WORKSHEET 2

CHAPTER 6 – STUDY OF THE FIRST ELEMENT – HYDROGEN

A. Tick (✓) the correct option.

1. The element which contains one valence electron like hydrogen is
   a. helium. b. sodium. c. fluorine. d. oxygen.
2. A metal that reacts with very dilute nitric acid at low temperature to liberate hydrogen gas is
   a. manganese. b. iron. c. aluminium. d. zinc.
3. Very pure hydrogen is obtained from
   a. methane. b. electrolysis of water. c. Bosch process. d. hydrides.
4. Hydrogenation of vegetable oils takes place in the presence of
   a. nickel. b. iron. c. copper. d. lead.
5. Hydrogen when passed through molten sulphur forms
   a. hydrochloric sulphate. b. sulphuric acid. c. hydrogen sulphide. d. hydrogen sulphate.

B. Fill in the blanks from the choices given within the brackets.

1. Most of the hydrogen occurs in the combined state in the form of _____ (water/minerals)
2. Dilute _____ (nitric/sulphuric) acid is used for the preparation of hydrogen.
3. When zinc reacts with water, _____ (water/zinc) is reduced and _____ (zinc/zinc oxide/hydrogen) is oxidised to _____ (zinc oxide/hydrogen)
4. The reaction of hydrogen with oxygen is _____ (exothermic/endothermic)
5. Hydrogenation of vegetable oils take place in the presence of finely divided nickel at _____ (250 °C/200 °C)

C. Correct the following statements.

1. Pure zinc is preferred to granulated zinc in the preparation of hydrogen using dilute nitric acid.
2. Copper reacts with dilute acids to liberate hydrogen.
3. Hydrogen is used as a rocket fuel in space research.
4. Metals adsorb hydrogen.
5. Water gas is a mixture of equal volumes of hydrogen and carbon dioxide.

D. Give reasons for the following.

1. No flame must be brought near the apparatus while preparing hydrogen gas.
2. Oxy-hydrogen flame is used for welding and cutting metals.
3. Hydrogen is not collected by the downward displacement of air although it is lighter than air.
4. Potassium and sodium are not used for the laboratory preparation of hydrogen gas from water.
5. Lead is not used for the laboratory preparation of hydrogen from dilute acids.

Name: ..... Teacher's signature: .....

Class: IX Date: .....

E. Answer the following questions.

1. State the products of the reaction "when steam is passed over red hot iron".
2. Complete the following equations.
   a. Iron (III) oxide + Hydrogen $\longrightarrow$ — + —
   b. Potassium + Hydrogen $\longrightarrow$ —
3. a. Hydrogen is evolved when dilute hydrochloric acid reacts with magnesium, but nothing happens in the case of mercury and silver. Explain.
   b. Why is helium used along with hydrogen for filling airships and balloons?
4. What is the relationship between reduction and reducing agent in a redox reaction? Write an example of a redox reaction showing the relationship between oxidation and oxidising agent.
5. a. How can you obtain hydrogen from methane?
   b. Hydrogen is used in the extraction of metals. Why?
   c. Name two metals that can displace hydrogen from alkalis. Write balanced equations for the same.

ANSWERS

WORKSHEET 2

A. Tick (✓) the correct option.

1. b
2. a
3. b
4. a
5. c

B. Fill in the blanks from the choices given within the brackets.

1. water
2. sulphuric
3. water, zinc, zinc oxide
4. exothermic
5. 200 °C

C. Correct the following statements.

1. Granulated zinc is preferred to pure zinc in the preparation of hydrogen using dilute sulphuric acid.
2. Copper does not react with dilute acids to liberate hydrogen.
3. Liquid hydrogen is used as a rocket fuel in space research.
4. Transition metals adsorb hydrogen.
5. Water gas is a mixture of equal volumes of hydrogen and carbon monoxide.

D. Give reasons for the following.

1. No flame must be brought near the apparatus while preparing hydrogen gas because hydrogen is a combustible gas and catches fire immediately.
2. Oxy-hydrogen flame produces a very high temperature which is used for welding and cutting metals.
3. Although hydrogen is lighter than air, it is not collected by the downward displacement of air because hydrogen forms an explosive mixture with air.
4. Potassium and sodium reacts explosively with water and catches fire immediately, therefore, they are not used in the preparation of hydrogen gas from water.
5. Lead reacts with dilute acids like sulphuric acid or hydrochloric acid and forms an insoluble coating of lead sulphate or lead chloride on the metal surface. Thus, preventing the further reaction. Hence, lead is not used for the laboratory preparation of hydrogen from dilute acids.

E. Answer the following questions.

1. When steam is passed over red hot iron, magnetic oxide of iron and hydrogen is produced.
2. a. Iron (III) oxide + Hydrogen $\longrightarrow$ Iron + Water

   b. Potassium + Hydrogen $\longrightarrow$ Potassium hydride
3. a. This is because mercury and silver are placed below hydrogen in the activity series. Therefore, they will not displace hydrogen from acids.

   b. Helium forms a non-inflammable mixture with hydrogen, therefore, it is used along with hydrogen for filling airships and balloons.
4. Reduction is the process of removal of oxygen or addition of hydrogen. Whereas reducing agent is a substance which causes the removal of oxygen from or addition of hydrogen to the other substance. Therefore, it can be said that reducing agent causes the reduction of other substance. For example,

$$CuO + H_2O \longrightarrow Cu + H_2O$$

In the above reaction, copper oxide is reduced to copper as oxygen is removed from copper oxide. At the same time, oxygen is added to hydrogen and is converted to water. This suggests that hydrogen causes the reduction of copper oxide to copper metal. Thus, hydrogen acts as a reducing agent.

5. a. Methane is mixed with steam and limited supply of oxygen passed over nickel catalyst at 900°C.

$$CH_4 + H_2O \longrightarrow CO + 3H_2$$

The carbon monoxide is removed by passing the mixture through ammoniacal copper (I) chloride solution which absorbs the carbon monoxide.

b. Hydrogen is a strong reducing agent. When hydrogen is passed over the oxides of less active metals like Cu, Pb, Fe, it removes oxygen from them and reduces metal oxides to their corresponding metals. Hence, hydrogen is used in the extraction of metals.

c. Aluminium and zinc can displace hydrogen from alkalis.

$$2Al + 2NaOH + 6H_2O \longrightarrow 2Na\,[Al(OH)_4] + 3H_2\uparrow$$

$$Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2\uparrow$$