CHAPTER 2

Acid Bases and Salts

1. ONE MARK QUESTIONS

1. Write chemical equation for the reaction of zinc metal on sodium hydroxide.

Ans : [CBSE 2016]

$Zn(s) + 2NaOH(aq) \xrightarrow{Heat} Na_2ZnO_2(aq) + H_2(g)$

2. Three acidic solutions A, B and C have pH = 0, 3 and 5 respectively.

a. Which solution has the highest concentration of H^+ ions?

b. Which solution has the lowest concentration of H^+ ions?

Ans : [CBSE 2015]

a. The solution with pH = 0 has highest concentration of H^+ ions.

b. The solution with pH = 5 has lowest concentration of H^+ ions.

3. What is meant by p and H in pH?

Ans : [CBSE 2014]

p stands for 'potenz' in German meaning power, H stands of hydrogen.

4. Define alkalies and give an example.

Ans : [CBSE 2014]

Water soluble bases are called alkalies e.g., NaOH.

5. Mention the range of pH for identification of a base.

Ans : [CBSE 2014]

7.1 to 14 is the pH range for bases.

6. How chloride of lime differs from calcium chloride?

Ans : [CBSE 2014]

$CaOCl_2$ is the chloride of lime whereas $CaCl_2$ calcium chloride.

7. What is meant by water of crystallisation in a substance?

Ans : [CBSE 2014]

The water molecules associated with a crystalline solid are called water of crystallisation.

8. Write the chemical name and chemical formula of washing soda.

Ans : [CBSE 2014]

$Na_2CO_3.10H_2O$, sodium carbonate deca-hydrate is washing soda.

9. What effect does an increase in concentration of $H^+(aq)$ ions in a solution have on pH of solution?

Ans : [CBSE 2013,2009]

Increase in H^+ concentration will lead to decrease in pH,

10. Name a gas evolved when dilute HCl reacts with sodium hydrogen carbonate. How is it recognised?

Ans : [CBSE 2013]

Carbon dioxide, it turns lime water milky. In this way, CO_2 gas is recognised.

11. What are olfactory indicators?

Ans : [CBSE 2013]

Those indicators whose smell changes in acidic and basic solutions.

12. Why does 1 M HCl solution have a high concentration of H^+ ions than 1 M CH_3COOH solution?

Ans : [CBSE 2013,2009]

It is because 1M HCl is a strong acid and it is completely ionised in aqueous solution whereas CH_3COOH is a weak acid, so it is only partially ionised.

13. Write the chemical equation representing the action of atmospheric CO_2 gas on bleaching powder when left exposed in open.

Ans : [CBSE 2013]

$CaOCl_2 + CO_2 \longrightarrow CaCO_3 + Cl_2$

14. How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal?

Ans : [CBSE 2012,2009]

Bring a burning matchstick near the gas. If it is burnt with 'pop' sound, the gas is H_2.

15. How is the pH of solution of an acid influenced when

it is diluted?

Ans : [CBSE 2012]

pH of the solution increases when it is diluted.

16. At what pH rain water is said to be acidic ?

Ans : [CBSE 2012]

When pH < 5.5, the rain water becomes acidic.

17. Which gas is evolved when dilute hydrochloric acid reacts with zinc metal? Write the molecular formula of this gas.

Ans : [CBSE 2012]

Dihydrogen gas, H_2.

18. Dry HCl gas does not change the colour of dry blue litmus. Give reason to justify it.

Ans : [CBSE 2012]

Dry HCl (g) does not form ions, therefore it does not affect dry blue litmus.

19. Why is HCl a stronger acid than acetic acid?

Ans : [CBSE 2012]

HCl is completely ionised in aqueous solution whereas acetic acid is only partially ionised in aqueous solution.

20. Name the chemicals used in acid fire extinguisher and the gas evolved from it when it is used?

Ans : [CBSE 2012, 2011]

$NaHCO_3$ (Sodium hydrogen carbonate) and H_2SO_4 (Sulphuric acid). The gas evolved is carbon dioxide.

21. Which is a stronger acid, with pH = 5 or with pH=2?

Ans : [CBSE 2011]

The acid with pH = 2 is a stronger acid.

22. A compound which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound and write its chemical formula.

Ans : [CBSE 2011]

$CaSO_4 \cdot \frac{1}{2}H_2O$ (Plaster of Paris), Calcium sulphate hemihydrate.

23. What is meant by term pH of solution? The pH of rain water collected from two cities A' and 'B' were found to be 6.0 and 5.0 respectively. The water of which city will be more acidic?

Ans : [CBSE 2011]

pH of solution is defined as negative logarithm of H^+ ion concentration. It determines the strength of acid and base. Rainwater with pH = 5 is more acidic.

24. A few drops of sulphuric acid are added to water before electrolysis, why?

Ans : [CBSE 2011]

Water is not a good conductor of electricity. Few drops of sulphuric acid makes it better conductor of electricity.

25. Write the names of two salts belonging to sodium family.

Ans : [CBSE 2011]

NaCl, Na_2CO_3 are two salts belonging to sodium family.

26. Which among distilled water, tap water and sea water is the best conductor of electricity?

Ans : [CBSE 2010, 2011]

Sea water is a better conductor due to the presence of ions.

27. Name the acids present in (i) nettle sting, (ti) curd.

Ans : [CBSE 2010]

(i) HCOOH, Formic acid,
(ii) Lactic acid, CH3-CH(OH)-COOH

28. Name a salt which does not contain water of crystallisation.

Ans : [CBSE 2010]

$NaHCO_3$ is a salt that does not contain water of crystallisation.

29. Write the name and chemical formula of the product formed by heating gypsum at 373 K.

Ans : [CBSE 2010]

Plaster of Paris, $CaSO_4 \cdot \frac{1}{2}H_2O$

30. The pH of a sample of vegetable soup was found to be 6.5. How is this soup likely to taste?

Ans : [CBSE 2010]

It will be sour in taste.

31. Which bases are called alkalies? Give one example of alkali.

Ans : [CBSE 2010,2009]

Those bases which are soluble in water are called alkalies e.g., NaOH, KOH.

32. Write the name and chemical formula of the product formed by action of chlorine on slaked lime.

Ans : [CBSE 2010]

$CaOCl_2$, Bleaching powder, Calcium oxy-chloride.

33. Write a balanced chemical equation for the reaction between sodium carbonate and hydrochloric acid indicating the physical state of reactants and the products.

Ans : [CBSE 2010]

$$Na_2CO_3(s) + 2HCl(dill) \longrightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$$

34. Name the acid and base that have constituted the salt ammonium nitrate.

Ans : [CBSE 2010]

Acid: HNO_3,
Base: NH_4OH (i.e., Nitric acid, Ammonium hydroxide).

