ACIDS BASES AND SALTS

- 1. The pH of a sample of vegetable soup was found to be 6.5. How is this soup likely to taste? Answer. The taste will be slightly sour as it is weakly acidic.
- 2. Which bases are called alkalies? Give an example of alkalies. Answer. Soluble bases are called alkalies, e.g. sodium hydroxide (NaOH).
- 3. Write a balanced chemical equation for the reaction between sodium carbonate and hydrochloric acid indicating the physical state of the reactants and the products. Answer.

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

- 4. Write a balanced chemical equation for a neutralisation reaction, mentioning the physical state of the reactants and the products. Answer. NaOH(aq) + HCl(aq) → NaCl(aq) + H₂O(l)
- 5. What happens when chlorine is passed over slaked lime at 313K? Write chemical equation of the reaction involved and state two uses of the product obtained. Answer. Bleaching powder is formed.

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

(i) It is used as bleaching agent in paper and textile industries.

(ii)It is used as disinfectant in purification of drinking water.

- 6. What would be the colour of red litmus in a solution of sodium carbonate? Answer. The red litmus will change to blue in sodium carbonate solution.
- 7. Which gas is evolved when sodium hydrogencarbonate reacts with dilute hydrochloric acid? Answer.Carbon dioxide gas is evolved.
- 8. Curd is not kept in copper and brass utensils. Why? Answer.Curd and sour substances contain acids which react with brass and copper vessels to form poisonous salts which are harmful for our health.
- 9. Name the gas usually liberated when a dilute acid reacts with a metal. What happens when a burning candle is brought near this gas?

Answer. H₂ gas is liberated. It burns with pop sound when burning candle is brought near the gas.

10. What effect does an increase in concentration of H⁺(aq.) in a solution have on the pH of solution?

Answer.Higher the concentration, lower will be pH of the solution.

- 11. Which one of these has a higher concentration of H⁺ ions ? 1 M HCl or 1 M CH₃COOH Answer.1 M HCl has higher concentration of H⁺ ions.
- 12. Why does 1 M HC1 solution have a higher concentration of H⁺ ions than 1 M CH₃COOH solution?

Answer.1 M HCl has higher cone, of (H^+) because it ionises completely in aqueous solution whereas $CH_3COOHdoes$ not as it is weak acid.

13. Which gas is generally liberated when a dilute solution of hydrochloric acid reacts with an active metal?

Answer.Hydrogen gas is liberated when active metal reacts with dilute hydrochloric acid $Zn(s) + 2HCl(dil.) \longrightarrow ZnCl_2(aq) + H_2(g)$

- 14. What is the colour of litmus in a solution of ammonium hydroxide? Answer.Red litmus will turn blue in ammonium hydroxide.
- 15. Name the natural source of each of the following acid (i) Citric acid. (ii)Oxalic acid.

(ii) Lactic acid. (iv) Tartaric acid.

Answer. (i) Lemon and orange.(ii)Tomatoes and Guava.

(iii)Sour milk (curd).(iv)Tamarind.

16. A student detected the pH of four unknown solution A, B, C and D as follows 11, 5, 7 and 2. Predict the nature of the solution.

Answer.A is basic 'B' is acidic 'C' is natural and 'D' is strongly acidic.

- 17. (i) Give the constituents of baking powder
 - (ii) Why cake or bread swells on adding baking powder? Write chemical equation. Answer.

(i) Baking powder containg sodium hydrogen carbonate and tartaric acid.

(ii)It is due to carbon dioxide

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

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

Answer. Bring a burning matchstick near the gas. It burns with 'pop' sound showing that it is hydrogen.

19. Name the acid present in the following:

(i) Tomato (ii) Vinegar (iii) Tamarind

Answer. (i) Oxalic acid (ii) Acetic acid (iii) Tartaric acid

20. Explain how antacid works.

Answer. Hyperacidity is caused by excess of hydrochloric acid in stomach. Antacid is basic in nature. It neutralizes excess of acid and gives relief from pain caused by hyperacidity.

21. (a) Define olfactory indicators. Name two substances which can be used as olfactory indicator.

(b) Choose strong acids from the following: CH₃COOH, H₂SO₄, H₂CO₃, HNO₃

Answer.

(a) Those substances whose smell (odour) changes in acidic or basic solution are called olfactory indicators, e.g. onion and vanilla.

(b) H_2SO_4 and HNO_3 are strong acids.

- 22. A white coloured powder is used by doctors for supporting fractured bones.
 - (a) Write chemical name and formula of the powder.
 - (b) When this white powder is mixed with water a hard solid mass is obtained. Write balanced chemical equation for the change.

Answer.

