CBSE Test Paper 01

Chapter 02 Acid Base and Salt

1. Electrolysis of brine solution produces chlorine gas and hydrogen at **(1)**
   a. Anode and cathode, respectively.
   b. Both at cathode
   c. Cathode and anode respectively
   d. Both at Anode
2. Name the substance which on treatment with chlorine yields bleaching powder. **(1)**
   a. CaO
   b. $Ca(OH)_2$
   c. CuO
   d. $CaCo_3$
3. Which one of the following is not required to find the pH of a solution? **(1)**
   a. Litmus paper
   b. Standard pH value chart
   c. pH paper
   d. Universal indicator
4. A blue litmus paper was first dipped in dil. HCl and then in dil. NaOH solution. It was observed that the colour of the litmus paper **(1)**
   a. changed first to red and then to blue
   b. changed to red
   c. remained blue in both the solutions
   d. changed first to red and then to blue
5. Under what soil condition do you think a farmer would spread or treat the soil of his fields with quick lime (CaO) or slaked time $(CaCO_3)$? **(1)**
   a. When the pH of the soil increases
   b. When the nutrients of the soil is lost
   c. When the pH of the soil decreases
   d. All of these
6. An aqueous solution turns red litmus solution blue. Excess addition of which solution

would reverse the change? **(1)**

7. Give one example of natural indicator. **(1)**
8. Although acetic acid is highly soluble in water but still it is a weak acid. Explain why? **(1)**
9. Why is sodium hydrogen carbonate an essential ingredient in most antacids? **(1)**
10. Why acids are not stored in metal containers? **(3)**
11. 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? **(3)**
12. Write some uses of caustic soda? **(3)**
13. i. A chemical compound X is used in glass and soap industry. Identify the compound and give its chemical formula.
    ii. How many molecules of water of crystallisation are present in compound X?
    iii. How will you prepare the above compound starting from sodium chloride? Write all relevant equations involved in the process. **(3)**
14. Give important properties of bases (alkalies). **(5)**
15. Write the formulae of the salts given below**:**
    Potassium sulphate, sodium sulphate, calcium sulphate, magnesium sulphate, copper sulphate, sodium chloride, sodium nitrate, sodium carbonate and ammonium chloride.
    Identify the acids and bases from which the above salts may be obtained. How many families can you identify among these salts? **(5)**

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Answers

1. a. Anode and cathode, respectively.

   Explanation: On electrolysis, brine (sodium chloride solution) produces hydrogen gas at the cathode and chlorine gas at the anode.

   The half-equations for the reactions are:

   At the cathode: $2\ H^+(aq) + 2\ e^- \rightarrow H_2(g)$

   At the anode: $2\ Cl^-(aq); \rightarrow Cl_2(g) + 2\ e^-$

   Overall process: $2\ NaCl\ (or\ KCl) + 2\ H_2O \rightarrow Cl_2 + H_2 + 2\ NaOH\ (or\ KOH)$

   The solution left provides sodium hydroxide (a strong alkali).

2. b. $Ca(OH)_2$

   Explanation: Bleaching powder is prepared by passing chlorine gas over dry slaked lime.

   $$\underset{\text{slaked lime}}{Ca(OH)_2} + Cl_2 \rightarrow \underset{\text{bleaching powder}}{CaOCl_2} + H_2O$$

3. a. Litmus paper

   Explanation: Litmus paper cannot be used to find the pH of a solution.

4. d. changed first to red and then to blue

   Explanation: Blue paper turn in red indicate the sample is acidic. Blue paper that does not change color indicates the sample is a base. HCl is acidic and NaOH is base, So, dil. HCl turns blue litmus red which becomes blue again in NaOH.

5. c. When the pH of the soil decreases

   Explanation: When the pH of the soil becomes acidic, slaked lime or quick lime is added to neutralise the soil.

6. Changing of red litmus to blue indicates that the solution is basic. So to neutralise the basic solution an acid should be added. To revert the colour change that is to change blue litmus red, excess of acid needs to be added so that the solution becomes acidic.

7. Indicators obtained from natural sources are called natural indicators. Litmus, turmeric, red cabbage, China rose, etc. are some common natural indicators used widely to show the acidic or basic character of substances.

8. The strength of an acid depends upon the extent of ionization. Acetic acid is highly soluble in water but it dissociates partially in the aqueous solution to produce a small amount of H+ ions and, therefore, considered as a weak acid.

9. Sodium hydrogen carbonate is slightly alkaline in nature that's why it is an essential ingredient in most antacids.

10. Acids cannot be stored in metal containers as they will react with the metal, forming metal salt and liberating Hydrogen gas. Containers made of glass are ideal for storage of acid due to its chemical inertness.

11. In solution A, $[H^+(aq)] = 10^{-6}$ M

    In solution B, $[H^+(aq)] = 10^{-8}$ M

    The pH value of a solution varies from 0 to 14. The pH value is 0 for a very strong acid and the pH value is 14 for a very strong base. The pH value is 7 for a neutral solution. Hence A is acidic and B is basic in nature. The concentration of hydrogen ion decreases from pH value of 0 to 14 therefore A has more hydrogen ion concentration.

