Chapter 2
Acids, Bases and Salts

Intext Questions Page No. 18

Question 1. 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:

- Put the red litmus paper turn by turn in each of the three test tubes. The solution which turns the red litmus paper to blue will be a basic solution here, the blue litmus paper formed can now be used to test the acidic solution.
- Put this blue litmus paper in the remaining two test tubes one by one. The solution which turns the blue litmus paper to red will be the acidic solution.
- The solution which has no effect on any litmus paper will be neutral and hence it will be distilled water.

Intext Questions Page No. 22

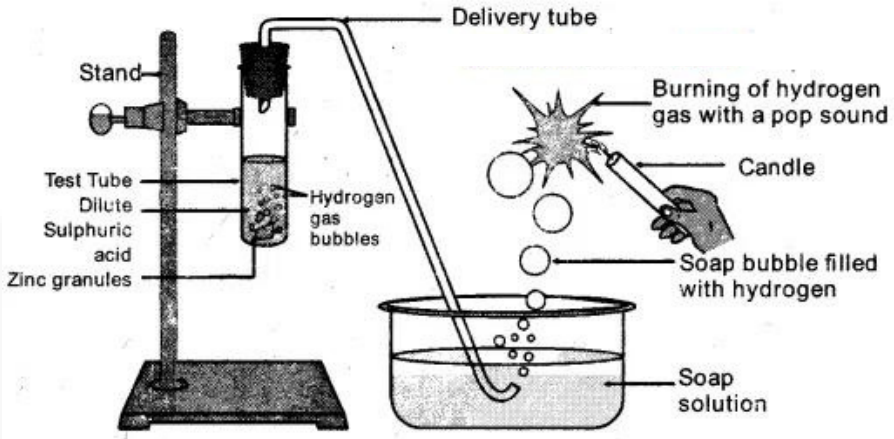
Question 1. Why should curd and sour substances not be kept in brass and copper vessels?

Answer: Curd and other sour substances are acidic in nature. So, when they are kept in brass and copper vessels, harmful products along with hydrogen gas are produced which spoil the food.

Question 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: Hydrogen gas is usually liberated when an acid reacts with a metal. Let us illustrate it with the following examples:

1. Add some pieces of zinc granules into 5ml of a dilute solution of sulphuric acid (H_2SO_4).
2. Shake it well.
3. Pass the produced gas into a soap solution.
4. Now, soap bubbles are formed in the soap solution and these soap bubbles contain hydrogen.
5. Bring a burning candle near a gas-filled bubble. A candle burns with a pop sound. So, the following reaction takes place:
   $H_2SO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + H_2 \uparrow$



Reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning.

6. We can test the evolved hydrogen gas by its burning with a pop sound when a candle is brought near the soap bubbles.

pH Calculator is a free online tool that displays the pH value for the given chemical solution.

Question 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:

$$\underset{\text{Calcium carbonate}}{CaCO_3(s)} + \underset{\text{Hydrochloric acid}}{2HCl(aq)} \longrightarrow \underset{\text{Calcium chloride}}{CaCl_2(aq)} + \underset{\text{Carbon dioxide}}{CO_2(g)} + \underset{\text{Water}}{H_2O(l)}$$

Intext Questions Page No. 25

Question 1. Why do HCl, HNO_3 etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

Answer: HCl or HNO_3 dissolve in water to form H^+ or H_3O^+ ions in aqueous solutions which show their acidic character. The following reactions take place when HCl or HNO_3 are mixed with water:

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

$H^+ + H_2O \rightarrow H_3O^+$

On the other hand, when alcohol and glucose are mixed with water they do not dissolve to form ions due to the presence of hydrogen bonds and basic character. Hence, they do not show acidic character.

Question 2. Why does an aqueous solution of acid conduct electricity?**Answer:** In the aqueous solution, acid forms ions and these ions are conductor of electricity.

Question 3. 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 it has no hydrogen ions (H^+) or hydronium (H_3O^+) ions in it.

Question 4. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

Answer: Mixing water to acid is an exothermic reaction. Hence while diluting an acid it is recommended that the acid should be added to water and not water to acid. If we mix water to acid explosion occurs and burning take place.

Question 5. How is the concentration of hydronium ions (H3O+) affected when a solution of an acid is diluted?