(a) Calcium sulphate hemihydrate

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

- 23. Explain the action of dilute hydrochloric acid on the following with chemical equation:(i) Magnesium ribbon (ii) Sodium hydroxide (iii) Crushed egg shellsAnswer.
 - (i) Hydrogen gas will be formed

Mg (s) + 2HCl (dil) \longrightarrow MgCl₂ (aq) + H₂ (s)

(ii) Sodium chloride and water will be formed

 $NaOH + HCl \longrightarrow NaCl + H_2O$

(iii) Crushed egg shell are made up of CaCO₃ which reacts with dil HCl to give brisk effervescence due to CO₂

 $CaCO_3$ (s) # 2HCl \longrightarrow CaCl₂ + H₂O + CO₂

- 24. State reason for the following statements:
 - (i) Tap water conducts electricity whereas distilled water does not.

(ii) Dry hydrogen chloride gas does not turn blue litmus red whereas dilute hydrochloric acid does.

(iii) During summer season, a milk man usually adds a very small amount of baking soda to fresh milk.

(iv) For a dilution of acid, acid is added into water and not water into acid.

(v) Ammonia is a base but does not contain hydroxyl group.

Answer.

(i) Tap water contains ions which conduct electricity, distilled water does not contain ions.

(ii)Dry HCl does not form ions but HCl gives H⁺ and Cl⁻.

(iii) Baking soda does not allow milk to change to lactic acid which makes milk sour.

(iv) Adding water to acid is highly exothermic. Therefore water is added to acid very slowly with cooling.

(v) Ammonia dissolves in water and forms H⁻ Therefore, it is basic in nature.

25. (a) Write the chemical formula of hydrated copper sulphate and anhydrous copper sulphate. Giving an activity illustrate how these are inter convertible.(b) Write chemical names and formula of plaster of paris and gypsum.

Answer.

(a)CuSO₄.5H₂O is hydrated copper sulphate. CuSO₄ is anhydrous copper sulphate.

Aim: To show crystalline salts contain water of crystallization.

Material Required: CuSO4.5H2O (Blue vitriol), boiling tube, burner, cork,

delivery tube, test tube, clamp stand.

Procedure: 1.Take 2g of CuSO₄.5H₂O in a boiling tube fitted in a clamp stand.

2.Observe its colour. Fit it with cork and delivery tube bent at two right angles which dips into a test tube.

3.Heat crystals in boiling tube.

4.Observe vapours being condensed in test tube.

5.Cool the crystals and add few drops of water into it.

Observation: Water vapours get condensed in a test tube and colour

of blue crystals changes into white. On adding water to anhydrous copper sulphate it changes into blue again.

Chemical Reaction :

$CuSO_4.5H_2O \xrightarrow{heat} CuSO_4 + 5H_2O$

Blue vitriol

White

Conclusion : Crystalline substances have water of crystallization which are lost on heating. When we add water inCuSO₄till a saturated solution is formed. On cooling, it gets converted into CuSO₄.5H₂Ocrystals and it shows that both are inter convertible.

 $CaSO_4$. $\frac{1}{2}H_2O$ calcium sulphate hemihydrate

CaSO₄.2H₂O calcium sulphate dihydrate.

- 26. (a) Write the name given to bases that are highly soluble in water. Give an example.
 - (b) How is tooth decay related to pH? How can it be prevented?

(c) Why does bee sting cause pain and irritation? Rubbing of baking soda on the sting area gives relief. How?

Answer.(a) Alkali, e.g. NaOH (Sodium hydroxide).

(b) Lower the pH, more will be tooth decay. Acid reacts with $Ca_3(PO_4)_2$ and cause tooth decay. It can be prevented by brushing teeth after every meal.

(ic) It is due to formic acid. Sodium hydrogencarbonate (Baking soda) neutralises formic acid giving relief.

27. (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 extiguisher

(iii) to make bread and cake soft and spongy.

Answer.

- (b) How is washing soda is obtained from baking soda? Write balanced chemical equation.
- (a) (i) It is weakly basic in nature and naturalize hyperacidity.
- (ii)It liberates CO₂ with H2SO₄, which extinguish fire.
- (iii) It liberates CO₂ on heating which makes bread and cake soft and sponge.

(b)
$$2NaHCO_3 \xrightarrow{heat} Na_2CO_3 + CO_2 + H_2O_3$$

Baking soda on heating gives sodium carbonate which on crystallisation from hydrated washing soda

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

28. Describe an activity with diagram to illustrate that the reaction of metal carbonates and metal bicarbonates with acids 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.

Answer.

Aim: To show acid reacts with metal carbonate to liberate carbon dioxide,

Material Required: CaCO₃(marble chips), Woulfe-bottle, thistle funnel, dil. HCl, gas jar, matchbox, delivery tube bent at two right angles, lime water.

Procedure:

Take two test tubes, label them as A and B.