35. Suggest one way to reduce alkaline nature of the soil.

Ans : [CBSE 2010]

Add ammonium nitrate (Acidic salt) to neutralise alkaline nature of soil.

36. Oxides of metals are basic while those of non-metals are acidic. Explain.

Ans : [CBSE 2010]

Metal oxides dissolve in water to form base basic in nature. On the other hand non-metals dissolve in water to form acids, acidic in nature.

37. What is the difference between slaked lime and lime water?

Ans : [CBSE 2010]

The solid $Ca(OH)_2$ is slaked lime whereas clear solution of $Ca(OH)_2$ in water is lime water.

38. Write a balanced chemical equation for the neutralisation reaction, mentioning the physical state of reactants and products.

Ans : [CBSE 2010]

$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$

39. During summer season, a milkman usually adds a very small amount of baking soda to fresh milk. Give one reason.

Ans : [CBSE Sample Paper 2009]

Baking soda is basic in nature, it will not allow milk to turn sour due to the formation of lactic acid.

40. Curd is not kept in copper and brass utensils, why?

Ans : [CBSE 2009C]

Curd contains lactic acid which can make poisonous compounds with brass and copper vessels.

41. Fresh milk has pH = 6. When it changes to curd will its pH value increase or decrease?

Ans : [CBSE 2009]

pH value will decrease when milk changes to curd.

42. What would be the colour of litmus in a solution of sodium carbonate?

Ans : [CBSE 2009]

The red litmus will turn blue in Na_2CO_3 solution.

43. What is the colour of litmus in a solution of ammonium hydroxide?

Ans : [CBSE 2009]

Red litmus will turn blue green colour in a solution of ammonium hydroxide.

44. On adding dilute hydrochloric acid to copper oxide powder, the solution formed is blue green. Predict the new compound formed which imparts a blue green colour to the solution.

Ans : [CBSE 2008]

Copper chloride imparts blue green colour to the solution.

45. How does flow of acid rain water into river makes the survival of aquatic life in the river difficult?

Ans : [CBSE 2008]

Acidic water makes aquatic species uncomfortable. Aquatic species are more comfortable in the pH 7 to 7.8.

46. How does the pH change when solution of a base is diluted?

Ans : [CBSE 2008]

When solution of a base is diluted, its pH decreases.

47. Arrange the following in an increasing order of their pH values: NaOH solution, Blood, Lemon juice.

Ans : [CBSE 2008]

Lemon juice < Blood < NaOH solution.

48. At what pH in the mouth is tooth decay faster and why?

Ans : [CBSE 2008]

At pH lower than 5.5, tooth decay becomes faster because calcium phosphate (enamel) reacts with acid and gets corroded.

TWO MARKS QUESTIONS

49. A white chemical compound becomes hard on mixing proper quantity of water. It is also used to maintain joints in fixed position. Name the chemical compound and write its chemical formula. Write the chemical equation to show what happens when water is added to this compound in proper quantity.

Ans : [CBSE Sample Paper 2018, CBSE 2016]

$CaSO_4.\frac{1}{2}H_2O$ is the formula of the compound. The name of compound is 'Plaster of Paris' (Calcium sulphate hemihydrate).

$$\underset{\text{(Plaster of Paris)}}{CaSO_4 \cdot \tfrac{1}{2}H_2O} + \tfrac{3}{2}H_2O \longrightarrow \underset{\text{(Gypsum)}}{CaSO_4 \cdot 2H_2O}$$

50. Two solutions 'A' and 'B' have pH value 3.0 and 10.5 respectively. Which of these will turn

a. Blue litmus solution to red,

b. Phenolphthalein from colourless to pink? Justify your answer in each case.

Ans : [CBSE 2016]

a. 'A' with pH = 3, will turn blue litmus red because it is acidic in nature.

b. "B' with pH = 10.5, will turn phenolphthalein colourless to pink because 'B' is basic in nature.

51. The pH of soil 'A' is 7.5, while that of soil "B is 4.5. Which of the two soils A or B should be treated with powdered chalk to adjust the pH and why?

Ans : [CBSE 2016]

Soil 'B' is acidic, therefore it needs to be treated with powdered chalk to adjust its pH because chalk is basic, which will make soil neutral.

52. Write the chemical equation to describe how baking soda is produced on a large scale. Also write the chemical name of the products formed in the reaction.

Ans : [CBSE 2016]

$$NH_3 + H_2O + CO_2 + NaCl \longrightarrow \underset{\substack{\text{(Sodium hydrogen}\\\text{carbonate)}}}{NaHCO_3} + \underset{\substack{\text{(Ammonium}\\\text{chloride)}}}{NH_4Cl}$$

53. What is chlor-alkali process? Write a balanced chemical equation for the reaction involved in this

process, to justify your answer.

Ans : [CBSE 2016]

When brine solution is electrolysed we get alkali (NaOH) and chlorine (Cl_2) gas, this process is called chlor-alkali process.

$$2NaCl(aq) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g) + Cl_2(g)$$

54. What is meant by the term water of crystallisation? How would you show that copper sulphate crystals contains water of crystallisation?

Ans : [CBSE 2016]

The molecules of water associated with a crystalline substance are called water of crystallisation.

When hydrated copper sulphate is heated its colour changes from blue to dirty white and water droplets are formed.

$$CuSO_4.5H_2O \xrightarrow{\text{Heat}} CuSO_4 + 5H_2O$$

If we add little water to anhydrous $CuSO_4$, we get blue colour again. It is the presence of molecules of water of crystallisation which was lost on heating.

$$\underset{\text{(Anhydrous)}}{CuSO_4} + 5H_2O \longrightarrow CuSO_4.5H_2O$$

55. Mention the pH of aqueous solution of the following salts as 7, more than 7, less than 7.

KCl, Na_2CO_3, NH_4C1, $NaNO_3$ (Sodium nitrate)

Ans : [CBSE 2016]

KCl and $NaNO_3$ has pH = 7

Na_2CO_3 has pH > 7

NH_4Cl has pH < 7

56. 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 one of this is acidic and which one is basic?

Ans : [CBSE 2016]

'A' has more H^+ ion concentration.

'A' is acidic while 'B' is basic.

57. Give suitable reasons to justify the following statement: An aqueous solution of sodium chloride is neutral but an aqueous solution of sodium metal is basic.

Ans : [CBSE 2016]

Sodium chloride is made up of a strong base, NaOH and a strong acid, HCl. Therefore, its aqueous solution is neutral in nature.

