

## Chapter – 2 Acid, Bases and Salts

### Class 10 Science NCERT Textbook – Page No. 18

**Q1. You have been provided with three test-tube. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test-tube?**

**Answer:**

- i) Put the red litmus paper in all test-tubes. The solution which turns red litmus to blue is basic solution.
- ii) Put the blue litmus paper in the remaining two test-tubes. The solution which turns blue litmus paper to red is acidic solution.
- iii) If it has no effect on any litmus paper it is neutral that is distilled water.

### Class 10 Science NCERT Textbook – Page No. 22

**Q1. Why should curd and sour substances not be kept in brass and copper vessels?**

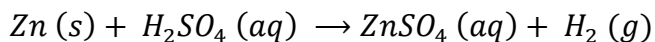
**Answer:**

Curd and sour substances contain acids which react with brass and copper to form metal compounds which cause food poisoning and damage health.

**Q2. Which gas is usually liberated when an acid reacts with a metal? Illustrate with the help of an example. How will you test the presence of this gas?**

**Answer:**

When acid reacts with a metal, hydrogen gas is evolved that is when dilute sulphuric acid reacts with zinc, hydrogen gas is evolved and zinc sulphate is formed.



The presence of hydrogen gas is tested by burning it. When a lighted match stick is brought near a gas jar containing hydrogen gas, it burns with a 'pop' sound making a little explosion.

**Q3. Metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.**

**Answer:**

The gas that extinguishes a burning candle is carbon dioxide which is formed by reaction of dilute hydrochloric acid on a metal carbonate and produces effervescence forming calcium chloride and metal compound is calcium carbonate ( $CaCO_3$ ). Calcium carbonate reacts with HCl to form calcium chloride, carbon dioxide and water.



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**Q1. Why do  $HCl$ ,  $HNO_3$ , etc. show acidic character in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?**

**Answer:**

The acidic character is due to the presence of hydrogen ions [ $H^+(aq)$  ions] in aqueous solution. HCl and  $HNO_3$  show acidic properties as they produce hydrogen ions when dissolved in water. The alcohol and glucose do not show acidic character as they do not ionise in water to produce hydrogen ions.

**Q2. Why does an aqueous solution of an acid conduct electricity?**

**Answer:**

The aqueous solution of an acid conducts electricity due to the presence of charges particles called 'ions' in it. For example; when hydrochloric acid is dissolved in water, then its aqueous solution contains hydrogen ions [ $H^+(aq)$ ] and chloride ions [ $Cl^-(aq)$ ]. These ions carry electric current, due to  $H^+(aq)$  ions and  $Cl^-(aq)$  ions, hydrochloric acid conducts electricity.

**Q3. Why does dry HCl gas not change the colour of dry litmus paper?**

**Answer:**

Dry HCl gas does not change the colour of dry litmus paper because it has no hydrogen ions,  $H^+(aq)$  ions, in it which can impart acidic properties to it.

**Q4. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?**

**Answer:**

A concentrated acid is diluted by adding water. The process of mixing water to a concentrated acid is highly exothermic and heat is evolved.

- i) When the concentrated acid is added to water, heat is evolved slowly and absorbed by the larger amount of water.
- ii) If water is added to concentrated acid, large amount of heat is evolved immediately which changes water to steam explosively and splash the acid on our face or clothes causing acid burns.

**Q5. How is the concentration of hydronium ions ( $H_3O^+$ ) affected when the solution of an acid is diluted?**

**Answer:**

On diluting an acid, the concentration of hydronium ( $H_3O^+$ ) ions decreases.

**Q6. How is the concentration of hydroxide ions ( $OH^-$ ) affected when excess of base is dissolved in a solution of sodium hydroxide?**

**Answer:**

On dissolving more sodium hydroxide base in the same solution, the concentration of hydroxide ions ( $OH^-$ ) increases.

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**Q1. You have two solutions A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of these is acidic and which one basic?**

**Answer:**

- a) The pH of a solution is inversely proportional to its hydrogen ion concentration, thus solution having lower pH have more hydrogen ion concentration. So, Solution A having pH = 6 have more hydrogen ion concentration.
- b) Solution A is acidic and solution B is basic.

**Q2. What effect does the concentration of  $H^+$  ( $aq$ ) ions have on the nature of the solution?**

**Answer:**

Higher the concentration of  $H^+$  ( $aq$ ) ions in a solution, more acidic the solution will be.

**Q3. Do basic solutions also have  $H^+$  (aq) ions? If yes, then why are these basic?**

**Answer:**

Basic solution has hydrogen ions [ $H^+$  (aq) ions] in them due to ionisation of water in which the base is dissolved. They are basic because the concentration of hydroxide ions [ $OH^-$  ions] is more than the concentration of hydrogen ions.

**Q4. Under what soil condition do you think a farmer would treat the soil of his fields with quicklime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?**

**Answer:**

A farmer treat the soil of his fields with quicklime (calcium oxide), or slaked lime (calcium hydroxide) or chalk (calcium carbonate) if the soil is too acidic with low pH. All these are bases and hence react with the excess acid in the soil and reduce its acidity.

