**Chapter - 2**

**Acids, Bases and Salts**

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

Answer- The acidic and basic nature of the solution can be identified by using litmus paper. A basic solution turns red litmus to blue and an acidic solution turns the blue litmus to red. The solution which changes the red litmus to blue is basic solution. Now, between two solutions, which turn the litmus which turned blue because of basic solution, to red, is acidic solution. The last one solution is distilled water.

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

Answer- Curd and other sour substances reacts with brass and copper vessels and forms hydrogen and other harmful substances due to presence of acid in them. That’s why curd and other sour substances should not be kept in brass and copper vessels.

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

Answer- When acid reacts with metal, it liberates hydrogen gas usually. The hydrogen gas liberates by reaction of acid and metals is tested by using following method –

Fit an apparatus as shown in the figure.



* Take some zinc granules in the test tube and pour sulphuric acid in it.
* Allow the gas pass through the solution of soap.
* When gas starts coming out from the soap solution bubbles are formed.
* Bring a burning candle near the bubbles of gas it burns with a pop sound.
* Burning of gas with pop sound proves that it is hydrogen gas.

Reaction involve in this process:

Acid + Metal → Salt + Hydrogen gas

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

Answer- When calcium carbonate reacts with hydrochloric acid, it produces carbon dioxide gas with effervescence. Carbon dioxide used as fire extinguisher. Hence, it extinguishes a burning candle. Therefore, the metal compound A is calcium carbonate.

CaCO3 (s) + 2HCl (aq) → CaCl2 (s) + CO2 (g) + H2O (l)

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1. **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- HCl, HNO3, etc. form hydronium ions in aqueous solutions while alcohol and glucose do not dissociates hydronium ion in the solution instead they contain hydrogen.

Hence, HCl, HNO3, etc show acidic characters in aqueous solution while solutions of compounds like alcohol and glucose do not.

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

Answer- Acid dissociates ions in aqueous solution, which conducts electricity.

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

Answer- Dry HCl gas does not change the colour of the dry litmus paper Because dry HCl gas does not contain hydronium ions. Hence, it does not changes the colour of dry litmus paper.

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

Answer- When acid is mixed with water it evolves heat. The reaction takes place in this process is exothermic.

If water is mixed with acid, then because of presence of large amount of acid, more heat would be evolved, which may splashes out and can be resulted into accident due to burning.

Therefore, it is recommended that the acid should be added to water and not water to the acid.

1. **How is the concentration of hydronium ions (H3O+) affected when a solution of an acid is diluted?**

Answer- The concentration of hydronium ions (H3O+) decreases when a solution of an acid is diluted.

1. **How is the concentration of hydroxide ions (OH–) affected when excess base is dissolved in a solution of sodium hydroxide?**

Answer- The concentration of hydroxide ions increase when excess base is dissolved in a solution of sodium hydroxide.

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1. **You have two solutions, A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration?**

**Which of this is acidic and which one is basic?**

Answer- An acidic solution has pH value less than 7 and a basic solution has pH value more than 7. Hence, the solution A having pH value is 6 is acidic consequently has more hydrogen ion concentration. The solution B which has pH value is 8 is basic solution.

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

Answer- The concentration of H+ (aq) ions determines the acidic nature of solution. Hence, acidity of a solution increases with increases in concentration of H+ (aq) ions and vice versa.

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

Answer- Yes basic solutions also have H+(aq) ions. They are basic because the concentration of hydroxide (OH-) is more than the H+(aq) ions.

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

Answer- If the soil is acidic then it should be treated with quick lime or slaked lime to make it neutralize so that soil can be made proper for cultivation.

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1. **What is the common name of the compound CaOCl2?**

Answer- Common name of CaOCl2 is bleaching powder.

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

Answer- Calcium hydroxide [Ca(OH)2] yields bleaching powder when treated with chlorine.

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

Answer- Sodium carbonate (Washing soda) is used for softening the hard water.

**4. What will happen if a solution of sodium hydrocarbonate is heated?**

**Give the equation of the reaction involved.**

Answer- When solution of sodium hydrocarbonate is heated, sodium carbonate, water and carbon dioxide gas is formed.