Answer: Concentration of hydronium ions (H3O+) decreases and becomes weak. In this way concentration of hydronium ion affects when a solution of acid is diluted.

Question 6. How is the concentration of hydroxide ions (OH-) affected when excess base is dissolved in a solution of sodium hydroxide?

Answer: When excess base is dissolved in a solution of sodium hydroxide concentration of OH- Hydroxide ion is more.

Intext Questions Page No. 28

Question 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: Solution 'A' is acidic because pH of the solution A is 6 which is less than 7 while solution 'B' is basic because pH of the solution 'B' is 8 which is greater than 7. Solution 'A' has more hydrogen ion concentration in comparison to solution 'B' because solution 'A' is acidic.

If the pH value is less than 7, it represents an acidic solution.
If the pH value is more than 7, it represents a base.
It the pH - 6 is acidic it has more concentration of ions than pH-8 which is a base.

Question 2. What effect does the concentration of H+(aq) ions have on the nature of the solution?

Answer: If the concentration of H+(aq) ions is increased then the solution becomes acidic and if the concentration of H+(aq) ions is decreased then the solution becomes basic in nature.

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

Answer: Yes. H+ ions are always present in basic solution. Concentration of Basic is more than OH– ions.

Question 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 and improper for cultivation, then to increase the basicity of soil, the farmer would treat the soil with quick lime or slaked lime or chalk.

Intext Questions Page No. 33

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

Answer: Bleaching powder.

Question 2. Name the substance which on treatment with chlorine yields bleaching powder.

Answer: Dry slaked lime or calcium hydroxide.

Question 3. Name the sodium compound which is used for softening hard water.

Answer: Sodium carbonate.

Na2CO3, 10 H2O is the compound of sodium to soften hard water.

Question 4. What will happen if a solution of sodium hydrocarbon is heated? Give the equation of the reaction involved.

Answer: When sodium hydrocarbon is heated then sodium carbonate and water are formed along with the evolution of carbon dioxide gas.

$2NaHCO3 \rightarrow Na2CO3 + H2O + CO2$

Question 5. Write an equation to show the reaction between Plaster of Paris and water.

Answer: Plaster of Paris reacts with water to form gypsum.

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

(Plaster of Paris) (Water) (Gypsum)

Ncert Textbook Exercises

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

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

Answer: (d) 10

Bases turn red litmus to blue. pH value of 7 is greater than 7. Hence this solution changes red litmus to blue.

Question 2. 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: (b) the solution contains HCl.

Question 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 of 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: (d) 16 mL HCl solution is required.

Question 4. Which one of the following types of medicines are used for treating indigestion?

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

Answer: (c) Antacid is used to treat indigestion.

Question 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

$H_2SO(aq) + Zn(s) \rightarrow ZnSO_4(aq) + H_2(g)$

b) hydro Chloric acid + magnesium → Magnisium Chloride + Hydrogen

$2HCl(aq) + Mg(s) \rightarrow MgCl_2(aq) + H_2(g)$

(c) Sulphuric Hydrigen Sulphate + Aluminium → Aluminium + Hydrogen Chloride

$3H_2SO_2(aq) + Mg(s) \rightarrow MgCl_2(aq) + H_2(g)$

d) Hydrochloric acid + Iron → Ferric + Hydrogen

$6HCl(aq) + 2Fe(s) \rightarrow 2FeCl_2(aq) + 3H_2(g)$

Question 6. Compounds such as alcohols and glucose also contain hydrogen but are not categorised as acids. Describe an activity to prove it.

Answer: Experiment: Fix two nails on the cork and keep this in 100 ml beaker. Two nails are fixed to 6 volt battery, bulb and switch. Then pour some dilute HCl in the beaker and switch on the current. Repeat the experiment separately with glucose and alcohol solutions.

Observation: Bulb glows in HCl solution but do not glows in glucose solution.

Result: HCl → H^+ and Cl^- ions.

These ions conduct electricity and bulb g

By this experiment we conclude that All acids contain Hydrogen.

Question 7. Why does distilled water not conduct electricity, whereas rainwater does?

Answer: Distilled water cannot conduct electricity because it does not contain ions while rainwater conducts electricity as it contains ions due to the presence of dissolved salts in it.

Question 8. Why do acids not show acidic behavior in the absence of water?