Sodium metal reacts with water to form NaOH(Base) and H_2 gas:

$$2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g)$$

58. What is the action of litmus on

a. dry ammonia gas

b. solution of ammonia gas in water?

Ans : [CBSE 2016]

a. There is no effect of dry litmus on dry ammonia gas.

b. Solution of ammonia will turn red litmus blue.

59. State the observations you would make on adding sodium hydroxide to an aqueous solution of

a. ferrous sulphate,

b. aluminium chloride.

Ans : [CBSE 2016]

a. Green precipitate of $Fe(OH)_2$ will be formed:

$$FeSO_4(aq) + 2NaOH(aq) \longrightarrow \underset{\text{(Green ppt)}}{Fe(OH)_2\downarrow} + Na_2SO_4(aq)$$

b. White precipitate of $Al(OH)_3$ will be formed:

$$AlCl(aq) + 3NaOH \longrightarrow \underset{\text{(White ppt)}}{Al(OH)_3(s)} + 3NaCl(aq)$$

60. 15 mL of water and 10 mL of sulphuric acid are to be mixed in a beaker

a. State the method that should be followed with reason.

b. What is this process called?

Ans : [CBSE 2015]

a. Acid should be added to the water slowly with constant cooling because the reaction is highly exothermic.

b. This process is called dilution.

61. Name the acid present in the following:

a. Tomato,

b. Vinegar,

c. Tamarind

Ans : [CBSE 2015]

a. Tomato contains oxalic acid.

b. Vinegar contains acetic acid.

c. Tamarind contains tartaric acid.

62. Explain how antacid works.

Ans : [CBSE 2015]

Antacids are weakly basic in nature. They neutralise excess of HCl present in our stomach and gives us relief from hyper-acidity.

63. Equal lengths of magnesium ribbon are taken in test tube '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 fizzing occur more vigorously and why?

Ans : [CBSE 2015]

The fizzing will occur more vigorously in test tube 'A' because HCl is a strong acid and reacts faster than acetic acid which is a weak acid.

64. State what does pH of solution signify? Three solutions A, B and C have pH values of 6, 2 and 10 respectively. Which one of these solutions is highly acidic? Which solution will turn red litmus blue?

Ans : [CBSE 2015]

pH of solution signifies the nature of the solution i.e., it is weakly acidic, strongly 1 acidic, neutral, weakly basic, strongly basic.
'B' with pH = 2 is strongly acidic.
'C' with pH = 10 will turn red litmus blue.

65. Define an acid and a base. Name one weak acid and one strong acid.

Ans : [CBSE 2015]

Acid is a substance which gives H^+ ions in an aqueous solution.
Base is substance which gives OH^- ions in the aqueous solution.
CH_3COOH is a weak acid, H_2SO_4 is a strong acid.

66. What is universal indicator? State the purpose for which this indicator is used.

Ans : [CBSE 2015]

Universal indicator is a mixture of a number of indicators. It is used to determine pH of a solution.

67. Name the natural source of each of the following acid:
a. Citric acid,
b. Oxalic acid,
c. Lactic acid,
d. Tartaric acid.

Ans : [CBSE 2014]

a. Citric acid—Lemon, Orange.
b. Oxalic acid—Tomato, Guava
c. Lactic acid—Curd, Sour milk
d. Tartaric acid—Tamarind

68. Explain why sodium hydroxide solution cannot be kept in aluminium containers? Write the equation for the reaction that may take place for the same.

Ans : [CBSE 2014]

It because 'Al' reacts with NaOH to form sodium meta-aluminate and hydrogen gas:
$2Al + 2NaOH + 2H_2O \longrightarrow NaAlO_2 + 3H_2$

69. A student detected the pH of four unknown solutions A, B, C and D as follows: 11, 5, 7 and 2. Predict the nature of these solutions.

Ans : [CBSE 2013]

pH = 11 is basic
pH = 5 is acidic
pH = 7 is neutral
pH = 2 is strongly acidic

70. Give two uses of baking soda and washing soda each.

Ans : [CBSE 2013]

Use of baking soda:
a. It is used in making of bread, biscuits, cakes.
b. It is used as an antacid.
Use of washing soda:
a. It is used as a cleansing agent.
b. It is used to remove hardness of water.

71. A compound 'X' of sodium is commonly used for making crispy pakoras. It is also used for curing acidity in the stomach. Identify 'X'. Write the formula and its chemical name. State the reaction which takes place when it is heated.

Ans : [CBSE 2013, 2008(C)]

'X' is $NaHCO_3$, sodium hydrogen carbonate. It is used in cooking and for curing acidity in stomach.
$2NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + CO_2 + H_2O$

72. Crystals of a substance changes their colour on heating in a closed vessel but regained it after sometime, when they were allowed to cool down.
a. Name one such substance.
b. Explain the phenomenon involved.

Ans : [CBSE 2012]

a. $CuSO_4.5H_2O$ (Hydrated copper sulphate)
b. $\underset{\text{Blue}}{CuSO_4.5H_2O} \xrightarrow{\text{Heat}} \underset{\text{(Dirty white)}}{CuSO_4} + 5H_2O$

The colour changes due to the loss of molecules of water of crystallisation. Colour is regained by absorbing water molecules from the atmosphere containing water vapours.

73. (a) Write the name given to the bases that are highly soluble in water. Give an example.
(b) Why does bee sting causes pain and irritation? Rubbing of baking soda on the sting area gives relief. How?

Ans : [CBSE 2012]

(a) Highly soluble bases are called alkalies e.g., KOH.
(b) Bee sting contains HCOOH, formic acid which causes irritation. Baking soda (basic) neutralises HCOOH, therefore it gives relief from pain on rubbing it on sting area,

74. The pH of the mouth of a person is lower I than 5.5. What changes will occur in his mouth? How these changes can be controlled? Write any two measures.

Ans : [CBSE 2012, 2011, 2010]

Acid will be formed in the mouth which causes tooth decay.
a. Wash your mouth with water after every meal.
b. Brush your teeth after meal. Toothpastes are basic in nature and it will neutralise the acid formed in mouth.

75. What is a neutralisation reaction? Give one example.

Ans : [CBSE 2011]

The reaction in which acid reacts with a base to form salt and water is called neutralisation reaction e.g.,
$KOH(aq) + HNO_3(aq) \longrightarrow KNO_3(aq) + H_2O(l)$

76. Write the chemical name of Plaster of paris. Write a chemical equation to show the reaction between Plaster of paris and water.