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**Q1. What is the common name of the compound  $CaOCl_2$ ?**

**Answer:**

The common name of  $CaOCl_2$  is Bleaching Powder.

**Q2. Name the substance which on treatment with chlorine yields bleaching powder**

**Answer:**

Slaked lime is that substance which on treatment with chlorine yields bleaching powder.

**Q3. Name the sodium compound which is used for softening hard water.**

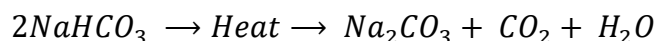
**Answer:**

Sodium carbonate (Washing soda) is the sodium compound which is used for softening hard water.

**Q4. What will happen if a sodium hydrogen carbonate is heated? Give the equation of the reaction involved.**

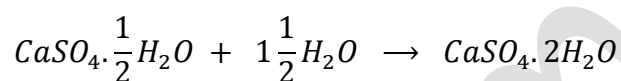
**Answer:**

When sodium hydrogen carbonate is heated, it forms sodium carbonate with the evolution of carbon dioxide gas.



**Q5. Write an equation to show the reaction between Plaster of Paris and water.**

**Answer:**



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**Q1. A solution turns red litmus blue, its pH is likely to be:**

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

**Answer:** Option d)

Changing the color of red litmus paper to blue is a general property of the alkaline, pH scale gives information of acidic basic and neutral solution.

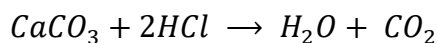
- Solution of pH ranging 0 to 7 on pH scale are acidic solution.
- Solutions of pH 7 to 14 on pH scale are basic solutions.
- Solutions of pH equal to 7 on pH scale are neutral solutions.

**Q2. A solution reacts with crushed egg-shells to give a gas that turns lime water milky. The solution contains:**

- a) *NaCl*
- b) *HCl*
- c) *LiCl*
- d) *KCl*

**Answer:** Option b)

Egg shells calcium carbonate, which on reaction with *HCl* liberates *CO*<sub>2</sub> gas which turn lime water to milky.



**Q3. 10 mL of a solution of  $NaOH$  is found to be completely neutralised by 8 mL of a given solution of  $HCl$ . If we take 20 mL of the same solution of  $NaOH$ , the amount  $HCl$  solution (the same solution as before) required to neutralise it will be**

- a) 4 mL
- b) 8 mL
- c) 12 mL
- d) 16 mL

**Answer:** Option d)

Since 10 mL of  $NaOH$  8 mL of  $HCl$ , 20 mL of  $NaOH$  require  $8 \times 2 = 16$  mL of  $HCl$ .

**Q4. Which one of the following types of medicines is used for treating indigestion?**

- a) Antibiotic
- b) Analgesic
- c) Antacid
- d) Antiseptic

**Answer:** Option c)

Indigestion is due to excess of acid in the stomach is treated by medicine called Antacid.

**Q5. Write one of the following types of medicines is used for treating indigestion?**

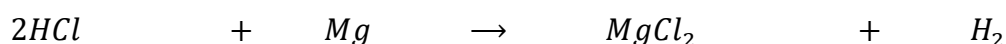
- a) Dilute sulphuric acid reacts with zinc granules
- b) Dilute hydrochloric acid reacts with magnesium ribbon
- c) Dilute sulphuric acid reacts with aluminium powder
- d) Dilute hydrochloric acid reacts with iron filings

**Answer:**

a) Sulphuric acid + Zinc  $\rightarrow$  Zinc sulphate + Hydrogen



b) Hydrochloric acid + Magnesium  $\rightarrow$  Magnesium chloride + Hydrogen



c) Sulphuric acid + Aluminium  $\rightarrow$  Aluminium sulphate + Hydrogen



d) Hydrochloric acid + Iron  $\rightarrow$  Iron (II) chloride + Hydrogen



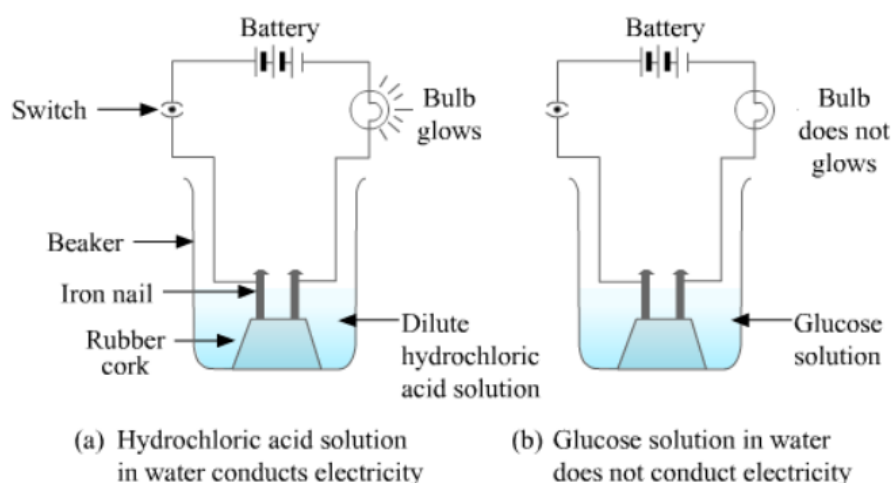
**Q6. Compounds such as alcohol and glucose also contain hydrogen but are not categorised as acids. Why? Describe an activity to prove it.**

**Answer:**

Compounds with hydrogen are acids which dissolve in water to produce hydrogen ions,  $H^+$  (aq). The hydrogen containing compounds like alcohol and glucose are not acids because they do not ionize to produce hydrogen gas,  $H^+$  (aq), when dissolved in water, thus aqueous solutions of alcohol and glucose do not conduct electricity.

