Experiments

[May be demonstrated by the teacher or performed by the students.]

1. Objective

To show acids, bases and salt solutions in water are electrolytes, but organic substances in liquid state or aqueous solution are non electrolytes.

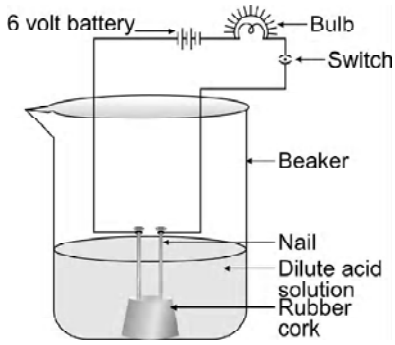
Materials Required

A rubber cork, two brightly polished copper nails, connecting wires, a 250 ml beaker, a 6 volt battery, a six volt bulb in a bulb holder, a switch or a single one way key and the following solutions.

(i) dilute hydrochloric acid
(ii) dilute sulphuric acid
(iii) dilute acetic acid
(iv) dilute sodium hydroxide solution
(v) dilute ammonium hydroxide solution
(vi) limewater [$Ca(OH)_2$ solution]
(vii) common salt solution
(viii) copper sulphate solution
(ix) alcohol
(x) ether
(xi) glucose solution in water
(xii) sugar solution in water

Procedure

1. Take the rubber cork and place it in an inverted position. Fix two copper nails in the cork by hammering.



2. Tie the ends of two connecting wires to the copper nails tightly.
3. Place the cork in the 250 ml beaker.
4. Connect the other ends of the connecting wires to a 6-V battery, through a bulb and a switch as shown in the figure. Your apparatus is ready for finding the conductivity of different liquids.
5. Half fill the beaker with liquid (i) i.e., hydrochloric acid. Switch on the current. Observe whether the bulb glows brightly or dimly or does not glow at all. If the bulb glows brightly, then the liquid is a strong electrolyte, if dimly then a weak electrolyte and if it does not glow then the liquid is a non-electrolyte.
6. Pour off the hydrochloric acid. Wash the apparatus thoroughly, first with tap water and then with distilled water. Repeat the activity from liquid (ii) to liquid (xii). Record your observations in the observation table.
7. On the basis of the observation table make a list of (i) strong electrolytes (ii) weak electrolytes, (ii) non-electrolytes.

Observation Table

S.No.	Name of liquid/solution	Glow of bulb bright/dim/no-glow	Nature of electrolyte
I.	Dilute hydrochloric acid		
II.	Dilute sulphuric acid		
III.	Dilute acetic acid		
IV.	Dilute sodium hydroxide solution		
V.	Dilute ammonium hydroxide solution		
VI.	Limewater		
VII.	Common salt solution		
VIII.	Copper sulphate solution		
IX.	Alcohol		
X	Ether		
XI.	Glucose solution		
XII.	Sugar solution		

Precautions

1. After carrying out the activity with one liquid always wash the beaker and the cork with tap water and then with distilled water. Finally, dry the apparatus with a clean towel or hot air blower.
2. Once the activity is over, switch off the current.

3. The copper nails must be partially dipped in the liquid while performing the experiment.

Group Discussions

1. Discuss, why some liquids allow the current to flow through them conveniently. What is nature of these liquids?
2. Discuss, why some liquids allow less current to flow through them? What is the nature of these liquids? How does this nature differ from the nature of the compounds in Q. 1?
3. Discuss, why some liquids not allow the current to flow through them? What is the nature of these liquids.
4. Discuss in which direction the cations and anions move in strong electrolytes or weak electrolytes?
5. Discuss what happens to cations and anions on reaching their respective electrodes and why?

2.Objective

To identify bleaching powder, among the given sample of chemicals.

Materials Required

Four samples of chemicals: (i) ammonium chloride, (ii) sodium chloride, (iii) potassium chloride, (iv) bleaching powder, four beakers of 100 ml, conc. sulphuric acid, a dropper, a glass stirrer, white cotton cloth strip (10 cm × 2 cm), petals of coloured flower.