12. Three uses of caustic soda:

    a. It is used in paper industry.
    b. It is used in manufacture of soap and detergents.
    c. It is used in the manufacture of artificial fibres.
    d. It is used as a cleansing agent and in the manufacturing of washing soda.
    e. Sometimes, sodium hydroxide is also used as a reagent in the laboratories.
    f. It is used in the preparation of soda lime.
    g. It is used in the extraction of aluminium by purifying bauxite.

13. i. The compound (X) is washing soda. Its chemical formula is $Na_2CO_3 .10H_2O$

    ii. Ten molecules of water of crystallisation are present in this compound.

    iii. Ammonia and carbon dioxide gas in passed through brine (or concentrated sodium chloride solution) then a mixture of $NaHCO_3$ and NH_4Cl is formed.

$NaCl\ (s) + NH_3\ (g) + CO_2(g) + H_2O(l) \rightarrow NaHCO_3\ (s) + NH_4CI(g)$

On Heating $NaHCO_3$, sodium carbonate is formed releasing water and carbon dioxide

$2NaHCO_3\ (s) \xrightarrow{\triangle} Na_2CO_3\ (s) + H_2O(l) + CO_2(g)$

Anhydrous sodium carbonate (also known as soda ash) is dissolved in water. The solution is recrystallized and upon cooling, it gives hydrated sodium carbonate (called washing soda).

$$Na_2CO_3\ (s)\ +\ 10H_2O(l)\ \rightarrow \underset{Washing\ soda}{Na_2CO_3\ .10H_2O(s)}$$

14. i. Bases are soapy to touch and have bitter taste.

ii. They change the colour of indicators.

Indicator	Colour change
Litmus	From red to blue
Phenolphthalein	From colourless to pink
Methyl orange	From orange to yellow

iii. They act as electrolytes.

iv. They have a corrosive action on the skin.

v. Action with ammonium salts : When they are warmed with an ammonium salt, ammonia gas is produced.

e.g. $NH_4Cl + NaOH \rightarrow NaCl + H_2O + NH_3 \uparrow$

vi. They absorb carbon dioxide from the air to form carbonates.

$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

$2KOH + CO_2 \rightarrow K_2CO_3 + H_2O$

vii. They neutralise acids to from salt and water

$Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$

$Fe(OH)_2 + 2HCl \rightarrow FeCl_2 + 2H_2O$

viii. Action of heat : All bases except NaOH decompose on heating to give oxides.

$Ca(OH)_2 \xrightarrow{Heat} CaO + H_2O$

$2Al(OH)_3 \xrightarrow{Heat} Al_2O_3 + 3H_2O$

ix. Precipitation reactions : When added to the solutions of the salts of the heavy

metals viz. copper, iron, zinc, etc. the bases produce insoluble metal hydroxides as precipitates.

$CuSO_{4(aq)} + 2NH_4OH \rightarrow (NH_4)_2SO_4 + Cu(OH)_2\downarrow$ (pale blue)

$ZnSO_{4(aq)} + 2NaOH_{(aq)} \rightarrow Na_2SO_{4(aq)} + Zn(OH)_2 \downarrow$ (white)

x. Amphoteric nature : The hydroxides of zinc, aluminium and lead are amphoteric i.e. they can act as weak bases as well as weak acids.

a. As weak bases :

$Zn(OH)_2 + 2HCl\ (dil) \rightarrow ZnCl_2(aq) + 2H_2O$

$Al(OH_3)(s) + 3HCl(dil) \rightarrow AlCl_3(aq) + 3H_2O$

b. As weak acids

$Al(OH_3)(s) + 2NaOH(aq) \rightarrow \underset{\text{Sodium meta aluminate}}{NaAlO_2(aq)} + 2H_2O$

$Zn(OH)_2(s) + 2NaOH\ (aq) \rightarrow \underset{\text{Sodium zincate}}{Na_2ZnO_2(aq)} + 2H_2O$

15. The following table gives the formulae of the given salts, and the acids and bases from which these salts may be obtained**:**

S.No.	Salts	Formula	Family	Acid and Base
1.	Potassium sulphate	K_2SO_4	Potassium salts	H_2SO_4 and KOH
2.	Sodium sulphate	Na_2SO_4	Sodium salts	H_2SO_4 and NaOH
3.	Calcium sulphate	$CaSO_4$	Calcium salts	H_2SO_4 and $Ca(OH)_2$
4.	Magnesium sulphate	$MgSO_4$	Magnesium salts	H_2SO_4 and $Mg(OH)_2$
5.	Copper sulphate	$CuSO_4$	Copper salts	H_2SO_4 and $Cu(OH)_2$
6.	Sodium chloride	NaCl	Chloride salts	HCl and NaOH
7.	Sodium nitrate	$NaNO_3$	Nitrate salts	HNO_3 and NaOH
8.	Sodium carbonate	Na_2CO_3	Carbonate salts	H_2CO_3 and NaOH
9.	Ammonium chloride	NH_4Cl	Chloride salts	HCl and NH_4OH