Ans : [CBSE 2011]

$CaSO_4 \cdot \frac{1}{2}H_2O$ (Calcium sulphate hemihydrate)

$CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O \longrightarrow CaSO_4 \cdot 2H_2O$

77. State in brief the preparation of washing soda from baking soda. Write balanced chemical equation of the reaction involved.

Ans : [CBSE 2011]

When sodium hydrogen carbonate (Baking soda)

is heated sodium carbonate is formed which on crystallisation forms washing soda:

$$\underset{\text{(Baking soda)}}{2NaHCO_3} \xrightarrow{\text{Heat}} Na_2CO_3 + CO_2 + H_2O$$

$$\underset{\text{(Washing soda)}}{Na_2CO_3 + 10H_2O} \longrightarrow Na_2CO_3 \cdot 10H_2O$$

78. What is colour of $FeSO_4.7H_2O$ crystals? How does this colour change upon heating? Give a balanced chemical equation for the change.

Ans : [CBSE 2011]

$FeSO_4.7H_2O$ is pale green in colour. It becomes dirty white on heating.

$FeSO_4.7H_2O \longrightarrow FeSO_4 + 7H_2O$

If it is heated strongly Fe_2O_3 and SO_2, SO_3 gases will be formed .

$2FeSO_4 \xrightarrow{\text{Heat}} Fe_2O_3 + SO_2 + SO_3$

79. Classify the following salts into acidic, basic and neutral salts: Potassium sulphate, ammonium chloride, sodium carbonate, sodium chloride

Ans : [CBSE 2011]

Acidic: Ammonium chloride,
Basic: Sodium carbonate,
Neutral: Potassium sulphate, sodium chloride.

80. A student dropped few pieces of marble in dilute HCl contained in a test tube. The evolved gas was passed through lime water.

a. What change would be observed in lime water?
b. Write a balanced chemical equation for the above change.

Ans : [CBSE 2011]

a. Lime water will turn milky.
b. $Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$

81. A white powder is added while baking breads and while making cakes to make them soft and fluffy. What is the name of that powder? What are the main ingredients in it? What are the functions of each ingredient?

Ans : [CBSE 2011,2010]

The powder is baking powder. It consist of sodium hydrogen carbonate and tartaric acid.

$NaHCO_3$ gives CO_2 on heating which makes the bread cake soft and fluffy. Tartaric acid neutralises Na_2CO_3 which is bitter in taste.

82. HCl and HNO_3 show acidic characteristics in aqueous solution while alcohol and glucose solutions do not. Give reasons.

Ans : [CBSE 2011]

HCl and HNO_3 form H^+ or H_3O^+ ions in aqueous solution whereas alcohol and glucose do not dissociate into ions.

$$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$$
$$HNO_3 + H_2O \longrightarrow H_3O^+ + NO_3^-$$

83. What is bleaching powder chemically? Give a reaction for its preparation. State one of its use.

Ans : [CBSE 2011]

Bleaching powder is chemically $CaOCl_2$, calcium oxychloride

$\underset{\text{(Dry slaked lime)}}{Ca(OH)_2} + Cl_2 \longrightarrow CaOCl_2 + H_2O$

It is used as a disinfectant i.e., it makes water fit for drinking.

84. What are olfactory indicators? Dry HCl gas does not change the colour of dry blue litmus. Give reason.

Ans : [CBSE 2011]

Olfactory indicators: They give different smell in acids and bases.

Dry HCl(g) does not form ions, so there is no effect on litmus.

85. Answer the following:

a. Why is Plaster of paris written as $CaSO_4 \cdot \frac{1}{2}H_2O$? How is it possible to have a half water molecule attached with $CaSO_4$?
b. Why is sodium hydrogen carbonate an essential ingredient in antacids?

Ans : [CBSE 2011,2010]

a. It has one molecule of water associated with 2 molecules of $CaSO_4$. Water molecules are present as water of crystallisation.
b. It is a mild base and it can neutralise hyper acidity without harming our body.

86. What happens when chlorine is passed over slaked lime at 313 K? Write chemical equation of the reaction involved and state two uses of the product.

Ans : [CBSE 2010]

Bleaching powder, $CaOCl_2$ is formed:

$Ca(OH)_2 + Cl_2 \xrightarrow{313\,K} CaOCl_2 + H_2O$

a. It is used as an oxidising agent.
b. It is used as a disinfectant.

87. What is meant by 'water of crystallisation' of a substance? Describe an activity to show that blue copper sulphate crystals contains water of crystallisation.

Ans : [CBSE 2009]

The molecules of water associated with a crystalline substance are called 'water of crystallisation.'

$CuSO_4 \cdot 5H_2O \longrightarrow CuSO_4 + 5H_2O$

When hydrated copper sulphate is heated its colour changes from blue to dirty white and water droplets are formed. If we add little quantity of water to anhydrous $CuSO_4$, we get blue colour again. It is those

presence of molecules water of crystallisation which was lost on heating.

Activity: To study the effect of heat on hydrated crystalline salts.

i. Take 2 g of $CuSO_4 \cdot 5H_2O$ in a test tube.
ii. Observe the initial colour of the salt.
iii. Heat the test tube at top of burner carefully as shown in the diagram.
iv. Record your observations.
v. Cool the crystals and add few drops of water.
vi. Record your observations again.

Observations: Blue colour of $CuSO_4 \cdot 5H_2O$is changed to dirty white anhydrous $CuSO_4$ and water droplets were formed. On adding water, blue colour of salt was restored.

Conclusion: $CuSO_4 \cdot 5H_2O$ is a hydrated salt which loses water of crystallisation, which on heating becomes dirty white and regains its colour when it comes in contact with water.

Chemical reactions involved:

$$\underset{\text{(Blue)}}{CuSO_4 \cdot 5H_2O(S)} \xrightarrow{\text{Heat}} \underset{\text{(Dirty white)}}{CuSO_4(s)} + 5H_2O(l)$$

$$CuSO_4(s) + 5H_2O(l) \xrightarrow{\text{Heat}} \underset{\text{(Blue)}}{CuSO_4 \cdot 5H_2O}$$

88. Write the chemical formulae of washing soda and baiting soda. Which one of these two is an ingredient of antacids? How does it provide relief in stomachache?

Ans : [CBSE 2000]

$Na_2CO_3 \cdot 10H_2O$ is washing soda, $NaHCO_3$ is baking soda. $NaHCO_3$ is an ingredient of antacid. It neutralises hyper acidity in stomach and gives relief.

89. What is baking powder? How does it make the cake soft and spongy?

Ans : [CBSE 2008]

Baking powder is made up of $NaHCO_3$ and tartaric acid. $NaHCO_3$, on heating gives CO_2 which makes the cake soft and spongy.

