Long Answer Type Questions

[5 Marks]

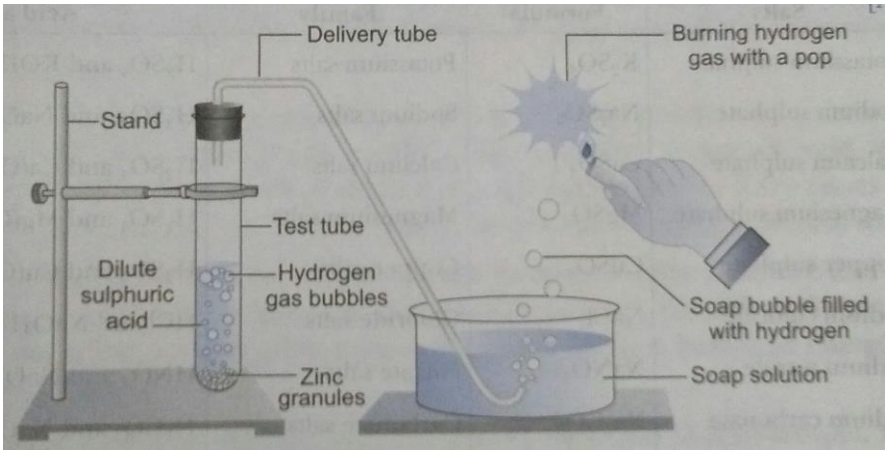
Que 1. (i) In the following schematic diagram for the preparation of hydrogen gas as shown as figure, what would happen if following changes are made?

(a) In place of zinc granules, same amount of zinc dust is taken in the test tube.

(b) Instead of dilute sulphuric acid, dilute hydrochloric acid is taken.

(c) Sodium hydroxide is taken in place of dilute sulphuric acid and the tube is heated.

(ii) How do metal carbonates and metal hydrogencarbonates react will acids?



Ans. (i) (a) Hydrogen gas will evolve with greater speed.

(b) Almost same amount of gas is evolved.

(c) If sodium hydroxide is taken, hydrogen gas will be evolved.

$$Zn + 2NaOH \rightarrow \underset{Sodium\ zincate}{Na_2ZnO_2} + H_2$$

(ii) All metal carbonates and hydrogencarbonates react with acids to form a corresponding salt, carbon dioxide and water.

Metal carbonate + Acid → Salt + Carbon dioxide + Water

Metal hydrogencarbonate + Acid → Salt + Carbon dioxide + Water

For example, sodium carbonate reacts with dilute hydrochloric acid as follows:

$$Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$$

Sodium hydrogencarbonate reacts with dilute hydrochloric acid as follows:

$$NaHCO_3(s) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l) + CO_2(g)$$

Que 2. A metal carbonates X on reacting with an acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas G that is obtained at anode during electrolysis of brine is passed on dry Y, it gives a compound Z, used for disinfecting drinking water. Identify X, Y G and Z.

Ans. The gas evolved at anode during electrolysis of brine is chlorine (G).

When chlorine gas is passed through dry Ca (OH) 2 (Y) produced bleaching powder (Z) used for disinfecting drinking water.

$$\underset{Slaked\ lime}{Ca(OH)_2} + Cl_2 \rightarrow \underset{Bleaching\ powder}{CaOCl_2} + H_2O$$

Since Y and Z are calcium salts, therefore X is also a calcium salt and is calcium carbonate.

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$$

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

Que 3. 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?

Ans. The formulae of the given salts and the acids and bases from which these salts may be obtained are given in the following table.

S.No.	Salts	Formula	Family	Acids and Base
1.	Potassium sulphate	K_2SO_4	Potassium salts	H_2SO_4 and K OH
2.	Sodium sulphate	$NaSO_4$	Sodium salts	H_2SO_4 and Na OH
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

Que 4. A sulphate salt of group 2 element of the periodic Table is a white, soft substance, which can be moulded into different shapes by making its dough. When this compound is left in open for some time, it becomes a solid mass and cannot be used for moulding purposes. Identify the sulphate salt and state why does it shows such a behaviour. Give the reaction involved.

Ans The substance which is used for making different shapes is plaster of Paris. Its chemical name is calcium sulphate hemihydrate ($CaSO_4.\ ^1/_2H_2O$). The two formula unit of Ca SO_4 share one molecule of water. As a result, it is soft.

When it is left open for some time, it absorbs moisture from the atmosphere and forms gypsum, which is a hard solid mass.

$$\underset{\substack{Plaster\ of\ Paris\\(Soft)(Sulphate\ salt)}}{CaSO_4.\frac{1}{2}H_2O} + 1\frac{1}{2}H_2O \rightarrow \underset{Gypsum\ (Hard\ mass)}{CaSO_4.2H_2O}$$