Take about 0.5 g of sodium carbonate (Na2CO3) in test tube A and about 0.5 g of sodium hydrogen carbonate (NaHCO3) in test tube B.

Add about 2 mL of dilute HCl to both the test tubes.

Pass the gas produced in each case through lime water (calcium hydroxide solution) as shown in below figure and record your observations.



The reactions occurring in the above Activity are written as

2HCl(dil.) $CaCO_{s}(s)$ + $CaCl_{9}(aq)$ $H_{0}O(l)$ $CO_{9}(g)$ Marble Hydrochloric (White ppt.) Water Carbon Calcium chloride (Calcium carbonate) acid dioxide $Ca(OH)_{9}(aq)$ $CaCO_3(s)$ + H₀O(l) $+ CO_{9}(g)$ Lime water Carbon dioxide (White ppt.) Calcium carbonate

Conclusion: Metal carbonates react with dilute acids to liberate carbon dioxide. Limestone, chalk, marble are different forms of calcium carbonate. All metal carbonates and hydrogen carbonates react with acids to form corresponding salts, water and carbon dioxide.

29. "Sodium hydrogencarbonate is a basic salt". Justify the statement. How is it converted into washing soda? Explain.

Answer. Sodium hydrogen carbonate is a salt of sodium hydroxide (strong base) and carbonic acid (weak acid).

It is basic salt. It is converted into washing soda by heating followed by crystallization.

 $2NaHCO_{3}(aq) \xrightarrow{heat} Na_{2}CO_{3} \xrightarrow{} CO_{2} + H_{2}O$

- 30. (a) Identify the acid and the base whose combination forms the common salt that you use in your food. Write its formula and chemical name of this salt. Name the source from where it is obtained.
 - (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 the chemical equation for
 - it.
 - Answer.

(a) HCl is acid and NaOH is base whose combination forms the common salt. Its formula is NaCl (Sodium chloride). It is obtained from sea water.

(b) Rock salt is the common name for the mineral "halite". Its chemical formula is NaCl.

It may be white or light blue or yellow depending upon impurities present in it.

(c) $2NaCl + 2H_2O \xrightarrow{electrolysis} 2NaOH + H_2 + Cl_2$

31. (i) Explain why is hydrochloric acid a strong acid and acetic acid, a weak acid. How can it be verified?

(ii) Explain why aqueous solution of an acid conducts electricity.

- (iii) 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,
- (a) Identify the most acidic and most basic solutions.
- (b) Arrange the above four solutions in the increasing order of H^+ ion concentration.
- (c) State the change in colour of pH paper on dipping in solution C and D.

Answer.

(i) HCl is completely ionised in aqueous solution whereas acetic acid is partially ionised in aqueous solution. HCl gives dark red colour with pH paper whereasCH₃COOH gives orange colour

(ii) It is because acid ionises in aqueous solution and these ions conduct electricity. (Hi) (a) 'A' is most acidic and 'C' is most basic.

(b) C $(10^{-12}) < B (10^{-9}) < D (10^{-7}) < A (10^{-6})$

(c) pH paper will become blue in 'C' and green in 'D'.

32. (a) Identify the compound of calcium which is yellowish white powder and is used for disinfecting drinking water. Write its chemical name and formula. How is it manufactured? Write the chemical equation for the reaction involved. Also list two other uses of the compound.

(b) Write the balanced chemical equation qf chlor-alkali process.

Answer. (a) The compound is bleaching powder (CaOCl₂). Its chemical name is calcium oxychloride. It is manufactured by reaction of solid slaked lime with dry chlorine gas.

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

- (i) It is used as disinfectant.
- (ii) It is used for preparation of chloroform.

(b) $2NaCl + 2H_2O \xrightarrow{electrolysis} 2NaOH + H_2 + Cl_2$

33. (a) Mention the pH range within which our body works. Explain how antacids

give relief from acidity. Write the name of one such antacid.

(b) Fresh milk has a pH of 6. How does the pH will change as it turns to curd? Explain your answer.

(c) A milkman adds a very small amount of baking soda to fresh milk. Why does this milk take a longer time to set as curd?

(d) Mention the nature of toothpastes. How do they prevent tooth decay? Answer.

(a) Our stomach has pH equal to 2. Antacids neutralizes excess of acid in our body and gives relief from hyperacidity. Sodium hydrogencarbonate is one of such antacid.

(b) pH will decrease as it turns to curd because curd is acidic due to the presence of lactic acid.

(c) It takes longer time to set as curd as bacteria do not work well in presence of sodium hydrogencarbonate, i.e. fermentation will take place slowly.

(d) Toothpastes are basic in nature. They neutralize the acid formed in mouth which causes tooth decay.

