CBSE Test Paper-03

Chapter 02 Acid Base and Salt

1. 10 mL of a solution of NaOH is found to be completely neutralized 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 required to neutralize it will be **(1)**

   a. 8ml
   b. 12ml
   c. 4ml
   d. 16ml

2. The colour of the pH paper strip turned red when it was dipped into a sample. The sample could be **(1)**

   a. dilute Hydrochloric acid
   b. tap water
   c. dilute Sodium bicarbonate solution
   d. dilute Sodium hydroxide solution

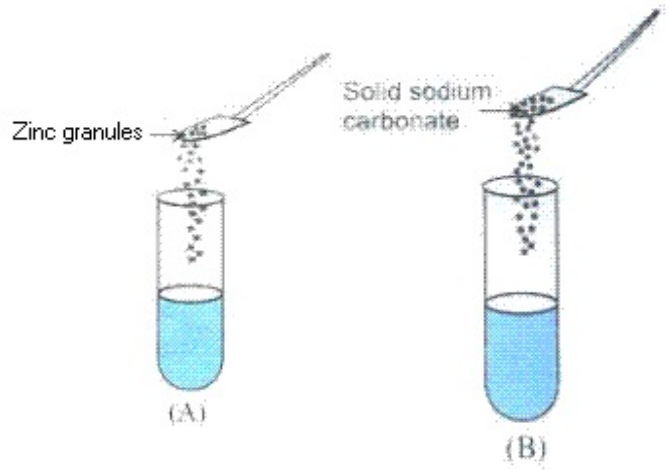
3. A student takes some zinc granules in a test tube and adds dilute hydrochloric acid to it. He would observe that the colour of the zinc granules changes to **(1)**

   a. brown
   b. black
   c. yellow
   d. white

4. Higher the hydronium ion concentration, **(1)**

   a. higher is the pH value
   b. lower is the pH value
   c. moderate is the pH value
   d. pH value is the zero

5. A student took two test tubes containing 2 ml of dilute hydrochloric acid and added zinc granules to test tube (A) and solid sodium carbonate to test tube (B) as shown below:



The correct observation would be **(1)**

   a. Rapid reaction in both the test tubes
   b. No reaction in any of the test tubes.
   c. Slow reaction in (A) and rapid reaction in (B)
   d. Rapid reaction in (A) but a slow reaction in (B)

6. Name two salts that are used in black and white photography. **(1)**

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

8. 'A' is a soluble acidic oxide and 'B' is a soluble base. Compared to the pH of pure water, what will be the pH of **: (1)**
   (a) Solution of 'A'
   (b) Solution of 'B'

9. What is pH of tomato juice ? **(1)**

10. State the chemical property in each case on which the following uses of baking soda are based :
    (i) as an antacid
    (ii) as a constituent of baking powder. **(3)**

11. State reason for the following:

    i. Dry HCl gas does not change the colour of the dry blue litmus paper.
    ii. Alcohol and glucose also contain hydrogen, but do not conduct electricity.
    iii. Concentration of H_3O^+ ions is affected when a solution of an acid is diluted. **(3)**

12. How is chloride of lime chemically different from calcium chloride ? Why does chloride of lime gradually lose its chlorine when kept exposed to air ? **(3)**

13. Experiment to show that blue vitriol crystals contain water of crystallization : **(3)**

14. When CO_2 gas pass through saturated solution of ammonical brine, two compound 'X' and 'Y' are formed. 'Y' is used as antacid and decomposes to form another solid 'Z'. Identify 'X', 'Y', 'Z' and write the chemical equations. **(5)**

15. i. The PH of rain water collected from two cities A and B was found to be 6 and 5 respectively. Water of which city is more acidic? Find out the ratio of hydrogen ion concentration in the two samples of rain water?
    ii. Arrange the following in order (ascending) of their PH values.$NaOH$ solution, Blood, lemon Juice. **(5)**

CBSE Test Paper-03

Chapter 02 Acid Base and Salt

Answers

1. d. 16ml

   Explanation: 10 mL of NaOH solution is neutralized by 8 mL of HCl.

   1 mL of NaOH soultion is neutralized by $\frac{8}{10}$ mL of HCl.

   20 mL of NaOH solution will neutralize $\frac{8}{10}$ * 20 mL of HCl = 16 mL

2. a. dilute Hydrochloric acid

   Explanation: Dilute Hydrochloric acid turns pH paper red. It is acetic in nature.

3. b. black

   Explanation: Zinc granules changes to black in colour.

4. b. lower is the pH value

   Explanation: The hydrogen ion concentration is represented by the symbol $[H^+]$. The pH is defined as pH = -log $[H^+]$ ie, it's the negative logarithm of the H^+ concentration.

   In water H^+ is really H_3O^+ (the hydronium ion) . The greater the concentration of the hydronium ion, the lower the value of pH. It is simply logarithms. It has nothing to do with the chemistry behind it.

5. a. Rapid reaction in both the test tubes

   Explanation: Reaction will be rapid in both test tubes

   $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

   $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

6. Two salts that are used in black and white photography are silver chloride ($AgCl$) and silver bromide ($AgBr$).

   Silver chloride decomposes to form silver metal and chlorine gas when exposed to light. The white colour of silver chloride changes to greyish white due to the formation of silver metal.