THREE MARKS QUESTIONS

90. 2 mL of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing. Write the equation for the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid.

Ans : [CBSE 2018]

$$Zn(s) + 2NaOH \xrightarrow{\text{Worm}} \underset{\text{(Sodium zincate)}}{Na_2ZnO_2} + H_2$$

Test: Bring a burning splinter near the gas. If it burns with 'pop' sound, the gas liberated is hydrogen.

$Zn + H_2SO_4(dil) \longrightarrow ZnSO_4(aq) + H_2$

Hydrogen gas will be evolved by reaction of the same metal with dilute H_2SO_4, strong acid.

91. The pH of a salt which is used to make tasty and crispy pakoras is 14. Identify the salt and write a chemical equation for its formation. List its two uses.

Ans : [CBSE 2018]

The salt is $NaHCO_3$, sodium hydrogen carbonate.

$NH_3(g) + CO_2(g) + NaCl(g) + H_2O(l) \longrightarrow NaHCO_3(s) + NH_4Cl$

Uses:

a. It is used as an antacid.
b. It is used in soda-acid fire extinguishers.

No salt has pH = 14. $NaHCO_3$ has pH = 8.4.

92. (a) Why does aqueous solution of an acid conduct electricity?
(b) How does the concentration of H_3O^+ ions change when a solution of an acid is diluted?
(c) Which one has a higher pH, a concentrated or a dilute solution of hydrochloric acid?
(d) What would to be the gas evolved on adding dilute to hydrochloric acid to
(i) Solid sodium carbonate placed in a test tube?
(ii) Zinc metal in a test tube?

Ans : [CBSE 2018(C)]

a. It contains ions which carry current.
b. H_3O^+ ions will decrease when it is 7 diluted.
c. Dilute solution has higher pH than concentrated.
d. (i) CO_2 gas will be formed:
$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$
(ii) Hydrogen gas will be formed:
$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$

93. pH has a great importance in our daily life. Explain by giving three examples.

Ans : [CBSE Sample Paper 2018]

a. pH of our stomach is 2.0 and it is needed for the digestion of proteins in our body.
b. Blood has pH = 7.36 to 7.42 which must be maintained for proper health.
c. pH of soil is determined and suitable chemicals are added so as to make it suitable for growth of crops.

94. Answer the following questions:
a. State the colour of phenolphthalein in soap solution.
b. Name the by-product of chlor-alkali process which is used for the manufacture of bleaching powder.
c. Name one indicator which specifies the various levels of H^+ ion concentration.

Ans : [CBSE 2016]

a. Phenolphthalein will turn pink in soap solution.
b. Chlorine is the by-product of chlor-alkali process which is used in the manufacture of bleaching powder.
c. Universal indicator specifies the various levels of H^+ ion concentration.

95. a. Define a universal indicator. Mention its one use.
b. Solution 'A' gives pink colour when a drop of phenolphthalein indicator is added to it. Solution 'B' gives a red colour when a drop of methyl orange is added to it. What type of solutions are 'A' and 'B' and which of these will have higher pH?
c. Name one salt whose solution has pH greater than

7 and one salt with pH less than 7.

Ans : [CBSE 2016]

a. Universal indicator is mixture of indicators used to find pH of solution. It is used to measure levels of H^+ ion concentration.

b. 'A' is basic in nature, 'B' is acidic in nature. 'A' will have higher pH than 'B'. It should be greater than 7.

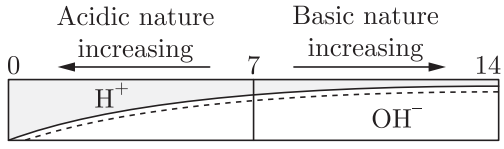
c. Na_2CO_3 is the salt whose pH is more than, $CuSO_4$ is the salt whose pH is less than 7.

96. a. Define pH scale. Draw a figure showing variation of pH with change in concentration of $H^+(aq)$ and $OH^-(aq)$ ions.

b. Mention the pH of acidic, basic and neutral solutions respectively.

Ans : [CBSE 2016]

a. pH scale is a scale which is used for measuring hydrogen ion concentration in a solution.



b. pH < 7 is for acidic solution, pH > 7 basic solution, pH = 7 for neutral solution.

97. a. Define olfactory indicators. Name two substances which can be used as olfactoiy indicators.

b. Choose strong acids from the following: CH_3COOH, H_2SO_4, H_2CO_3, HNO_3

Ans : [CBSE 2015]

a. Olfactory indicators: They give different smell in acidic and basic medium e.g., onion, clove, vanilla.

b. HNO_3 and H_2SO_4 are strong acids among the given acids.

98. Explain the action of dilute hydrochloric acid on the following with suitable chemical equations:

a. Magnesium ribbon,

b. Sodium hydroxide,

c. Crushed egg shells.

Ans : [CBSE 20151

a. $Mg(s) + 2HCl(dil) \longrightarrow MgCl_2(aq) + H_2(g)$

b. $NaOH(aq) + HCl(dil) \longrightarrow NaCl(aq) + H_2O(l)$

c. $CaCO_3(s) + 2HCl(dil) \longrightarrow CaCl_2(g) + CO_2(g) + H_2O(1)$

99. a. The blue colour of crystals of a substance on heating in a closed test tube gets changed but the colour was regained after sometime on cooling. Name that substance and write its chemical formula. Explain the phenomenon involved.

b. Write name and chemical formulae of two such compounds whose one unit is associated with 10 and 2 water molecules respectively.

Ans : [CBSE 2015]

a. Hydrated copper sulphate, $CuSO_4.5H_2O$ is the name and chemical formula of that substance. It loses water of crystallisation on heating and regains these molecules of water on exposure to the atmosphere:

$$\underset{\text{Blue}}{CuSO_4 \cdot 5H_2O} \xrightarrow{Heat} \underset{\text{(Dirty while)}}{CuSO_4} + 5H_2O$$

$$CuSO_4(s) + 5H_2O(l) \longrightarrow \underset{\text{Blue}}{CuSO_4 \cdot 5H_2O}$$

b. $Na_2CO_3.10H_2O$, washing soda (Sodium carbonate decahydrate) has 10 molecules of water of crystallisation. $CaSO_4.2H_2O$, gypsum, chemically calcium sulphate dihydrate has 2 molecules of water of crystallisation.

100. You are provided with magnesium ribbon and sulphur powder. Explain with the help of activity that metal oxides are basic and oxides of non-metals are acidic in nature.

Ans : [CBSE 2014]

Bum magnesium ribbon with the help of tongs to form white ash. Dissolve the ash in hot water. Add red litmus which turns blue, showing that MgO is a basic oxide.