Activity:

- i) Take hydrochloric acid, sulphuric acid, glucose and alcohol.
- ii) Fix two iron nails on rubber cork and place the cork in a beaker.
- iii) Connect it to two terminals of a 6-volt battery by switch and a bulb.
- iv) Pour dilute hydrochloric acid in the beaker and switch on the current. The bulb starts glowing, which shows that hydrochloric acid conducts electricity.
- v) Now, taking glucose solution in the beaker and switch on the current. The bulb does not glow, which shows that glucose solution does not conduct electricity.



**Q7. Why does distilled water not conduct electricity whereas rain water does?**

**Answer:**

Distilled water does not conduct electricity because it does not have ionic compounds like acids, bases and salts in it. When rain water falls on earth, it dissolves an acidic gas 'carbon dioxide' and forms carbonic acid. Carbonic acid provides hydrogen and carbonate ions to rain water, so rain water conducts electricity.

**Q8. Why do acids not show acidic behaviour in the absence of water?**

**Answer:**

The acidic behaviour of acids is due to the presence of hydrogen ions, the acids produce hydrogen ions only on dissolving in water. In the absence of water, acids do not produce hydrogen ions and hence do not show acidic behaviour.

**Q9. Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4, 1, 11, 7 and 9 respectively.**

- Which solution is (i) neutral (ii) strongly alkaline (iii) strongly acidic (iv) weakly acidic, and (v) weakly alkaline?
- Arrange the pH values in the increasing order of hydrogen ion concentration.

**Answer:**

- (i) neutral: D (pH = 7)  
(ii) strongly alkaline: C (pH = 11)  
(iii) strongly acidic: B (pH = 1)  
(iv) weakly acidic: A (pH = 4)



(v) weakly alkaline: E (pH = 9)

- b) The solution having highest pH (11) will have the minimum hydrogen ion concentration whereas the solution having the least pH (1) will have the maximum hydrogen ion concentration. Hence, the given solution can be arranged in the increasing order of their hydrogen ion concentration as follows:

$C$  (pH = 11)  $E$  (pH 9)  $D$  (pH 7)  $A$  (pH 4)  $B$  (pH 1)

Decreasing order of pH

**Q10. Equal lengths of magnesium ribbons are taken in test-tubes A and B. Hydrochloric acid is added to test-tube A while acetic acid ( $CH_3COOH$ ) is added to test-tube B. In which test-tube will the fizzing occur more vigorously and why?**

**Answer:**

Hydrochloric acid is a strong acid whereas acetic acid is a weak acid, the hydrochloric acid contains hydrogen ions in it due to which the fizzing occurs vigorously in test-tube A which is due to the evolution of hydrogen gas, formed by reaction of acid on the magnesium metal.

**Q11. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.**

**Answer:**

As the milk turns into curd, its pH is below 6. This is because a lactic acid is produced when milk turns into curd.

**Q12. A milkman adds a very small amount of baking soda to fresh milk.**

- Why does he shift the pH of the fresh milk from 6 to slightly alkaline?**
- Why does this milk take a longer time to set as curd?**

**Answer:**

- Fresh milk is acidic and it is made alkaline by adding a little of baking soda so that it does not get sour due to the formation of lactic acid in it.
- The alkaline milk takes a longer time to set into curd because the lactic acid formed during curdling has to neutralise the alkali present in it.

**Q13. Plaster of Paris should be stored in a moisture-proof container. Explain why?**

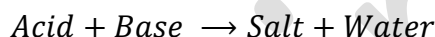
**Answer:**

Plaster of Paris is stored in a moisture-proof container as moisture cause slow setting by hydration which make the plaster of Paris useless after some time.

**Q14. What is neutralisation reaction? Give two examples.**

**Answer:**

The reaction between acid and base to form salt and water is neutralisation reaction. This is:



The examples of neutralisation reaction are:

- i) Sodium hydroxide reacts with sulphuric acid to form sodium and water:



- ii) Magnesium hydroxide reacts with hydrochloric acid forming magnesium chloride and water:



**Q15. Give two important uses each of washing soda and baking soda.**

**Answer:**

- a) Uses of washing soda:

- i) Washing soda is a used as a cleaning agent for domestic purposes like washing clothes.
- ii) Washing soda remove permanent hardness of water.

- b) Uses of baking soda:

- i) Baking soda act as an antacid to remove acidity of the stomach.
- ii) Baking soda is used in making baking powder, cakes, bread etc.