2NaHCO3 (aq) $→$ Na2CO3 + H2O + CO2 ↑

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

Answer-

CaSO4.$\frac{1}{2} $H2O + 1$\frac{1}{2}$ H2O → CaSO4.2H2O

*Plaster of Paris Water Gypsum*

**Exercises**

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

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

Answer - (d) 10

**2. A solution reacts with crushed egg-shells to give a gas that turns lime-water milky.**

**The solution contains**

1. **NaCl (b) HCl (c) LiCl (d) KCl**

Answer – (b) HCl

**3. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount**

**HCl solution (the same solution as before) required to neutralise it will be**

1. **4 mL (b) 8 mL (c) 12 mL (d) 16 mL**

Answer – (d) 16 mL

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

**(a) Antibiotic**

**(b) Analgesic**

**(c) Antacid**

**(d) Antiseptic**

Answer- (c) Antacid

**5. Write word equations and then balanced equations for the reaction taking place when –**

**(a) dilute sulphuric acid reacts with zinc granules.**

**(b) dilute hydrochloric acid reacts with magnesium ribbon.**

**(c) dilute sulphuric acid reacts with aluminium powder.**

**(d) dilute hydrochloric acid reacts with iron filings.**

Answer- (a) Sulphuric acid + Zinc → Zinc sulphate + Hydrogen

H2SO4 (aq) + Zn (s) → ZnSO4 (aq) + H2 (g)

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



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

3H2SO4 (aq) + 2Al (s) → Al2(SO4)3 (aq) + 3H2 (g)

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

6HCl (aq) + 2Fe (s) → 2FeCl3 (aq) + 3H2 (g)

**6. Compounds such as alcohols and glucose also contain hydrogen but are not**

**categorised as acids. Describe an Activity to prove it.**

Answer-

• Take solutions of glucose, alcohol, hydrochloric acid, sulphuric acid, etc.

• Fix two nails on a cork, and place the cork in a 100 mL beaker.

• Connect the nails to the two terminals of a 6 volt battery through a bulb and a switch, as shown in figure.

• Now pour some glucose solution in the beaker and switch on the current.

• Repeat with alcohol solution and hydrochloric acid.



It is observed that bulb does not glow using glucose or alcohol solution. While if a solution of acid is used instead of glucose or alcohol solution, bulb glows.

Bulb glows when the solution of hydrochloric acid is used, because it dissociates hydronium ion in aqueous solution. But glucose and alcohol do not dissociate hydronium ion in the water, which is responsible for the conduction of electricity. Hence solution of glucose and alcohol do not conduct electricity.

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

Answer- Rain water contains acids and many other substances as impurities, which produce hydronium ion, while distilled water does not contain any ionic substance that can dissociate hydronium ion.

That’s why rain water conduct electricity and distilled water does not.

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

Answer- Hydronium ions are responsible for behavior as acid. Acids do not dissociate hydronium ion in the absence of water, hence they do not show acidic behavior in absence of water.

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

**(a) neutral?**

**(b) strongly alkaline?**

**(c) strongly acidic?**

**(d) weakly acidic?**

**(e) weakly alkaline?**

**Arrange the pH in increasing order of hydrogen-ion concentration.**

Arrange the pH in increasing order of hydrogen-ion concentration.

Answer –

(a) D - neutral. As its pH value is equal to 7

(b) C – Strongly alkaline. As its pH value is 11.

(c) B – Strongly acidic. As its pH value is equal to 1

(d) A – Weakly acidic. As its pH value is equal to 4 and more than solution B.

(e) E – Weakly alkaline. As its pH value is equal to 9 and less than C.

pH value of the given solution in Increasing order of hydrogen-ion concentration.

1. 9 < 7 < 4 < 1
2. **Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH3COOH) is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube will the fizzing occur more vigorously and why?**

Answer –In test tube A fizzing occur more vigorously because HCl is stronger acid than acetic acid. Hence, HCl liberates hydrogen gas more vigorously, which causes fizzing more vigorously.

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

Answer-

The value of pH of milk decreases, when it turns into curd. Curd is acidic in nature because an acidic substance has less value of pH.

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

**(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?**

**(b) Why does this milk take a long time to set as curd?**

Answer- (a) By making the milk more alkaline, it is prevent for more time to turn into curd. That’s why milkman shifts the pH of fresh milk to slightly alkaline by adding a very small amount of baking soda to it.

(b) As this milk is slightly more alkaline than other, therefore, acid produced to set into curd will be neutralized by baking soda added by milkman. Hence, this milk takes a longer time to set as curd.

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

Answer- Because plaster of Paris turns into Gypsum after reacting with moisture present in air. That’s why Plaster of Paris should be stored in a moisture-proof container.

CaSO4.$\frac{1}{2} $H2O + 1$\frac{1}{2}$ H2O → CaSO4.2H2O

1. **What is a neutralisation reaction? Give two examples.**

Answer- When acid is added to base, it produces salt and water after neutralizing each other, such reactions are known as neutralization reaction.

**15. Give two important uses of washing soda and baking soda.**

Answer:-Washing Soda –

(a) Washing soda is used to remove the permanent hardness of water.

(b) Washing soda is used in making soap.

Baking Soda –

(a) Baking soda is used as baking powder, in the making of bread, and other many items.

(b) Baking soda is used in fire – extinguisher.