$2AgCl\ (s) \rightarrow 2Ag\ (s) + Cl_2\ (g)$

Silver bromide also behaves in a similar fashion. The pale yellow colour of silver bromide changes to greyish white due to the formation of silver metal.

$2AgBr\ (s) \rightarrow 2Ag\ (s) + Br_2\ (g)$

7. HCl, HNO_3, etc., ionise in the aqueous solution to produce H^+ ions. Hence, they show acidic character. Compounds like C_2H_5OH and glucose do not ionise in the aqueous solution to give H^+ ions, i.e., hydrogen present in them is non-ionisable. Hence, they do not show acidic character.

8. The pH of a solution is inversely proportional to its hydrogen ion concentration. This means that an aqueous solution having a higher concentration of hydrogen ion will have lower pH and vice-versa.
   Solution 'A' which is a soluble acidic oxide will supply a large number of hydrogen (H^+) ions and thus, its pH will be less than 7.
   Solution 'B' which is a soluble base will supply a lesser number of hydrogen (H^+) ions and thus, its pH will be more than 7.

9. Tomato is Acidic. Tomatoes are generally considered a high acid food item with a pH 4.1.

10. i. It is alkaline and neutralizes excess acid in the stomach. Therefore, it is used as an antacid. It is a mild non-corrosive base, so it is an ingridient of antacids.
    ii. Baking powder contains baking soda and tartaric acid. When baking powder is heated, sodium hydrogen carbonate decomposes to give CO_2 and sodium carbonate CO_2 causes bread and cakes to rise.

11. i. Dry HCl gas does not produce free H^+ ions, hence, it does not change the color of the dry blue litmus paper.
    ii. Alcohol and glucose contain hydrogen but they do not ionize in the solution to produce H^+ ions and can not conduct electricity.
    iii. The volume of the solution increases when a solution is diluted, but the number of ions remains the same, so the concentration of H_3O^+ per unit volume decreases.

12. Chloride of lime is calcium hypochlorite [$Ca(OCl)_2$] which is alkaline. Calcium chloride

is $CaCl_2$ which is neutral.

On the other hand, calcium chloride is $CaCl_2$. When exposed to air, it loses its chlorine because it reacts with carbon dioxide present in air to give calcium carbonate and chlorine gas.

$CaOCl_2$	+	CO_2	→	$CaCO_3$	+	Cl_2
Caclcium oxycholoride				calcium carbonate		chlorine gas

13. Take some powdered copper sulphate crystals in a clean and dry test tube and heat the crystals with slightly tilting it downwards. Drops of colourless liquid will condense on the cooler parts and collect it in a dish.
Anhydrous white copper sulphate is left behind in the test tube. This liquid turns anhydrous copper sulphate blue indicating that this liquid is water.

$CuSO_4.5H_2O$	$\xrightarrow{Heat}$	$CuSO_4$	+	5 H_2O
Hydrated Copper sulphate		Anhydous copper sulphate		

14. When CO_2 gas is passed through a saturated solution of ammoniacal brine, ammonium chloride and sodium bicarbonate are formed.
Compound 'Y' is used as antacid, hence compound 'Y' is sodium bicarbonate.
Compound 'X' is ammonium chloride.
Compound 'Y' decomposes to form another solid 'Z'. Compound 'Z' is sodium carbonate.
The chemical equations for the reactions are as follows**:**

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow \underset{(Ammonium Chloride)}{NH_4Cl} + \underset{Sodium hycarbonate}{NaHCO_3}$$

$$\underset{Sodium hycarbonate}{2NaHCO_3} \xrightarrow{Heat} \underset{Sodium carbonate}{Na_2CO_3(s)} + H_2O + CO_2$$

15. **(a)** The pH of a rain water solution will be inversely proportional to the hydrogen ion concentration.
This means that rain water having a higher concentration of hydrogen ion will have a

lower pH and vice-versa.

$$pH = -\log[H^+] = \log\left[\frac{1}{H^+}\right]$$

Hydrogen ion concentration in the rain water for city **A** is calculated is as follows**:-**

$$\log\left[\frac{1}{H^+}\right] = 6 \implies \left[\frac{1}{H^+}\right] = anti\log 6 \implies \left[\frac{1}{H^+}\right] = 10^6 \implies [H^+] = 10^{-6} \text{ .....(i)}$$

Hydrogen ion concentration in the rain water for city **B** is calculated is as follows**:-**

$$\log\left[\frac{1}{H^+}\right] = 5 \implies \left[\frac{1}{H^+}\right] = anti\log 5 \implies \left[\frac{1}{H^+}\right] = 10^5 \implies [H^+] = 10^{-5} \text{ .....(ii)}$$

From (i) and (ii), we get the ratio of hydrogen ion concentration in the two samples of rain water**:**

$$\text{Ratio}\frac{(\text{City A})}{(\text{City B})} = \frac{10^{-6}}{10^{-5}} = \frac{1}{10}$$

Thus, rain water of **city B (pH = 5)** is **more acidic.**

(b) Ascending order of pH values are as follows**:-**

pH of Lemon juice < pH of Blood < pH of NaOH solution