

# 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?**

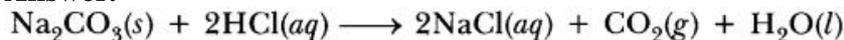
**Answer.** The taste will be slightly sour as it is weakly acidic.

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.**



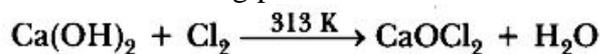
4. **Write a balanced chemical equation for a neutralisation reaction, mentioning the physical state of the reactants and the products.**

**Answer.**



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.



(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.** H<sub>2</sub> 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<sup>+</sup>(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<sup>+</sup> ions? 1 M HCl or 1 M CH<sub>3</sub>COOH**

**Answer.** 1 M HCl has higher concentration of H<sup>+</sup> ions.

12. **Why does 1 M HCl solution have a higher concentration of H<sup>+</sup> ions than 1 M CH<sub>3</sub>COOH solution?**

**Answer.** 1 M HCl has higher conc. of (H<sup>+</sup>) because it ionises completely in aqueous solution whereas CH<sub>3</sub>COOH does 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



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.**

**(iii) 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 containing sodium hydrogen carbonate and tartaric acid.

(ii) It is due to carbon dioxide



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:

$\text{CH}_3\text{COOH}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{CO}_3$ ,  $\text{HNO}_3$

Answer.

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

(b)  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  are strong acids.

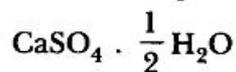
22. A white coloured powder is used by doctors for supporting fractured bones.

(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



(b)  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O} + \frac{3}{2} \text{H}_2\text{O} \longrightarrow \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

23. Explain the action of dilute hydrochloric acid on the following with chemical equation:

(i) Magnesium ribbon (ii) Sodium hydroxide (iii) Crushed egg shells

Answer.

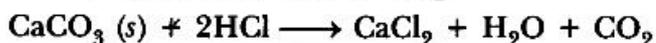
(i) Hydrogen gas will be formed



(ii) Sodium chloride and water will be formed



(iii) Crushed egg shells are made up of  $\text{CaCO}_3$  which reacts with dil HCl to give brisk effervescence due to  $\text{CO}_2$



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)  $CuSO_4 \cdot 5H_2O$  is hydrated copper sulphate.  $CuSO_4$  is anhydrous copper sulphate.

**Aim:** To show crystalline salts contain water of crystallization.

**Material Required:**  $CuSO_4 \cdot 5H_2O$  (Blue vitriol), boiling tube, burner, cork, delivery tube, test tube, clamp stand.

Procedure: 1. Take 2g of  $CuSO_4 \cdot 5H_2O$  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.

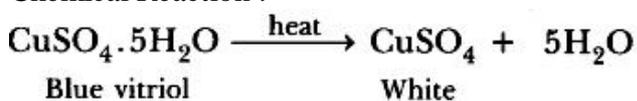
4. Observe vapours being condensed in test tube.

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 :



**Conclusion :** Crystalline substances have water of crystallization which are lost on heating. When we add water in  $CuSO_4$  till a saturated solution is formed. On cooling, it gets converted into  $CuSO_4 \cdot 5H_2O$  crystals and it shows that both are inter convertible.

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

$CaSO_4 \cdot 2H_2O$  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 extinguisher

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

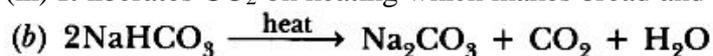
**Answer.**

(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  $\text{CO}_2$  with  $\text{H}_2\text{SO}_4$ , which extinguish fire.

(iii) It liberates  $\text{CO}_2$  on heating which makes bread and cake soft and sponge.



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



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:**  $\text{CaCO}_3$ (marble chips), Woulfe-bottle, thistle funnel, dil. HCl, gas jar, matchbox, delivery tube bent at two right angles, lime water.