$2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$

$MgO(s) + H_2O(Hot) \longrightarrow Mg(OH)_2(aq)$

Heat sulphur taken in a iron spatula and pass the gas through water. Add blue litmus into it. It will turn red showing SO_2 is an acidic oxide.

$S + O_2 \longrightarrow SO_2$

$SO_2 + H_2O \longrightarrow H_2SO_3$ (Sulphurous acid)

101. List two differences between acids and bases on the basis of chemical properties.

Ans : [CBSE 2013]

	Acids	Bases
1.	Acids turn blue litmus red.	Bases turn red litmus blue.
2.	Acids liberate CO_2 with metal carbonates and hydrogen carbonates.	Bases do not react with metal carbonates and hydrogen carbonates.

102. A substance 'X' is used as antacid reacts with hydrochloric acid to produce a gas W which is used in fire extinguishers:

a. Name the substance X and 'Y'.

b. Write a balanced equation of the reaction between X and hydrochloric acid.

Ans : [CBSE 2013]

a. 'X' is $NaHCO_3$ (Sodium hydrogen carbonate). 'Y' is CO_2 gas, which is used in fire extinguishers.

b. $NaHCO_3(s) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l) + CO_2(g)$

103. "Sodium hydrogen carbonate is a basic salt." Justify the statement. How is it converted into washing soda? Explain.

Ans : [CBSE 2012]

$NaHCO_3$ is a salt of NaOH which is a strong base and H_2CO_3 (Carbonic acid) which is a weak acid, therefore it is a basic salt. It can be converted into washing soda by heating followed by crystallisation:

$$2NaHCO_3(s) \xrightarrow{Heat} Na_2CO_3(s) + CO_2(g) + H_2O(l)$$

$$Na_2CO_3 + 10H_2O \longrightarrow \underset{\text{(washing soda)}}{Na_2CO_3 \cdot 10H_2O}$$

104. Describe an activity with diagram to illustrate that the reaction of metal carbonates or metal bicarbonates

with acid produces carbon dioxide. Write the relevant equations of all the reactions that take place. Name any two forms in which calcium carbonate is found in nature.

Ans : [CBSE 2012]

Activity: To show reaction of metal carbonates and metal hydrogen carbonates with dilute acids.

1. Take marble chips in Woulfe bottle.
2. Set the apparatus as shown in the diagram.
3. Add dilute HCl with the help of thistle funnel.
4. Collect the gas and pass through lime water and bring a burning matchstick near the gas.
5. Observe what happens.

Observation: Lime water turns milky. The burning matchstick gets extinguished.

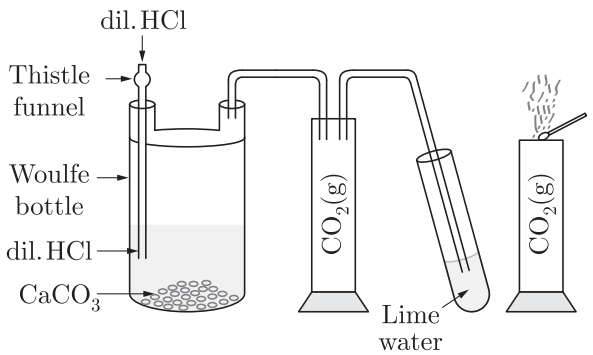
Conclusion: Metal carbonates react with dilute acids to liberate carbon dioxide.

Repeat the experiment with $NaHCO_3$ taken in Woulfe bottle.

Observation:

CO_2 gas will be evolved which turns lime water milky.

Conclusion: Metal hydrogen carbonates give CO_2 with dilute acids.



Reaction of calcium carbonate with dilute hydrochloric acid to liberate carbon dioxide gas which turns lime water milky and extinguishes burning matchstick

$$NaHCO_3 + HCl \longrightarrow NaCl + H_2O + CO_2$$
$$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$$

105. What is neutralisation reaction? Give two examples.

Ans : [CBSE 2011]

The reaction in which acid reacts with base to form salt and water is called neutralisation reaction e.g.,

$NaOH + HCl \longrightarrow NaCl + H_2O$

$2KOH + H_2SO_4 \longrightarrow K_2SO_4 + 2H_2O$

$CaCO_3$ (Marble), $CaCO_3$(Chalk) are the two forms in which calcium is found in nature.

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

a. Neutral,
b. Strongly alkaline,
c. Strongly acidic,
d. Weakly acidic,
e. Weakly alkaline.

Arrange the pH in increasing order of H+ ion concentration.

Ans : [CBSE 2011]

a. 'B' is neutral,
b. D is strongly alkaline,
c. 'C' is strongly acidic,
d. A is weakly acidic,
e. 'E' is weakly basic. D<E<B<A<C is the increasing order of H^+ ion concentration.

107. You have been provided with three test tubes. One of them contains distilled water and the other two contains an acidic solution and a basic solution respectively. If you are given only red litmus, how will you identify the contents 5 of each test tube?

Ans : [CBSE 2011]

Add red litmus to each of them. The test tube in which it turns blue contains the base.

Add blue litmus to the remaining two test tubes. The one in which it turns red contains the acid. The other one in which blue litmus and red litmus do not change contains distilled water,

108. While constructing a house, a builder selects marble flooring and marble table top for the kitchen where vinegar and lemon juice, tamarind etc., and more often used for cooking are to be kept. Will you agree to this selection and why?

Ans : [CBSE 2010]

No, he has taken wrong decision. Marble will react with vinegar and other acids and get corroded.

$CaCO_3 + 2CH_3COOH \longrightarrow (CH_2COO)_2Ca + H_2O + CO_2$

109. Name the products formed in each case when:

a. Hydrochloric acid reacts with caustic soda.
b. Granulated zinc reacts with caustic soda.
c. Carbon dioxide is passed through lime water.

Ans : [CBSE 2009]

a. $NaOH + HCl \longrightarrow \underset{\text{Sodium chloride}}{NaCl} + \underset{\text{Water}}{H_2O}$

b. $Zn + 2NaOH \longrightarrow \underset{\text{soudium zincate}}{Na_2ZnO_2} + \underset{\text{Hydrogen}}{H_2(g)}$

c. $Ca(OH)_2 + CO_2(g) \longrightarrow \underset{\text{Calcium carbonate}}{CaCO_3(s)} + \underset{\text{Water}}{H_2O(l)}$

FIVE MARKS QUESTIONS

110. a. Define indicator. Name two indicators obtained from plants.
b. Write a balanced chemical equation for the reaction taking place when sodium oxide reacts with water. How will this solution behave towards phenolphthalein and red litmus paper?
c. State what happens when sodium hydroxide solution reacts with hydrochloric acid.