Procedure

1. Spread the white cotton strip and place over it petals of coloured flower. Rub the petals on the cloth, such that it gets stained with the colour of the flowers. Cut the strip into four equal pieces.
2. Take the four beakers and label them P, Q, R and S.
3. In beaker P place 1 g of sample A, in beaker Q place 1 g of sample B, in beaker R place 1 g of sample C and in beaker S place 1 g of sample D.
4. Pour about 20 ml of distilled water in each beaker, so as to make a solution. Stir the contents of each beaker with the glass rod. Make sure that the glass rod must be thoroughly washed before stirring in the next beaker.
5. Place the stained piece of cotton cloth in each of the beakers, so that it gets thoroughly immersed.
6. With the help of a dropper add 2 drops of concentrated sulphuric acid in each beaker and stir the contents.
7. Wait for few minutes. Take out each strip of cloth and check for the colour and stain.
8. Record your observations in the observation table.

S.No.	Colour of cotton cloth dipped in sample chemical	Colour of cotton cloth after treating sample solution with H_2SO_4
1.	Sample A	
2.	Sample B	
3.	Sample C	
4.	Sample D	

The chemical is bleaching powder in the beaker, where the colour of flower petals is bleached.

Bleaching powder reacts with dilute sulphuric acid to liberate chlorine gas. The chlorine gas reacts with water to form nascent oxygen, which in turn bleaches the colour of flowers.

$$CaOCl_{2(s)} + H_2SO_{4\,(aq)} \rightarrow CaSO_{4(s)}\, H_2O_{(l)} + Cl_2$$

$$Cl_2 + H_2O \rightarrow 2HCl + [O]$$

Group Discussions

1. Why does the stained cloth get bleached with bleaching powder? Discuss in detail.
2. Is it possible to bleach artificial dyes with bleaching powder? Discuss in detail.
3. Discuss what kind of bleaching takes place in terms of oxidation or reduction.
4. Why is the bleaching done by bleaching powder permanent in nature?
5. Why is bleaching powder not used in bleaching silk?
6. Discuss at least two more uses of bleaching powder, other than bleaching.
7. Is it possible to recognise bleaching powder, by switching the salt sample? If so, discuss what chemical process/processes are involved.
8. Why does bleaching powder not completely dissolve in water? Discuss, is it a single salt or a mixture of two salts.

3. Objective

To prove copper sulphate crystals [$CuSO_4.5H_2O$] contain water of crystallisation.

Materials Required

A hard glass test tube, a single hole rubber cork, fitted

with a glass tubing but at an angle of 120°, iron stand, ordinary glass tube, a trough containing cold water, a bunsen burner and 10 g of copper sulphate crystals.

Procedure

1. Fill 1/3 of the hard glass test tube with copper sulphate crystals. Clamp the test tube in an iron stand. In the mouth of the test tube fit a delivery tube whose other end goes into another test tube placed in cold water.
2. Heat the crystals of copper sulphate strongly. You will notice :
   (i) The crystals give out stream of fumes. The fumes move to the test tube placed in water and condense to form a colourless liquid.
   (ii) The crystals lose their blue colour and change to a white powder.
3. Allow the apparatus to cool. Remove the test tube containing anhydrous copper sulphate. Add a few drops of water to the anhydrous copper sulphate. You will notice that copper sulphate regains its colour.

   Thus, the activity proves that hydrated copper sulphate contains water.

Group Discussions

1. Why does copper sulphate lose its blue colour on strong heating?
2. Discuss how the presence of water molecules in its crystals produce colour.
3. Find out the names of at least four more salts that contain water of crystallisation and write their correct chemical formulae.
4. The dehydration reaction of copper sulphate crystals is given below.

   $CuSO_4.5H_2O \xrightarrow{100°C} CuSO_4.H_2O \xrightarrow{250°C} CuSO_4$

   What is the colour of $CuSO_4.H_2O$?