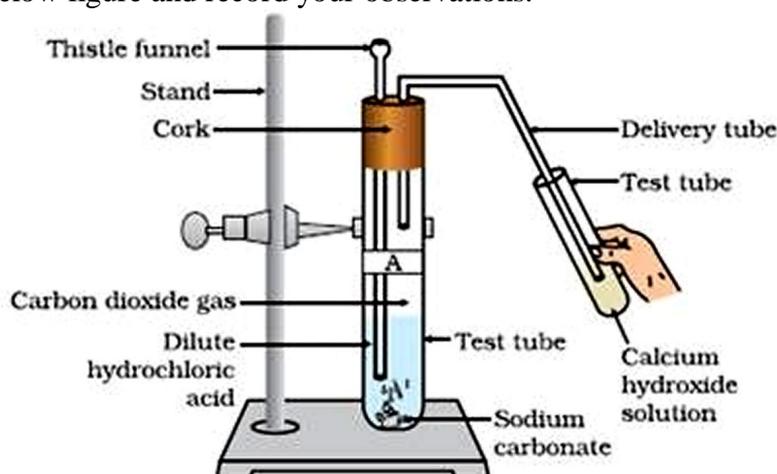
**Procedure:**

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

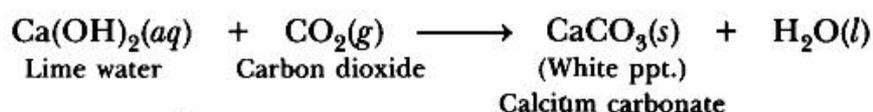
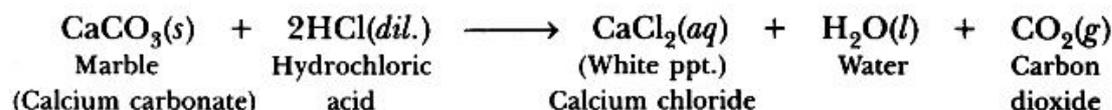
Take about 0.5 g of sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) in test tube A and about 0.5 g of sodium hydrogen carbonate ( $\text{NaHCO}_3$ ) in test tube B.

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

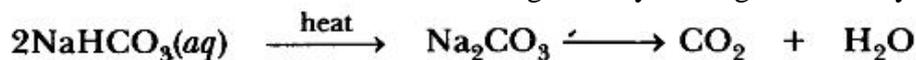


**Conclusion:** Metal carbonates react with dilute acids to liberate carbon dioxide. Limestone, chalk, marble are different forms of calcium carbonate. All metal carbonates and hydrogen carbonates react with acids to form corresponding salts, water and carbon dioxide.

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.



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.

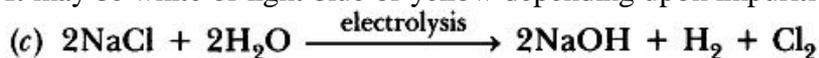
(b) What is rock salt? Mention its colour and the reason due to which it has this colour.

(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.



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  $\text{H}^+$  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 whereas  $\text{CH}_3\text{COOH}$  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.

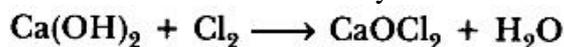
(b)  $\text{C} (10^{-12}) < \text{B} (10^{-9}) < \text{D} (10^{-7}) < \text{A} (10^{-6})$

(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.

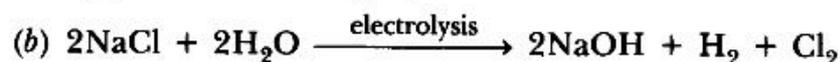
(b) Write the balanced chemical equation of chlor-alkali process.

**Answer.** (a) The compound is bleaching powder ( $\text{CaOCl}_2$ ). Its chemical name is calcium oxychloride. It is manufactured by reaction of solid slaked lime with dry chlorine gas.



(i) It is used as disinfectant.

(ii) It is used for preparation of chloroform.



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?

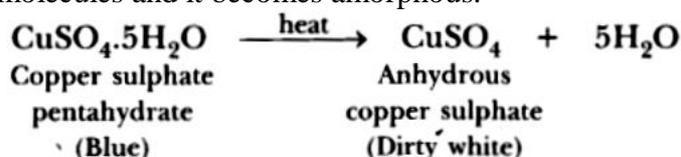
**Answer.**

- (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.

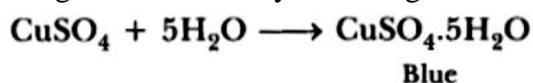
34. (a) Crystals of a substance changed their colour on heating in a closed test tube but regained it after sometime when they were allowed to cool down. Name the substance and write its formula and explain the phenomenon involved.
- (b) Name the compound whose one formula unit is associated with 10 water molecules. How is it prepared? Give equations of related reactions. Give two uses of the compound.