Ans : [CBSE 2016]

a. Indicator is a substance which give different colour or odour in acid and base e.g., litmus and turmeric are indicators obtained from plants.

b. $Na_2O(s) + H_2O(l) \longrightarrow 2NaOH(aq)$

Solution will turn phenolphthalein pink and red litmus paper blue.

c. Sodium chloride and water are formed:

$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$

111. State the reason for the following statements:

a. Tap water conducts electricity whereas distilled water does not.

b. Dry hydrogen chloride gas does not turn blue litmus red whereas dilute hydrochloric acid does.

c. During summer season, a milkman usually adds a very small amount of baking soda to fresh milk.

d. For dilution of an acid, acid is added to water and not water to acid.

e. Ammonia is a base but it does not contain hydroxyl group.

Ans : [CBSE 2015]

a. Tap water contains ions which makes it a good conductor whereas distilled water does not contain any ions.

b. Dry HCl gas does not dissociate into ions, so it has no effect on the litmus. Hydrochloric acid form ions, so it turns blue litmus red.

c. Baking soda prevents the formation of lactic acid when milk turns sour.

d. Acid is added to water slowly because the reaction is highly exothermic. If water is added to acid, then glass container may break due to lot of heat evolved.

e. NH_3 dissolves in H_2O forming NH_4OH, therefore it acts as base:

$$NH_3 + H_2O \longrightarrow NH_4OH \longrightarrow NH_4 + OH^-$$

112. a. State the chemical properties on which the following uses of baking soda are based:
(i) as an antacid,
(ii) as a soda acid fire extinguisher,
(iii) to make bread and cake soft and spongy.

b. How is washing soda obtained from baking soda? Write the relevant balanced chemical equation.

Ans : [CBSE 2015]

a. (i) It is basic in nature.
(ii) It liberates CO_2 with acid which extinguishes fire.
(iii) It releases CO_2 gas on heating which makes bread and cake soft and spongy.

b. Washing soda is obtained by heating baking soda followed by crystallisation:

$$2NaHCO_3(s) \longrightarrow Na_2CO_3 + CO_2 + H_2O$$

$$Na_2CO_3 + 10H_2O \longrightarrow \underset{\text{(Washing soda)}}{Na_2CO_3 \cdot 10H_2O}$$

113. Write balanced chemical equations for the following:

a. Bleaching powder is kept open in air.

b. Blue crystals of copper sulphate are heated.

c. Chlorine gas is passed through dry slaked lime.

d. Carbon dioxide gas is passed through lime water.

e. NaOH solution is heated with zinc granules.

Ans : [CBSE 2014]

a. $CaOCl_2 + CO_2 \longrightarrow CaCO_3 + Cl_2$

b. $CuSO_4.5H_2O \xrightarrow{\text{Heat}} CuSO_4 + 5H_2O$

c. $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

d. $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

e. $Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2$

114. Equal length of magnesium ribbon are taken in two test tubes A and B. H_2SO_4 is added to test tube 'A' and H_2CO_3 is added in test tube 'B' in equal amounts:

a. Identify the test tube showing vigorous reaction.

b. Give reason to support your answer.

c. Name the gas liberated in both the test tubes. How will you prove its liberation?

d. Write chemical equations for both the reactions.

e. Out of two acids taken above, which one will have lower pH value and lower H^+ ion concentration respectively?

Ans : [CBSE 2014]

a. 'A' will show vigorous reaction.

b. H_2SO_4 is a strong acid, it reacts faster than H_2CO_3, a weak acid.

c. H_2 gas. If we bring a burning splinter near the gas, it will burn with 'pop' sound.

d. $Mg + H_2SO_4 \longrightarrow MgSO_4 + H_2$
$Mg + H_2CO_3 \longrightarrow MgCO_3 + H_2$

e. H_2SO_4 will have lower pH. H_2CO_3 will have lower H^+ ion concentration,

115. Write chemical equations when zinc granules react with

a. Sulphuric acid,

b. Hydrochloric acid,

c. Aluminium chloride,

d. Sodium hydroxide,

e. Nitric acid

Ans : [CBSE 2014]

a. $Zn(s) + H_2SO_4(dil.) \longrightarrow ZnSO_4(aq) + H_2(g)$

b. $Zn(s) + 2HCl(dil) \longrightarrow ZnC(aq) + H_2(g)$

c. $Zn(s) + AlCl_3(aq) \longrightarrow$ No reaction

d. $Zn(s) + 2NaOH(aq) \longrightarrow Na_2ZnO_2(aq) + H_2(g)$

e. $3Zn(s) + 8HNO_3(dil) \longrightarrow 3Zn(NO_3)_2(aq) + 2NO(g) + 4H_2O(l)$

116. The metal salt 'A' is blue in colour. When salt 'A' is heated strongly over a burner, then a substance 'B' present in it is eliminated and a white powder 'C' is left behind. When a few drops of a liquid 'D' is added to powder 'C', it becomes blue again.

a. Identify A, B, C and D.

b. Write the chemical equations involved.

c. Give an example of the salt which also shows the above property.

Ans : [CBSE 2014]

a. 'A' is $CuSO_4.5H2O$, 'B' is H_2O, 'C' is $CuSO_4$ (ahydrous).

b. $\underset{\text{(Blue)}}{CuSO_4 \cdot 5H_2O(s)} \xrightarrow{\text{Heat}} \underset{\text{(White) B}}{CuSO_4(s)} + H_2O(l)$

c. $FeSO_4.7H_2O$ is a salt which also shows this property.

117. a. Write the chemical name and chemical formula of washing soda.

b. How is chlorine obtained from sodium chloride? Give equations for the reactions involved.

c. Give an example of the salt which also shows the above property.

Ans : [CBSE 2014]

a. $Na_2CO_3 \cdot 10H_2O$, Sodium carbonate decahydrate.

b. $NaCl + H_2O + NH_3 + CO_2 \longrightarrow NaHCO_3 + NH_4Cl$

$$2NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + H_2O + CO_2$$

$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3 \cdot 10H_2O$

CO_2 gas is passed through ammonical brine to get back $NaHCO_3$. $NaHCO_3$ on heating again gives Na_2CO_3 which on crystallisation gives washing soda.

c. Na_2CO_3 is salt of NaOH (Strong base) and H_2CO_3(Weak acid), therefore it is a basic salt. It is used for softening hard water.

118. a. Identify the acid and the base whose combination forms the common salt that you use in your food. Write its chemical formula and chemical name of the salt.

b. What is rock salt? Mention its colour and the reason due to which it has this colour.

c. What happens when electricity is passed through brine? Write chemical equation for it.