34. (a) Crystals of a substance changed their colour on heating in a closed test tube but regained it after sometime when they were allowed to cool down. Name the substance and write its formula and explain the phenomenon involved.

(b) Name the compound whose one formula unit is associated with 10 water molecules. How is it prepared? Give equations of related reactions. Give two uses of the compound. Answer.

(a) CuSO₄.5H₂O is a blue crystalline solid. It becomes dirty white on heating due to loss of water molecules and it becomes amorphous.

 $\begin{array}{ccc} CuSO_4.5H_2O & \xrightarrow{heat} & CuSO_4 + 5H_2O \\ Copper sulphate & Anhydrous \\ pentahydrate & copper sulphate \\ & (Blue) & (Dirty white) \end{array}$

It regains its colour by absorbing water from atmosphere and becomes blue in colour.

$$CuSO_4 + 5H_2O \longrightarrow CuSO_4.5H_2O$$

Blue

(b)Na₂CO₃. 10H₂O. It is called sodium carbonate decahydrate or washing soda. It is prepared by passing CO₂ gas through saturated solution of ammonical brine.

Uses:

(i) It is used in the production of washing powder.

(ii) It is used for the manufacture of glass.

- 35. (a) Explain the following with the help of balanced chemical equations only.
 - (i) When an acid reacts with a metal carbonate.

(ii)When an acid reacts with a metal bicarbonate.

(iii) 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. Write which solution has more hydrogen ion concentration among the three and state the nature 'acidic or basic' of each solution.

Answer.

- (a) (i) $CaCO_3 + 2HCI \longrightarrow CaCl_2 + H_2O + CO_2$
 - (ii) NaHCO₃ + HCl \longrightarrow NaCl + H₂O + CO₂
 - (iii) $Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$
- (b) 'A' has maximum $[H_3O^+]$ equal 10^{-2} mol L⁻¹

'A' is acidic whereas B and C are basic in nature.

- 36. a) A metal compound 'X' reacts with dil. H₂SO₄ 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 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 soil? Why does the farmer treat the soil with quicklime?

Answer.

(a) 'X' is CaCO₃ (calcium carbonate). The gas evolved is CO₂.

 $CaCO_3 + H_2SO_4(dil.) \longrightarrow CaSO_4 + H_2O + CO_2$ Calcium sulphate

(b) (i) NaHCO₃ is antacid. It neutralizes excess of acid formed in the stomach.

(ii) The soil is acidic in nature. The farmer wants to make it neutral by adding quicklime which is good for crops.

37. What are strong 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.

Answer. Strong acids are those acids which are completely ionised in aqueous solution. Weak acids are those which do not ionise completely in aqueous solution. Strong acid: HCl, HNO₃,H₂SO₄ Weak acid: Citric acid, acetic acid, formic acid.

38. State the chemical name of Plaster of Paris. Write a chemical equation to show the reaction between Plaster of Paris and water.

Answer. Calcium sulphate hemihydrate. $CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O \longrightarrow CaSO_4 \cdot 2H_2O$

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

Answer. Sodium hydrogencarbonate (baking soda) on heating gives sodium carbonate which on recrystallisation gives washing soda.

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

Baking soda on heating gives sodium carbonate which on crystallisation from aqueous solution gives washing soda, e.g.

 $Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3 \cdot 10H_2O$

40. What is the colour of FeSO₄.7H₂O crystals? How does this colour change upon heating? Give balanced chemical equation for the changes.

Answer. Pale green is the colour of FeSO₄.7H₂O crystals. It becomes dirty white on heating.

$FeSO_4.7H_2O \xrightarrow{heat} FeSO_4 + 7H_2O$

Dirty white

Pale green

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

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

42. State reasons for the following statements:

(i) Stain of curry on a white cloth becomes reddish brown when soap is scrubbed on it and turns yellow again when the cloth in washed with plenty of water.

(ii) Curd should not be kept in copper or brass vessels. What is done to protect it? Answer. (i) Turmeric reacts with sodium hydroxide present in soap to form red coloured compound. It turns yellow again because sodium hydroxide becomes very dilute on adding lot of water and reaction stops.

(ii) Curd contains lactic acid which reacts with copper or brass vessels and taste changes. Curd should be kept in glass, steel or ceramic container which does not react with lactic acid present in it.

43. A student dropped few pieces of marble in dilute HC1 contained in a test tube. The evolved gas was passed through lime water.

(i) What change would be observed in lime water?

(ii) Write balanced chemical equation for the above change.

Answer.

(i) Lime water will turn milky due to formation of calcium carbonate.

(ii) Ca(OH) ₂ (aq) + CO₂ (g) \longrightarrow Ca CO₃ (s) + HaO(l)

44. (a) What is universal indicator?

(b) Write the chemical equation involved in the preparation of sodium hydroxide. Name the process.