Answer: Acids do not show acidic property in the absence of water. Because Hydrogen ions dissociates in presence of water. Hydrogen ions are responsible for acidic nature.

Question 9. 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.

Answer:

(a) Neutral → solution D → pH value of pH is 7.

(b) strongly alkaline → solution C → pH is 11

(c) strongly acidic → solution B → pH is 1

(d) weakly acidic → solution A → pH is 4

(e) weakly alkaline → solution E —> pH is 9

We can arrange the pH in increasing order of hydrogen ion concentration as 11 < 9 <7 <4<1

Question 10. 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:

The fizzing will occur strongly in test tube A, in which hydrochloric acid (HCl) is added. This is because HCl is a stronger acid than CH3COOH and therefore, produces hydrogen gas at a faster speed due to which fizzing occurs.

Question 11. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

Answer: pH value of fresh milk is 6, but when it converts into curd value of pH decreases because curd is acidic. Hence this value is becoming less.

Question 12. A milkman adds a very small amount of baking soda to fresh milk.

1. Why does he shift the pH of the fresh milk from 6 to slightly alkaline?
2. Why does this milk take a long time to set as curd?

Answer:

1. The milkman shifts the pH of the fresh milk from 6 to slightly alkaline because, in alkaline condition, milk does not set as curd easily. Hence, it does not get spoiled for longer period of time, in which he can sell it to make a profit.
2. Since this milk is slightly basic than usual milk, acids produced to set the curd are neutralised by the base. Therefore, it takes a longer time for the curd to set which is usually acidic.

Question 13. Plaster of Paris should be stored in a moisture-proof container. Explain why?

Answer: The Plaster of Paris should be stored in a moisture-proof container as it absorbs water from moisture and turns into a hard substance (Gypsum) as shown in the following chemical equation:

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

(Plaster of Paris) (Gypsum)

Question 14. What is a neutralisation reaction? Give two examples.

Answer: The reaction between an acid a base to give salt and water is known as a neutralisation reaction.

$$\text{Acid} + \text{Base} \longrightarrow \text{Salt} + \text{Water}$$

For example:

(*i*) $NaOH + HCl \longrightarrow NaCl + H_2O.$

(*ii*) $HNO_3 + KOH \longrightarrow KNO_3 + H_2O.$

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

Answer:

1. Washing Soda:

(a) This is used in glass, soap and paper industries,

(b) It is used for removing permanent hardness of water

2. Baking Soda:

(a) This is used cooking mixture of Baking soda and acid (tartaric acid – weak acid) is called Baking powder. When it is heated or combined with water. CO2 is evolved and soften the bread.

(b) It is also used in soda-acid fire extinguishers.

MP Board Class 10th Science Chapter 2 Additional Questions

Multiple Choice Questions

Question 1. The range of a pH scale is:

(a) 1 - 10 (b) 1 - 100 (c) 0 - 14 (d) 1 - 14

Answer: **(c) 0 - 14**

Question 2. pH is defined as:

(a) The logarithm of hydrogen ion concentration

(b) The negative logarithm of hydrogen ion concentration

(c) Hydrogen ion concentration

(d) None of the above

Answer: **(a) The logarithm of hydrogen ion concentration**

Question 3. Which of the following solution will have pH = 7?

(a) Tea

(b) The salt solution in distilled water

(c) Hydrochloric acid solution

(d) Water distilled with chlorine gas.

Answer: **(b) The salt solution in distilled water**

Question 4. Which colour indicate neutral solution on a pH paper?

(a) Brown (b) Green (c) Purple (d) White or transparent

Answer: **(b) Green**

Question 5. A solution is acidic if:

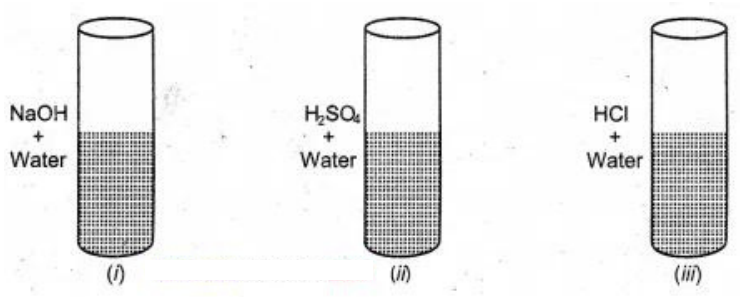
(a) it releases H+ ions in the solution. (b) it has a pH of less than 7.

