Chapter 2 Acids, Bases and Salts

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: Add few drops of solution from all three test tubes on the red litmus paper separately. The solution which turns red litmus to blue contains basic solution. Use this blue litmus paper to test the solutions in other two test tubes. The solution from the test tube which turns blue litmus paper to red will be the acidic solution and solution of the test tube which do not change either red or blue litmus paper contains water.

Question 2. Why should curd and sour substances not be kept in brass and copper vessels?
Answer: Curd and sour substances contain acids which can react with copper vessels and brass to form toxic compounds.

Question 3. 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 an acid react with a metal it liberates hydrogen gas.

Example: $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$
To test the presence of H_2 gas, bring a burning match stick near the mouth of the test tube where H_2 gas is released, the match stick burns with a pop sound.

Question 4. 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: Metal compound A is $CaCO_3$
Gas evolved is CO_2
Balanced equation: $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

Question 5. 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: Solutions like HCl, HNO_3 etc. get ionised in aqueous solutions and due to the presence of H^+ ions they show acidic characters. While solutions of compounds like alcohol and glucose do not form any such ions so they do not show acidic characters.

Question 6. Why does an aqueous solution of an acid conduct electricity?
Answer: Acid when forms a solution in water gets ionised, due to the presence of these ions electricity is conducted through it.

Question 7. Why does dry HCl gas not change the colour of the dry litmus paper?
Answer: Dry HCl gas does not release H^+ ions and hence, the acidic property of gas is not imparted.

Question 8. 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 and water mix, the reaction is highly exothermic, the acid may splash, cause burns and even the bottle/container can break. To avoid this and allow the heat evolved to be absorbed by water slowly, acid is added to water for diluting it.

Question 9. How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted?
Answer: When the solution-of acid is diluted then the concentration of hydronium ion (H_3O^+) per unit volume decreases.

Question 10. How is the concentration of hydroxide ions (OH^-) affected when excess base is dissolved in a solution of sodium hydroxide?
Answer: When base is mixed with water there is decrease in the concentration of OH^- ions per unit volume.

Question 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?
Answer: A with pH = 6 is acidic B with pH = 8 is basic
'A' has more hydrogen ion concentration.

Question 12. What effect does the concentration of H^+ (aq) ions, have on the nature of the solution?
Answer: If a solution has higher concentration of H^+ ions it is more acidic in nature.

Question 13. Do basic solutions also have H^+ (aq) ions? If yes, then why are these basic?
Answer: Yes basic solutions also have H^+ ions, but they are basic in nature due to more number of OH^- ions.

Question 14. 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: When the soil is acidic in nature, the farmer would add quicklime (CaO) or slaked lime ($Ca(OH)_2$) or chalk ($CaCO_3$)to make it neutral.

Question 15. What is the common name of the compound $CaOCl_2$?
Answer: The common name of $CaOCl_2$ is bleaching powder and chemical name is calcium oxychloride.

Question 16. Name the substance which on treatment with chlorine yields bleaching powder.
Answer: Calcium hydroxide ($Ca(OH)_2$) when treated with

chlorine yields bleaching powder.
$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

Question 17. Name the sodium compound which is used for softening hard water.
Answer: Sodium carbonate.

Question 18. What will happen if a solution of sodium hydrocarbonate is heated? Give the equation of the reaction involved.
Answer: When sodium hydrocarbonate is heated, sodium carbonate, water, and carbon dioxide gas is obtained.

$$2NaHCO_3 \xrightarrow{\text{heat}} Na_2CO_3 + H_2O + CO_2$$

Question 19. Write an equation to show the reaction between Plaster of Paris and water.
Answer:

$$\underset{\substack{\text{Plaster of Paris}\\\text{(white powder)}}}{CaSO_4 \cdot \frac{1}{2} H_2O} + \underset{\text{water}}{1\frac{1}{2} H_2O} \longrightarrow \underset{\substack{\text{Gypsum}\\\text{(solid mass)}}}{CaSO_4 \cdot 2H_2O}$$