Answer. (a) Universal indicator is the mixture of synthetic indicators which is used to find pH of solutions.

(b) $2NaCl(aq) + 2H_2O(l) \xrightarrow{electrolysis} 2NaOH(aq) + H_2(g) + Cl_2(g)$

It is called chlor-alkali process.

45. A gas 'X' reacts with lime water and forms a compound 'Y' which is used as a bleaching agent in chemical industry. Identify 'X' and 'Y\ Give the chemical equation of the reactions involved.

Answer. 'X' is chlorine; 'Y' is bleaching powder. 'X' is chlorine; 'Y' is bleaching powder.

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

46. (i) Name the compound which is obtained from baking soda and is used to remove permanent hardness of water.

(ii) Write its chemical formula.

(iii) What happens when it is recrystallised from its aqueous solution? Answer.

(i) Sodium carbonate is obtained from baking soda and is used to remove hardness of water. (ii) Na_2CO_3 .

(II) $\operatorname{Na}_2 \operatorname{CO}_3$.

(iii) It changes to washing soda, Na_2CO_3 . $10H_2O_3$.

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

Answer. The reaction between acid and base to form salt and water is called neutralization reaction. e.g. NaOH + HCl \rightarrow NaCl + H₂O and 2NaOH + H₂SO₄ \rightarrow Na₂SO₄ + 2H₂O

48. What is tooth enamel chemically? State the condition when it starts corroding. What happens when food particles left in the mouth after eating degrade? Why do doctors suggest use of tooth powder/toothpaste to prevent tooth decay?

Answer. It is made up of calcium phosphate.

It starts corroding due to acid formed in mouth. The food particles which are left in mouth form acids which cause tooth decay. Toothpaste and tooth powder are basic and neutralise acid formed in mouth which prevents tooth decay.

49. What is Plaster of Paris chemically? How is it prepared? List its two important uses. Answer. Calcium sulphate hemihydrate.

It is prepared by heating gypsum at 373 K.

CaSO₄.2H₂O
$$\xrightarrow{373 \text{ K}}$$
 CaSO₄. $\frac{1}{2}$ H₂O + $\frac{3}{2}$ H₂O
Gypsum Plaster of Paris

(ii) It is used to make casts and moulds.

⁽i) It is used to prepare chalks.

50. What is baking soda chemically called? Give reaction involved in its preparation. Write one of its uses.

Answer. Sodium hydrogen carbonate.

$$NH_3 + CO_2 + H_2O + NaCl \longrightarrow NaHCO_3 + NH_4O$$

or
 $NaCO_3 + CO_2 + H_2O \longrightarrow 2NaHCO_3$

It is used as an antacid.

51. Compounds like alcohols and glucose also contain hydrogen but are not categorised as acids. Discuss an activity to prove it.

Answer. Take a beaker of 250 ml and place two nails fixed with the help of cork.



- Connect the nails to the two terminals of a 6 volt battery as shown in figure.
- Now add some water containing ethanol and put the switch ON.
- Repeat the experiment with glucose solution.

Observation : K The bulb will not glow and the needle of ammeter will not show deflection because glucose and ethanol do not conduct electricity.

Conclusion: The experiment shows glucose and ethanol do not ionise in aqueous solution, that is, they do not give H^+ ions, therefore cannot conduct electricity. Thus, glucose and ethanol are not categorised as acids.

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

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

To show crystalline salts contain water of crystallisation.



Materials Required: CuS04.5H20 (Blue vitriol), boiling tube, burner, cork, delivery tube, test tube, clamp stand. **Procedure:**

1. Take 2g of CuS04.5H20 in a boiling tube fitted in a clamp stand.

2. Observe its colour. Fit it with cork and delivery tube bent at two right angles which dips into a test tube.

3. Heat crystals in boiling tube. '

4. Observe vapours being condensed in test tube.

5. Cool the crystals and add few drops of water into it.

Observation: Water vapours get condensed in a test tube and colour of blue crystals changes into white. On adding water to anhydrous copper sulphate, it changes into blue again. **Chemical Reaction:**

$$CuSO_4.5H_2O \xrightarrow{heat} CuSO_4 + 5H_2O$$

White

Blue vitriol Blue vitriol White

Conclusion: Crystalline substances have water of crystallisation which are lost on heating.

53. 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 into lime water.

Answer.

(a) Sodium chloride and water are formed.

NaOH(aq)+HCl(aq)→ NaCl(aq) $H_2O(l)$ Sodium hydroxide Hydrochloric acid Sodium chloride Water (b) Sodium zincate and H2(g) are formed. $2NaOH(aq) \longrightarrow Na_2ZnO_2(aq)$ Zn(s)+ + H₂(g) Zinc Sodium hydroxide Sodium zincate Hydrogen gas (c) Calcium carbonate and water are formed. \rightarrow CaCO₂(s) + $H_2O(l)$ $Ca(OH)_{2}(aq) +$ CO₂(g) -Lime water Carbon (white ppt) Water dioxide Calcium carbonate

A white powder is added while baking breads and cakes to make them soft and fluffy. Write the name of the powder. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking. Answer. Baking powder.