(c) it has dark red, orange or greenish-yellow colour on a pH paper.

(d) all of the above.

Answer: **(d) all of the above.**

Question 6. Which of the following solutions will have pH < 7?



Choose correct combination:

(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iii) (d) All of the above.

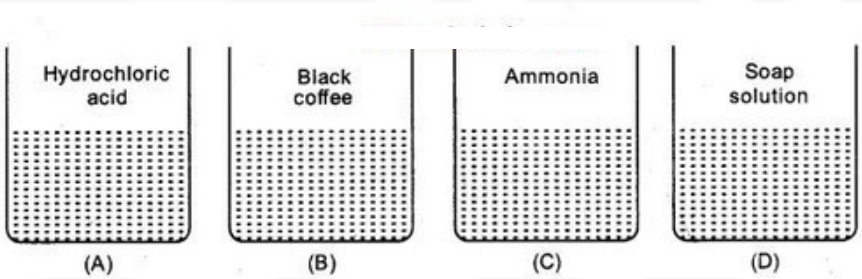
Answer: **(b) (ii) and (iii)**

Question 7. "p" in pH stands for:

(a) Phosphorus (b) Potenz (c) Potential (d) Polarity

Answer: **(b) Potenz**

Question 8. Four different jars A, B, C, D contains hydrochloric acid, black coffee, ammonia and soap solution. Choose the order of decreasing acidic strength.



(a) A > B > C > D (b) B > C > A > D (c) D > C > B > A (d) D = C > B > A

Answer: **(a) A > B > C > D**

Question 9. How can we find the pH of a solution?

(a) By dipping pH paper in it.

(b) By dropping some solution over pH paper.

(c) By heating pH paper in vapours of solution.

(d) By pouring all the solution over pH paper.

Answer: **(a) By dipping pH paper in it.**

Question 10. In a class, while doing practical on different solutions, four students give their observations. Which student/s has/ve given a correct explanation if their observation is as follows?

A.	Hydrochloric solution	–	Red colour
B.	Wale	–	Green
C.	Milk of magnesia	–	Yellow
D.	Bleach	–	Orange

Choose the correct combination of students with wrong observations:

(a) A and B (b) C and D (c) A, B, C (d) All students

Answer: **(b) C and D**

Question 11. Lemon juice gives orange colour over pH paper. What is its nature?

(a) Strong Acid (b) Basic (c) Neutral (d) Moderate acid

Answer: **(a) Strong Acid**

Question 12. Pure water has a pH = 7, while distilled water has pH = 8 – 10, it represents that distilled water is:

(a) Slightly basic (b) Strong base (c) Mild acid (d) Strong acid

Answer: **(a) Slightly basic**

Question 13. On a pH paper, pH values of 1 and 8 are represented by colours:

(a) Yellow and Orange (b) Purple and Greenish (c) Red and Bluish Green (d) Green and Red

Answer: **(c) Red and Bluish Green**

Question 14. Which of the following acids gives a dark red colour?

(a) Lemon juice (b) Hydrochloric acid (c) Acetic acid (d) Nitric acid

Answer: **(b) Hydrochloric acid**

Question 15. How pOH can by represented?

(a) -Log [H+] = pOH (b) -Log [H–] = pOH (c) -Log [pH] = pOH (d) -Log [OH–] = pOH

Answer: **(d) -Log [OH–] = pOH**

Question 16. If [H+] is 1.0 × 10-9 mole, what will be pH of solution?

(a) 10-9 (b) 1 (c) 9 (d) -9

Answer: **(c) 9**

Question 17. What is the nature of citric acid?

(a) Basic (b) Acidic (c) Neutral (d) Both a and b

Answer: **(b) Acidic**

Question 18. What is the nature of Sodium Hydroxide?

(a) Basic (b) Acidic (c) Neutral (d) Both a and b

Answer: **(a) Basic**

Question 19. pH > 7 represents?

(a) Basic solutions (b) Acidic solutions (c) Neutral solutions (d) All

Answer: **(a) Basic solutions**

Question 20. pH < 7 represents?