**Answer.**

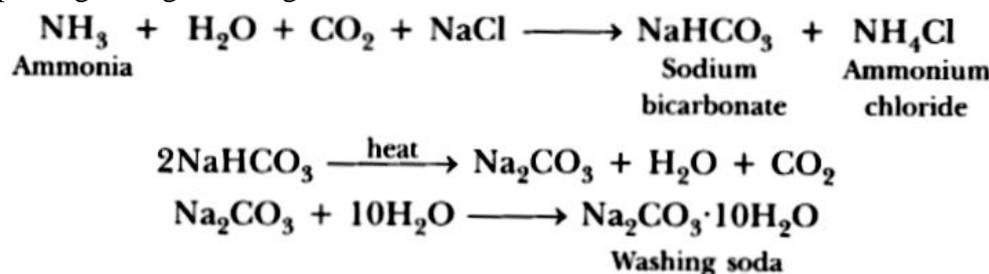
(a)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is a blue crystalline solid. It becomes dirty white on heating due to loss of water molecules and it becomes amorphous.



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



(b)  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ . It is called sodium carbonate decahydrate or washing soda. It is prepared by passing  $\text{CO}_2$  gas through saturated solution of ammonical brine.



**Uses:**

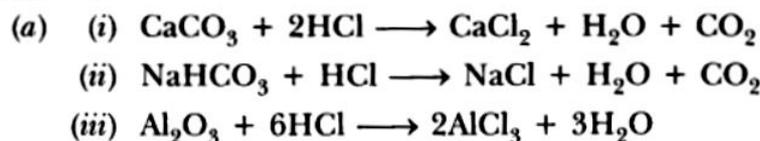
- (i) It is used in the production of washing powder.
- (ii) It is used for the manufacture of glass.

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.**



(b) 'A' has maximum  $[\text{H}_3\text{O}^+]$  equal  $10^{-2} \text{ mol L}^{-1}$

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

36. a) A metal compound 'X' reacts with dil.  $\text{H}_2\text{SO}_4$  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

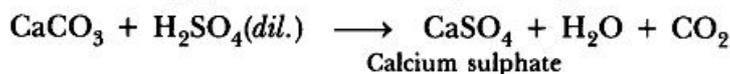
which occurred.

(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  $\text{CaCO}_3$  (calcium carbonate). The gas evolved is  $\text{CO}_2$ .



(b) (i)  $\text{NaHCO}_3$  is antacid. It neutralizes excess of acid formed in the stomach.

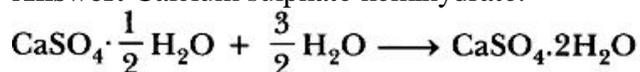
(ii) The soil is acidic in nature. The farmer wants to make it neutral by adding quicklime which is good for crops.

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:  $\text{HCl}$ ,  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$  Weak acid: Citric acid, acetic acid, formic acid.

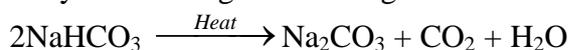
38. State the chemical name of Plaster of Paris. Write a chemical equation to show the reaction between Plaster of Paris and water.

Answer. Calcium sulphate hemihydrate.

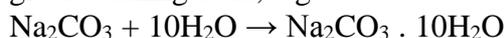


39. State in brief the preparation of washing soda from baking soda. Write balanced chemical equation of the reaction involved.

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

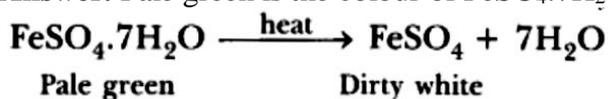


Baking soda on heating gives sodium carbonate which on crystallisation from aqueous solution gives washing soda, e.g.



40. What is the colour of  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  crystals? How does this colour change upon heating? Give balanced chemical equation for the changes.

Answer. Pale green is the colour of  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  crystals. It becomes dirty white on heating.



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:

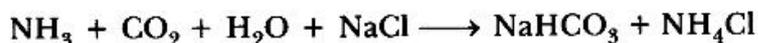
(i) Stain of curry on a white cloth becomes reddish brown when soap is scrubbed on it and turns yellow again when the cloth is washed with plenty of water.

(ii) Curd should not be kept in copper or brass vessels. What is done to protect it?

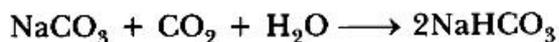
Answer. (i) Turmeric reacts with sodium hydroxide present in soap to form red coloured compound. It turns yellow again because sodium hydroxide becomes very dilute on adding lot of water and reaction stops.

(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.