It consist of sodium hydrogen carbonate and tartaric acid.

Sodium hydrogen carbonate gives CO₂ which makes cake soft and fluffy. Tartaric acid neutralizes the bitterness due to sodium carbonate produced.

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

54. (a) What is an alkali? Give an example.

(b) Why do HCl, HNO₃, etc. show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character? Answer.

(a) Soluble bases arp called alkalies, e.g. sodibm hydroxide is an alkali.

(b) HCl, HNO₃ionise in aqueous solution, whereas alcohol and glucose do not show acidic characters because they do not ionise in aqueous solution.

MULTIPLE CHOICE QUESTIONS [1 Mark]

1. The colour of neutral litmus solution is a) red (b) blue (c) purple (d) yellow

- 2. Which of the following indicators is an olfactory indicator?(a) litmus (b) vanilla (c) turmeric (d) phenolphthalein
- 3. Which one is suitable method to find the accurate pH value?(a) pH meter (b) pH paper (c) Universal indicator (d) Litmus solution
- 4. Which one of the following statements is correct about universal indicator?
 - (a) It is a mixture of HCl and NaOH
 - (b) It is a mixture of many indicators
 - (c) It is a solution of phenolphthalein in alcohol
 - (d) It is a solution of phenolphthalein in water.
- 5. Which of the following properties are shown by dilute HCl?
 - (1) It turns blue litmus red
 - (2) It turns red litmus blue
 - (3) It reacts with zinc and a gas is evolved
 - (4) It reacts with solid sodium carbonate to give brisk effervescence
 - (a) 1 and 2 (b) 1 and 3 (c) 1, 3 and 4 (d) 2, 3 and 4
- 6. A teacher gave two test tubes one containing water and the other containing sodium hydroxide solution to two students. Then he asked them to identify the test tube containing sodium hydroxide solution. Which one of the following can be used for correctly identifying the test tube containing the solution of sodium hydroxide?
 (a) Blue litmus (b) Red litmus (c) Sodium carbonate solution (d) Dilute HCl
- 7. Metallic oxides are ______ in nature, but non-metallic oxides are ______ in nature. The information in which alternative completes the given statement?
 (a) neutral, acidic (b) acidic, basic (c) basic, neutral (d) basic, acidic
- 8. When a drop of unknown solution X is placed on a strip of pH paper, a deep red colour is produced. This sample is which one of these?(a) NaOH (b) HCl (c) Water (d) CH3COOH
- 9. A student tests a sample drinking water and reports its pH value as 6 at room temperature. Which one of the following might have been added in water?(a) Calcium chloride (b) Sodium chloride (c) Sodium bicarbonate (d) Bleaching powder
- **10.** Solid sodium bicarbonate was placed on a strip of pH paper. The color of the strip (a) turned red (b) did not change (c) turned green and slightly yellow (d) turned pink
- 11. Four drops of red litmus solution were added to each of the following samples. Which one turns red litmus blue?(a) Alcohol (b) Distilled water (c) Sodium hydroxide sol (d) HCl
- 12. The pH of which of the following samples can not be found directly using pH paper?(a) Lemon juice (b) Dilute HCl (c) Solid sodium bicarbonate (d) Solution of a detergent.
- 13. Which of the following natural sources contains oxalic acid?(a) lemon (b) orange (c) tomato (d) tamarind
- 14. The acid found in an ant sting is(a) acetic acid (b) citric acid (c) tartaric acid (d) methanoic acid