C. Classroom Discussions

Discuss the importance of pH in:

1. Our digestive system
2. Mouth and tooth decay
3. Dairy industry
4. Breweries
5. Fruit processing plants
6. Meat processing plants
7. In agriculture
8. Diagnostic purposes
9. Cosmetic industry

D. Research

Find out how large number of animals and plants save themselves by chemical warfare.

E. Charts

1. Make a pictorial chart of organic acids, showing the fruit and the acid contained in it.
2. Make a chart showing :
   (i) Four strong inorganic acids
   (ii) Four weak inorganic acids
   (iii) Four organic acids
3. Make a pictorial chart of elements/compounds which can be obtained from common salt and state two or more uses of each product.

Question 1:

You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?

Answer

If the colour of red litmus paper gets changed to blue, then it is a base and if there is no colour change, then it is either acidic or neutral. Thus, basic solution can be easily identified.

Let us mark the three test tubes as **A**, **B**, and **C**. A drop of the solution in **A** is put on the red litmus paper. Same is repeated with solution **B** and **C**. If either of them changes colour to blue, then it is basic. Therefore, out of three, one is eliminated. Out of the remaining two, any one can be acidic or neutral. Now a drop of basic solution is mixed with a drop of each of the remaining two solutions separately and then the nature of the drops of the mixtures is checked. If the colour of red litmus turns blue, then the second solution is neutral and if there is no change in colour, then the second solution is acidic. This is because acidic and basic solutions neutralize each other. Hence, we can distinguish between the three types of solutions.

Question 1:

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

Answer

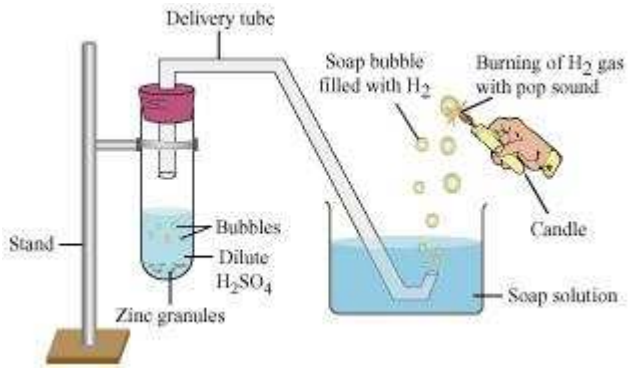
Curd and other sour substances contain acids. Therefore, when they are kept in brass and copper vessels, the metal reacts with the acid to liberate hydrogen gas and harmful products, thereby spoiling the food.

Question 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?

Answer

Hydrogen gas is usually liberated when an acid reacts with a metal.



Take few pieces of zinc granules and add 5 ml of dilute H_2SO_4. Shake it and pass the gas produced into a soap solution. The bubbles of the soap solution are formed. These soap bubbles contain hydrogen gas.

$$2H_2SO_4 + Zn \longrightarrow Zn(SO_4)_2 + 2H_2 \uparrow$$

We can test the evolved hydrogen gas by its burning with a pop sound when a candle is brought near the soap bubbles.

Question 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.

Answer

$$\underset{\text{Calcium carbonate}}{CaCO_{3(s)}} + \underset{\text{Hydrochloric acid}}{2HCl_{(aq)}} \longrightarrow \underset{\text{Calcium chloride}}{CaCl_{2(aq)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}} + \underset{\text{Water}}{H_2O_{(l)}}$$

Question 1:

Why do HCl, HNO_3, etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

Answer

The dissociation of HCl or HNO_3 to form hydrogen ions always occurs in the presence of water. Hydrogen ions (H^+) combine with H_2O to form hydronium ions (H_3O^+).

The reaction is as follows:

$$HCl_{(aq)} \longrightarrow H^+ + Cl^-$$

$$H^+ + H_2O \longrightarrow H_3O^+$$

Although aqueous solutions of glucose and alcohol contain hydrogen, these cannot dissociate in water to form hydrogen ions. Hence, they do not show acidic character.