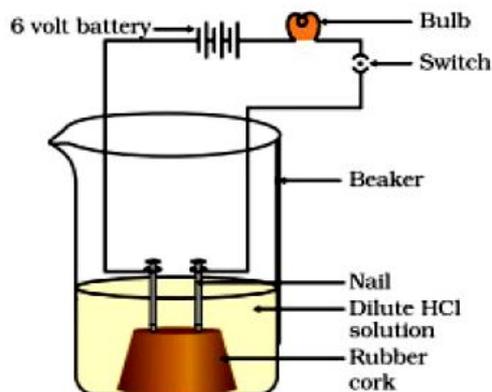
or



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.

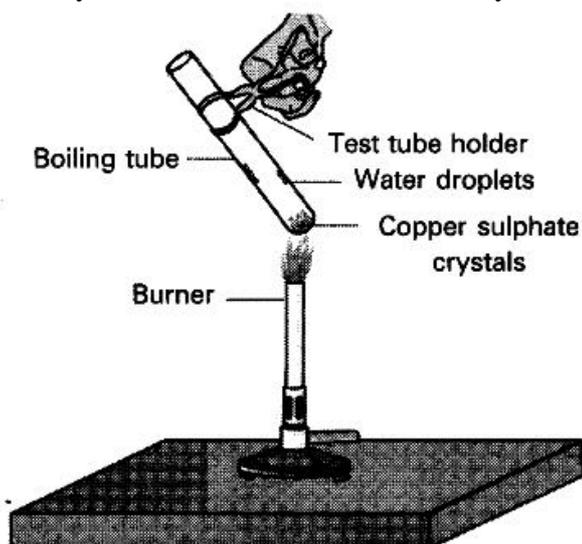
**Observation :** K The bulb will not glow and the needle of ammeter will not show deflection because glucose and ethanol do not conduct electricity.

**Conclusion:** The experiment shows glucose and ethanol do not ionise in aqueous solution, that is, they do not give  $\text{H}^+$  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:**  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  (Blue vitriol), boiling tube, burner, cork, delivery tube, test tube, clamp stand.

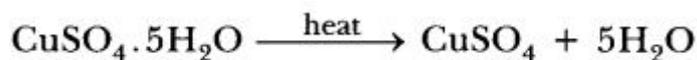
**Procedure:**

1. Take 2g of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  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:**



Blue vitriol

White

Blue vitriol White

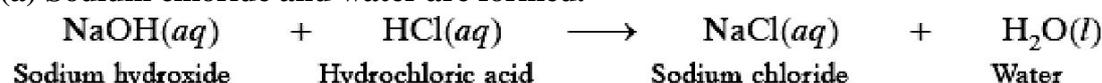
**Conclusion:** Crystalline substances have water of crystallisation which are lost on heating.

53. Name the products formed in each case when

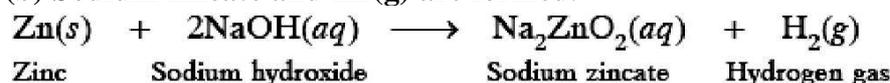
- (a) hydrochloric acid reacts with caustic soda.
- (b) granulated zinc reacts with caustic soda.
- (c) carbon dioxide is passed into lime water.

**Answer.**

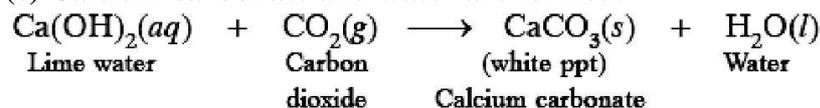
(a) Sodium chloride and water are formed.



(b) Sodium zincate and H<sub>2</sub>(g) are formed.



(c) Calcium carbonate and water are formed.

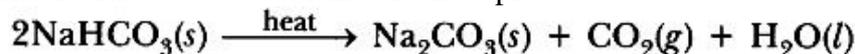


A white powder is added while baking breads and cakes to make them soft and fluffy. Write the name of the powder. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking.

**Answer.** Baking powder.

It consist of sodium hydrogen carbonate and tartaric acid.

Sodium hydrogen carbonate gives CO<sub>2</sub> which makes cake soft and fluffy. Tartaric acid neutralizes the bitterness due to sodium carbonate produced.



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

(b) Why do HCl, HNO<sub>3</sub>, etc. show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

**Answer.**

(a) Soluble bases are called alkalies, e.g. sodium hydroxide is an alkali.

(b) HCl, HNO<sub>3</sub> ionise in aqueous solution, whereas alcohol and glucose do not show acidic characters because they do not ionise in aqueous solution.