- 15. To relieve pain caused due to acidity, we can take(a) sour milk (b) lemon juice (c) orange juice (d) milk of magnesia
- **16.** What are the products obtained when potassium sulphate reacts with barium iodide in an aqueous medium?
 - (a) KI and BaSO4 (b) KI, Ba and SO2 (c) K, I2 and BaSO4 (d) K, Ba, I2 and SO2
- 17. Which of the following salts is basic in nature?(a) NH4NO3 (b) Na2CO3 (c) Na2SO4 (d) NaCl
- 18. Which of the following salts has the minimum pH value?(a) (NH4)2SO4 (b) NaHCO3 (c) K2SO4 (d) NaCl
- 19. You are given four unknown solutions I, II, III, and IV. The pH values of these solutions are found to be 3, 7, 8, and 10 respectively. Among the given solutions, which solution has the highest hydrogen ion concentration?(a) I (b) II (c) III (d) IV
- 20. Which one of the following is required to identify the gas evolved when dilute hydrochloric acid reacts with zinc metal?(a) blue litmus paper (b) red litmus paper (c) a burning slinter (d) lime water
- 21. Zinc reacts with an acid as well as with a base to liberate hydrogen. On the basis of this what should be the nature of the zinc metal?(a) basic (b) acidic (c) amphoteric (d) neutral
- 22. When you test the solutions of sodium bicarbonate, sodium hydroxide, hydrochloric acid and acetic acid with universal indicator, in which case would you get a red colour?(a) sodium bicarbonate (b) hydrochloric acid (c) sodium hydroxide (d) acetic acid
- 23. The pH of a sample of pure water is 7 at room temperature. What is its pH when a pinch of solid sodium bicarbonate is dissolved in it?(a) vary near to 7 (b) less than 7 (c) more than 7 (d) exactly 7
- **24.** If an unknown solution turns blue litmus red, then the pH of the solution is more likely to be (a) 12 (b) 10 (c) 7 (d) 4
- **25.** What is the pH of a 0.00001 molar HCl solution? (a)1 (b)9 (c)5 (d)4
- 26. There are alternate acid base theories that define an acid as any species that can {hint: According to Bronsted-Lowry theory, an acid is any species that can donate a proton to another species.}
 - (a) donate a proton (2) donate an electron (c) accept a proton (d) accept an electron
- 27. What happens when a solution of an acid is mixed with a solution of a base in a test tube?
 - (i) The temperature of the solution increases
 - (ii) The temperature of the solution decreases
 - (iii) The temperature of the solution remains the same
 - (iv) Salt formation takes place
 - (a) (i) only (b) (i) and (iii)
 - (c) (ii) and (iii) (d) (i) and (iv)

- **28.** An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change?
 - (a) Baking powder

- (b) Lime
- (c) Ammonium hydroxide solution (d) Hydrochloric acid
- **29.** During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to
 - (a) absorb the evolved gas
 - (b) moisten the gas
 - (c) absorb moisture from the gas
 - (d) absorb Cl– ions from the evolved gas
- **30.** The colour of methyl orange indicator in acidic medium is: a) Yellow b) green c) orange d) red
- 31. The colour of phenolphthalein indicator in basic solution is: (a) Yellow b) green c) pink d) orange
- 32. What is the colour methyl orange in alkaline medium?a) orange b) yellow c) red d) blue
- **33.** A solution turns red litmus blue, its pH will be: a) 1 b) 4 c) 5 d) 10
- **34.** 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
- 35. Why is universal indicator a better one than litmus paper?
 - a) Litmus paper can only be used for acids.
 - b) Litmus paper can only be used for alkalis.
 - c) Universal indicator goes green if something is neutral.
 - d) Universal indicator is useful for all ranges of pH of the solution.
- **36.** Water soluble bases are known as?
 - a) neutral b) base c) acid d) alkali
- **37.** Which of one of the following pairs of substances when mixed together produces table salt.
 - a) Sodium thiosulphate and sulpur dioxide
 - b) Hydro chloric acid and sodium hydroxide
 - c) Chlorine and oxygen
 - d) Nitric acid and sodium hydrogen carbonate
- 38. What colour would hydrochloric acid (pH=1) turn universal indicator.a) Orange b) purple c) yellow d) red
- 39. Which one of the following medicines is used for treating indigestion.a) Antibiotic b) analgesic c) antacid d) antiseptic
- 40. If magnesium reacts with hydrochloric acid, what gas is produced?a) Hydrogen b) oxygen c) carbon dioxide d) chlorine
- 41. Which of the following is the most accurate way of representing neutralization?

- a) Acid + base \rightarrow neutral solution
- b) Acid + base \rightarrow salt + water
- c) Acid + base \rightarrow sodium chloride + hydrogen
- d) Acid + base \rightarrow acidic solution
- 42. Which of the following salts does not contain water of crystallisation?
 - (a) Blue vitriol
 - (b) Baking soda
 - (c) Washing soda
 - (d) Gypsum