Ans : [CBSE 2013]

a. NaOH (Sodium hydroxide) and HCl (Hydrochloric acid) form common salt. NaCl is common salt, sodium chloride.

b. Rock salt is sodium chloride found in the form of rocks. It is yellowish in colour due to the presence of impurities.

c. Sodium hydroxide, H_2 gas and chlorine gas will be formed:

$2NaCl(aq) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g) + Cl_2(g)$

119. a. Explain why is hydrochloric acid a strong acid and acetic acid, a weak acid. How can it be verified?

b. Explain why aqueous solution of an acid conducts electricity.

c. You have four solutions A, B, C and D. The pH of solution A is 6, B is 9, C is 12 and D is 7.

(1) Identify the most acidic and most basic solutions respectively.

(2) Arrange the above four solutions in the increasing order of H^+ ion concentration.

(3) State the change in colour of pH paper on dipping in solution C and D.

Ans : [CBSE 2012]

a. Hydrochloric acid is a strong acid because it is completely ionised in its aqueous solution. Acetic acid is only partially ionised. HCl reacts with Mg vigorously whereas acetic acid reacts less vigorously.

b. Aqueous solution of acid contain ions which carry current, it conducts electricity.

c. (1) With pH = 6 'A' is most acidic,
With pH = 12, 'C' is most basic.

(2) C < B < D < A is the increasing order of H^+ ion concentration.

(3) pH paper will turn blue in 'C' with pH = 12, basic pH paper will turn green in D with pH = 7, neutral.

120. (a) Dry pellets of a base 'X' when kept in open absorbs moisture and turns sticky. The compound is also formed by chlor-alkali process. Write the chemical name and formula of X. Describe chlor-alkali process with balanced chemical equations. Name the type of reaction occurs when X is treated with dilute hydrochloric acid. Write the relevant chemical equation.

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

Ans : [CBSE 2012]

a. 'X' is NaOH. It is a base which is hygroscopic i.e., absorbs moisture from the atmosphere and turns sticky. It is also formed by the electrolysis of aqueous solution of brine by chlor alkali process:

$2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{Heat}} 2NaOH(aq) + H_2(g$

Neutralisation reaction will take place between NaOH and HCl:

$NaOH + HCl \longrightarrow NaCl + H_2O$

b. It is because the process is highly exothermic. If we add H_2O to acid, the glass container may break due to excess heat evolved.

121. a. Explain the following chemical properties of acids with the help of balanced chemical equations only:

(1) when an acid reacts with a metal carbonate,

(2) when an acid reacts with a metal bicarbonate,

(3) when an acid reacts with a metal oxide.

b. You are given three solutions A, B and C with pH values, 2,10 and 13 respectively. Which solution has the highest hydrogen ion concentration among the three and state the nature 'acidic or basic' of each solution.

Ans : [CBSE 2012]

a. (1) $Na_2CO_3 + H_2SO_4(dil) \longrightarrow Na_2SO_4 + H_2O + CO_2$

(2) $2NaHCO_3 + H_2SO_4(dil) \longrightarrow Na_2SO_4 + H_2O + CO_2$

(3) $MgO + H_2SO_4 \longrightarrow MgSO_4 + H_2O$

b. 'A' has more H+ ion concentration among the three.

A' is acidic.

'B' is basic.

'C' is strongly basic.

122. a. A metal compound 'X' reacts with dilute H_2SO_4 to produce effervescence. The gas evolved extinguishes a burning candle. If one of the compound formed is calcium sulphate, then what is 'X' and the gas evolved? Also write a balanced chemical equation for the reaction which has occurred.

b. (i) Name one antacid. How does it help to relieve indigestion in stomach?

(ii) A farmer treats the soil with quicklime or calcium carbonate. What is the nature of the soil? Why does the farmer treat the soil with quicklime?

Ans : [CBSE 2012]

This is is calcium carbonate

$CaCO_3(s) + H_2SO_4(dill) \longrightarrow CaSO_4(aq) + H_2O(l) + CO_2(g)$

The gas evolved is carbon dioxide (CO_2).

b. (i) $NaHCO_3$(baking soda) is an antacid. If neutralises excess of HCl in stomach and gives relief.

(ii) The nature of soil is acidic. The farmer treats the soil with quicklime (basic in nature) to neutralise the acidity of soil and make it fit for crops.

123. a. Tooth enamel is one of the hardest substance in

our body. Explain the changes in pH of mouth which indicates tooth decay. How does tooth paste help in preventing it?

b. What is the nature of salt if pH of its aqueous solution is greater than 7? Name the acid and base that would be used to prepare the following salts:
(i) Potassium sulphate, (ii) Ammonium chloride

Ans : [CBSE 2012]

a. Tooth enamel is made up of $Ca_3(PO_4)_2$ calcium phosphate. pH = 5.5 causes tooth decay because $Ca_3(PO_4)_2$ reacts with acid. Tooth paste are basic, neutralises the acid in mouth and prevents tooth decay.

b. The salt is basic if pH > 7.
(i) KOH and H_2SO_4 are needed to prepare K_2SO_4.
(ii) NH_4OH and HCl are needed to prepare NH_4Cl.

124. (a) A salt is produced by reaction between an acid and a base. Identify the acid and base from which the following salts have been formed:
(i) Na_2SO_4, (ii) NH_4Cl, (Hi) KNO_3, (iv) NaCl

(b) Which one of these will have pH less than 7 and why?

Ans : [CBSE 2012]

(a) (i) Na_2SO_4 is prepared from NaOH and H_2SO_4
(ii) NH_4Cl is formed by NH_4OH and HCl.
(iii) KNO_3 is formed by KOH and HNO_3.
(iv) NaOH is formed by NaOH and HCl.

(b) NH_4Cl has pH less than 7 because it is a salt of weak base NH_4OH and strong acid, HCl, therefore the salt is acidic.

125. What are strong acids and weak acids? In the following list of acids, separate strong acids from weak acids:
hydrochloric acid, citric acid, acetic acid, nitric acid, formic acid, sulphuric acid.

Ans : [CBSE 2012]

Strong acids are those acids which are completely ionised in aqueous solution e.g.-,

$HCl(aq) \longrightarrow H^+(aq) + Cl^-(aq)$

Weak acids do not ionise completely in aqueous solution:

$CH_3COOH(aq) \rightleftharpoons CH_3OO^-(aq) + H^+(aq)$

Strong acids: Hydrochloric acid, Nitric acid, Sulphuric acid.

Weak acids: Citric acid, Acetic acid, Formic acid.