(a) Basic solutions (b) Acidic solutions (c) Neutral solutions (d) All

Answer: **(b) Acidic solutions**

Question 21. Hydrogen ion concentration for pure water is:

(a) 7

(b) 10-7

(c) 10-7 mole/litre

(d) 107 moles/litre

Answer:

(c) 10-7 mole/litre

Very Short Answer Type Questions

Question 1. How can pH be represented using log?

Answer: pH = – log [H+].

Question 2. What is the range of pH on pH paper?

Answer: 0 – 14.

Question 3. What is the pH of a strong acid?

Answer: 0 – 2.

Question 4. Why is water neutral?

Answer: On dissociation, water has equal numbers of H+ and OH– ions. So, it does not go through any change and remains neutral.

Question 5. What is the pH of concentric HCl?

Answer: 1 – 2.

Question 6. What will be the colour of pH paper when coffee is poured over it?

Answer: Reddish as it is slightly acidic in nature.

Question 7. Which is more acidic–lemon juice or baking powder?

Answer: Lemon juice.

Question 8. What is the best medium to check any chemical's nature?

Answer: Water.

Question 9. What is the universal solvent?

Answer: Aqua regia.

Question 10. What kind of reactions are neutralisation reactions?

Answer: Any reaction between an acid and a base to form salt and water is called neutralisation reaction.

Question 11. Which solution is considered to be neutral?

Answer: Solutions with no acidity or alkalinity are neutral. Acids and bases are present in equal amounts.

Question 12. Write the formula of brine and bleaching powder.

Answer: NaCl and $CaOCl_2$.

Question 13. Name two products which we can be obtained by chemical processing of common salt.

Answer: Baking soda and bleaching powder.

Question 14. What is the common name of sodium hydrogen carbonate?

Answer: Baking soda.

Question 15. Write the formula for washing soda.

Answer: $Na_2CO_3.10H_2O$.

Question 16. What is the source of naturally occurring acid lactic acid?

Answer: Curd.

Question 17. Which acid is present in tomato?

Answer: Oxalic acid.

Question 18. Name two olfactory indicators.

Answer: Vanilla and clove.

Question 19. What is the colour of methyl orange in acidic solution?

Answer: Red.

Question 20. What is the colour of phenolphthalein in basic medium?

Answer: Pink.

MP Board Class 10th Science Chapter 2 Short Answer Type Questions

Question 1. How acids are different from bases when dissolved in water?

Answer:

Acids on dissolving in water produce H+ ions while the base produces OH- ions.

Question 2. Name two indicators and write their colour in different mediums.

Answer:

Name of indicator	Colour in acidic medium	Colour in basic medium
Methyl Orange	Red	Yellow Pink
Phenolphthalein	Colourless	Pink

Question 3. Name any three hydrated salts.

Answer:

1. Barium chloride, BaCl2. 2H2O.
2. Copper sulphate, CuSO4. 5H2O.
3. Ferrous sulphate, FeSO4. 6H2O.

Question 4. Name any three hydrated salts.

Answer:

$$\underset{\text{Acid}}{H_2SO_4} + \underset{\text{Base}}{2KOH} \longrightarrow \underset{\text{Salt}}{K_2SO_4} + \underset{\text{Water}}{2H_2O}$$

Question 5. What causes acidity in our body? How can it be cured?

Answer: Our stomach produces hydrochloric acid which helps in digestion of food. During indigestion, the stomach produces too much acid and this causes pain and irritation. This can be cured by using bases called antacids.

Question 6. What is the result of the reaction between an acid and a metal?

Answer:

Corresponding salt is formed with the evolution of hydrogen gas when a metal reacts with acid.

Question 7. Write two important uses of pH in everyday life. Also, give an example.

Answer: pH balance and its particular range of maintenance are very important in nature because it affects animal and plant life very much.

For example:

1. Curd formation: Atmospheric bacteria change the pH of milk which causes the curd formation.
2. Aids in digestion: Slight acidic conditions in the stomach due to the presence of hydrochloric acid aids in the digestion of food.

Question 8. Give examples of two acids and bases present in nature.

Answer:

1. Acids: Citric acid, acetic acid.
2. Bases: Calcium carbonate, sodium hydroxide.

Question 9. Discuss the various types of salts.