Question 2:

Why does an aqueous solution of an acid conduct electricity?

Answer

Acids dissociate in aqueous solutions to form ions. These ions are responsible for conduction of electricity.

Question 3:

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

Answer

Colour of the litmus paper is changed by the hydrogen ions. Dry HCl gas does not contain H^+ ions. It is only in the aqueous solution that an acid dissociates to give ions. Since in this case, neither HCl is in the aqueous form nor the litmus paper is wet, therefore, the colour of the litmus paper does not change.

Question 4:

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

Answer

Since the process of dissolving an acid in water is exothermic, it is always recommended that acid should be added to water. If it is done the other way, then it is possible that

because of the large amount of heat generated, the mixture splashes out and causes burns.

Question 5:

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

Answer

When an acid is diluted, the concentration of hydronium ions (H_3O^+) per unit volume decreases. This means that the strength of the acid decreases.

Question 6:

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

Answer

The concentration of hydroxide ions (OH^-) would increase when excess base is dissolved in a solution of sodium hydroxide.

Question 1:

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?

Answer

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.

Question 2:

What effect does the concentration of $H^+_{(aq)}$ ions have on the nature of the solution?

Answer

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

Question 3:

Do basic solutions also have $H^+_{(aq)}$ ions? If yes, then why are these basic?

Answer

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.

Question 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)?

Answer

If the soil is acidic and improper for cultivation, then to increase the basicity of soil, the farmer would treat the soil with quick lime or slaked lime or chalk.

Question 1:

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

Answer

The common name of the compound $CaOCl_2$ is bleaching powder.

Question 2:

Name the substance which on treatment with chlorine yields bleaching powder?

Answer

Calcium hydroxide [$Ca(OH)_2$], on treatment with chlorine, yields bleaching powder.

Question 3:

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

Answer

Washing soda ($Na_2CO_3.10H_2O$) is used for softening hard water.

Question 4:

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

Answer

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

$$\underset{\text{Sodium hydrogencarbonate}}{2NaHCO_3} \xrightarrow{\Delta} \underset{\text{Sodium carbonate}}{Na_2CO_3} + \underset{\text{Water}}{H_2O} + \underset{\text{Carbon dioxide}}{CO_2\uparrow}$$

Question 5:

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

Answer

The chemical equation for the reaction of Plaster of Paris and water can be represented as

$$CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \longrightarrow CaSO_4.2H_2O$$

Plaster of Paris Water Gypsum

Exercise solution

Question 1:

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

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

Answer

(d) Bases turn red litmus blue and acids turn blue litmus red. Basic solution has a pH value more than 7. Since the solution turns red litmus blue, its pH is likely to be 10.

Question 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

Answer

(b) The solution contains HCl.

Question 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) 8mL (c) 12 mL (d) 16 mL

Answer

(d) 16 mL of HCl solution will be required.

Question 4:

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

(a) Antibiotic

(b) Analgesic

(c) Antacid

(d) Antiseptic

Answer

(c) Antacid is used for treating indigestion.

Question 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) Sulphuric acid + Zinc → Zinc sulphate + Hydrogen

$$H_2SO_{4(aq)} + Zn_{(s)} \longrightarrow ZnSO_{4(aq)} + H_{2(g)}$$

(b) Hydrochloric acid + Magnesium → Magnesium chloride + Hydrogen

$$2HCl_{(aq)} + Mg_{(s)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$$

(c) Sulphuric acid + Aluminium → Aluminium sulphate + Hydrogen

$$3H_2SO_{4(aq)} + 2Al_{(s)} \longrightarrow Al_2(SO_4)_{3(aq)} + 3H_{2(g)}$$

(d) Hydrochloric acid + Iron → Ferric chloride + Hydrogen

$$6HCl_{(aq)} + 2Fe_{(s)} \longrightarrow 2FeCl_{3(aq)} + 3H_{2(g)}$$

Question 6:

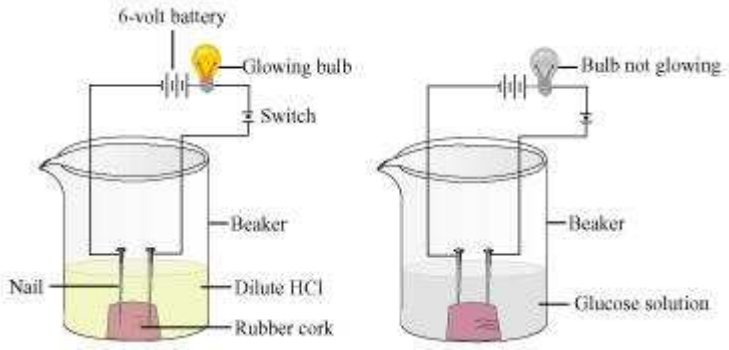
Compounds such as alcohols and glucose also contain hydrogen but are not categorized as acids. Describe an activity to prove it.

Answer

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

Observations:

It will be observed that the bulb glows in the HCl solution and does not glow in the glucose solution.



Result:

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 solution does not dissociate into ions. Therefore, it does not conduct electricity.

Conclusion:

From this activity, it can be concluded that all acids contain hydrogen but not all compounds containing hydrogen are acids.

That is why, though alcohols and glucose contain hydrogen, they are not categorised as acids.

Question 7:

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

Answer

Distilled water is a pure form of water and is devoid of any ionic species. Therefore, it does not conduct electricity. Rain water, being an impure form of water, contains many ionic species such as acids and therefore it conducts electricity.

Question 8:

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

Answer

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. It is the hydrogen ions that are responsible for the acidic behaviour.

Question 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 can be arranged in the increasing order of the concentration of hydrogen ions as: 11 < 9 < 7 < 4 < 1

Question 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. In which test tube will the fizzing occur more vigorously and why?

Answer

The fizzing will occur strongly in test tube A, in which hydrochloric acid (HCl) is added. This is because HCl is a stronger acid than CH_3COOH and therefore produces hydrogen gas at a faster speed due to which fizzing occurs.

Question 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

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.

Question 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) 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.

Question 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 Plaster of Paris, a powdery mass, absorbs water (moisture) to form a hard solid known as gypsum.

$$\underset{(\text{POP})}{CaSO_4.\frac{1}{2}H_2O} + 1\frac{1}{2}H_2O \longrightarrow \underset{\text{Gypsum}(\text{Hard solid})}{CaSO_4.2H_2O}$$

Question 14:

What is a neutralization reaction? Give two examples.

Answer

A reaction in which an acid and base react with each other to give a salt and water is termed as neutralization reaction. In this reaction, energy is evolved in the form of heat.

For example:

(i)

$$\underset{(\text{Base})}{NaOH} + \underset{(\text{Acid})}{HCl} \longrightarrow \underset{(\text{Salt})}{NaCl} + \underset{(\text{Water})}{H_2O}$$

(ii) During indigestion (caused due to the production of excess of hydrochloric acid in the stomach), we administer an antacid (generally milk of magnesia, $Mg(OH)_2$, which is

basic in nature). The antacid neutralizes the excess of acids and thus gives relief from indigestion.

$$Mg(OH)_2 + 2HCl \rightarrow MgCl_2 + 2H_2O$$

Question 15:

Give two important uses of washing soda and baking soda.

Answer

Two important used of washing soda and baking soda are as follows:

(1) Washing soda:

(a) It is used in glass, soap, and paper industries.

(b) It is used to remove permanent hardness of water.

(2) Baking soda:

(a) It is used as baking powder. Baking powder is a mixture of baking soda and a mild acid known as tartaric acid. When it is heated or mixed in water, it releases CO_2 that makes bread or cake fluffy.

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