43. Sodium carbonate is a basic salt because it is a salt of

- (a) strong acid and strong base
- (b) weak acid and weak base
- (c) strong acid and weak base
- (d) weak acid and strong base
- 44. Calcium phosphate is present in tooth enamel. Its nature is
 - (a) basic (b) acidic (c) neutral (d) amphoteric
- **45.** A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?
 - (a) Lemon juice
 - (b) Vinegar
 - (c) Common salt
 - (d) An antacid
- 46. Which of the following gives the correct increasing order of acidic strength?
 - (a) Water <Acetic acid <Hydrochloric acid
 - (b) Water <Hydrochloric acid <Acetic acid
 - (c) Acetic acid <Water <Hydrochloric acid
 - (d) Hydrochloric acid <Water <Acetic acid
- **47.** If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?
 - (a) Wash the hand with saline solution
 - (b) Wash the hand immediately with plenty of water and apply a paste of sodium
 - hydrogencarbonate
 - (c) After washing with plenty of water apply solution of sodium hydroxide on the hand
 - (d) Neutralise the acid with a strong alkali
- **48.** Sodium hydrogencarbonate when added to acetic acid evolves a gas. Which of the following statements are true about the gas evolved?
 - (i) It turns lime water milky
 - (ii) It extinguishes a burning splinter
 - (iii) It dissolves in a solution of sodium hydroxide
 - (iv) It has a pungent odour
 - (a) (i) and (ii) (b) (i), (ii) and (iii)
 - (c) (ii), (iii) and (iv) (d) (i) and (iv)
- **49.** Common salt besides being used in kitchen can also be used as the raw material for making (i) washing soda
 - (ii) bleaching powder

- (iii) baking soda
- (iv) slaked lime
- (a) (i) and (ii) (b) (i), (ii) and (iv)
- (c) (i) and (iii) (d) (i), (iii) and (iv)
- **50.** One of the constituents of baking powder is sodium hydrogen carbonate, the other constituent is (a) hydrochloric acid
 - (b) tartaric acid
 - (c) acetic acid
 - (d) sulphuric acid
- **51.** To protect tooth decay we are advised to brush our teeth regularly. The nature of the tooth paste commonly used is
 - (a) acidic
 - (b) neutral
 - (c) basic
 - (d) corrosive
- **52.** Which of the following statements is correct about an aqueous solution of an acid and of a base? (i) Higher the pH, stronger the acid
 - (ii) Higher the pH, weaker the acid
 - (iii) Lower the pH, stronger the base
 - (iv) Lower the pH, weaker the base
 - (a) (i) and (iii) (b) (ii) and (iii)
 - (c) (i) and (iv) (d) (ii) and (iv)
- 53. Which of the following phenomena occur, when a small amount of acid is added to water?
 - (i) Ionisation
 - (ii) Neutralisation
 - (iii) Dilution
 - (iv) Salt formation
 - (a) (i) and (ii) (b) (i) and (iii)
 - (c) (ii) and (iii) (d) (ii) and (iv) (ii)
- **54.** In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus (see below Figure) was set up. Which among the following statement(s) is(are) correct?
 - (i) Bulb will not glow because electrolyte is not acidic
 - (ii) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.
 - (iii) Bulb will not glow because circuit is incomplete
 - (iv) Bulb will not glow because it depends upon the type of electrolytic solution
 - (a) (i) and (iii) (b) (ii) and (iv)
 - (c) (ii) only (c) (iv) only



- 55. Which of the following is used for dissolution of gold? (a) Hydrochloric acid (b) Sulphuric acid (c) Nitric acid (d) Aqua regia 56. Which one of the following can be used as an acid-base indicator by a visually impared student? (a) Litmus (b) Turmeric (c) Vanilla essence (d) Petunia leaves 57. Which of the following substance will not give carbon dioxide on treatment with dilute acid? (a) Marble (b) Limestone (c) Baking soda (d) Lime **58.** Which of the following is acidic in nature? (a) Lime juice (b) Human blood (c) Lime water (d) Antacid **59.** The pH of the gastric juices released during digestion is (a) less than 7 (b) more than 7 (c) equal to 7 (d) equal to 0**60.** Which of the following is not a mineral acid? (a) Hydrochloric acid (b) Citric acid (c) Sulphuric acid (d) Nitric acid **61.** Which among the following is not a base? (a) NaOH (b) KOH (c) NH₄OH (d) $C_2H_5 OH$ 62. Which of the following statements is not correct? (a) All metal carbonates react with acid to give a salt, water and carbon dioxide (b) All metal oxides react with water to give salt and acid
 - (c) Some metals react with acids to give salt and hydrogen
 - (d) Some non metal oxides react with water to form an acid

63. Which of the following is(are) true when HCl (g) is passed through water?

(i) It does not ionise in the solution as it is a covalent compound.

- (ii) It ionises in the solution
- (iii) It gives both hydrogen and hydroxyl ion in the solution

(iv) It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule

- (a) (i) only (b) (iii) only
- (c) (ii) and (iv) (d) (iii) and (iv)
- 64. Which of the following statements is true for acids?
 - (a) Bitter and change red litmus to blue
 - (b) Sour and change red litmus to blue

- (c) Sour and change blue litmus to red(d) Bitter and change blue litmus to red
- 65. Which of the following are present in a dilute aqueous solution of hydrochloric acid?
 - (a) H_3O++Cl^-
 - (b) $H_3O + + OH^-$
 - (c) $Cl^- + OH^-$
 - (d) unionised HCl

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