Answer: There are three types of salts:

1. Neutral salts: Salts formed by the mixing of strong acid and strong base, e.g., NaCl, K_2SO_4 etc.
2. Acidic salts: Salts formed by the mixing of a strong acid and weak base e.g., NH_4Cl, $CaSO_4$.
3. Basic salts: Salts formed by the mixing of a strong base and weak acid e.g., Na_2CO_3, CH_3COONa etc.

Question 10. Common salt acts as raw material for many important daily use chemicals. Name some of them and also write their chemical formula.

Answer: Sodium hydroxide (NaOH), Baking Soda ($NaHCO_3$), Washing soda ($Na_2CO_3.10H_2O$) etc.

Question 11. What are the products of Chlor-alkali process?

$3MnO_2(s) + 4Al(s) \rightarrow 3Mn(s) + 2Al_2O_3(s)$

Answer: The products of Chlor-alkali process are chlorine and sodium hydroxide.

Question 12. Name two uses of each of the given salts:

1. Bleaching powder
2. Baking soda

Answer: Use of given salts are:

1. Bleaching powder:

- It is used as an oxidising agent in chemical industries.
- It is used for disinfecting water to make it free of germs.

2. Baking soda:

- It is used in soda acid fire extinguishers.
- It is an ingredient in antacids.

Question 13. What is the water of crystallisation?

Answer: The water of crystallisation is the fixed number of water molecules present in one formula unit of salt.

Question 14. Give reaction to show the formation of sodium zincate?

Answer:

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

Question 15. Name the products of electrolysis of brine and also give on use of each.

Answer: Chlorine gas, H2 gas, and sodium hydroxide are the products of electrolysis of brine:

1. Use of chlorine gas: It is used as a disinfectant.
2. Use of H2 gas: It is used in the manufacture of ammonia.
3. Use of sodium hydroxide: It is used for the manufacture of soaps and detergents.

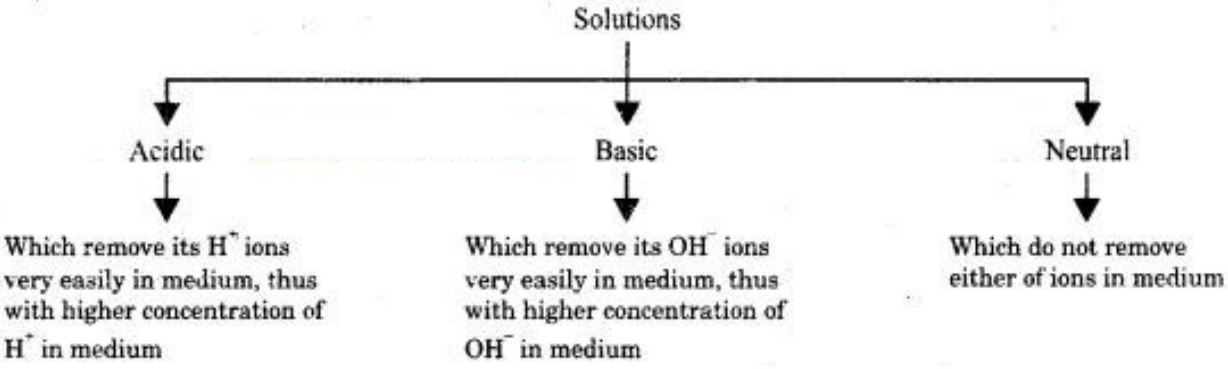
MP Board Class 10th Science Chapter 2 Long Answer Type Questions

Question 1. Discuss the nature of the solution and its type in brief and also explain the strength of a solution.

Answer:

Nature of the solution:

When a solute is dissolved solvent (generally water), it shows different kind of nature with regard to its reactivity and solubility. On the basis of removal of H+ ion or OH- the solution is formed. The types of solutions are divided as follows:



Strength of solution is determined by the,

1. Speed of reactivity i.e., how fast the ions are found dissociated.
2. Amount of ions (H+ or OH-) released or their ion concentration.

Question 2. Give one example in each case:

(a) a weak mineral acid.

(b) a base which is not an alkali.

(c) a hydrogen-containing compound which is not an acid.

(d) a basic oxide soluble in water.

(e) a basic oxide insoluble in water.

Answer:

(*b*) Copper(II) hydroxide, $Cu(OH)_2$.

(*c*) CH_4, methane.

(*d*) Na_2O, sodium oxide.

(*e*) CuO, copper(II) oxide.

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Conclusion

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