WORKSHEET 1

CHAPTER 6 – STUDY OF THE FIRST ELEMENT – HYDROGEN

A. Tick (✓) the correct option.

1. Which of the following is a similarity between hydrogen and halogens?
   a. Reducing agent b. Burning c. Cation formation d. Oxidising agent
2. Which of the following metals liberate hydrogen when reacts with steam?
   a. Potassium b. Molybednum c. Calcium d. Aluminium
3. Which promoter is used in the production of ammonia from nitrogen and hydrogen?
   a. Iron b. Molybednum c. Coke d. Platinum
4. In the given reaction,

   $$CuO + H_2 \longrightarrow Cu + H_2O$$

   the substance being reduced is
   a. H_2. b. CuO. c. Cu. d. H_2O.
5. Which of the following gas along with hydrogen is used for filling airships and hot balloons?
   a. Neon b. Argon c. Helium d. Krypton

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

1. Hydrogen is collected by _____ (downward/upward) displacement of water.
2. Arsine is an impurity present in hydrogen which can be removed by passing the gas through _____ (sodium hydroxide/silver nitrate) solution.
3. Hydrogen forms a diatomic molecule like _____ (sulphur/bromine)
4. The metal _____ (lead/copper) is not used to prepare hydrogen although it is placed above hydrogen in the reactivity series.
5. Moisture from hydrogen gas can be eliminated by passing hydrogen over _____ (anhydrous calcium oxide/anhydrous calcium chloride)

C. Complete and balance the following reactions.

1. $Mg + \text{——} \longrightarrow MgCl_2 + \text{——}$
2. $Al + KOH + \text{——} \longrightarrow KAlO_2 + \text{——}$
3. $Pb + \text{——} \longrightarrow Na_2PbO_2 + \text{——}$
4. $Al + H_2O \text{——} \longrightarrow + \text{——}$
5. $C + \text{——} \longrightarrow CO + \text{——}$

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

Class: ..... IX ..... Date: .....

D. Match the following.

1.	The process by which vegetable oil changes into vanaspati ghee	Water gas
2.	A liquid which turns anhydrous copper sulphate solution blue	Reducing agent
3.	A mixture of carbon monoxide and hydrogen	Oxidising agent
4.	A substance that causes the addition of hydrogen to other substance	Water
5.	A substance that causes the addition of oxygen to other substance	Hydrogenation

E. Answer the following questions.

1. Place the metals calcium, iron, magnesium and sodium in order of their activity with water, placing the most active metal first.
2. Hydrogen can be collected from heated metals when steam is passed over them. Name two such metals and write their balanced equations in support of your answer.
3. In the following reactions, state the substance oxidised, reduced, oxidising agent and reducing agent:
   a. $H_2S + Br_2 \longrightarrow 2HBr + S$
   b. $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$
   c. $Fe_2O_3 + 3CO \xrightarrow[\text{light}]{\text{uv}} 2Fe + 3CO_2$
   d. $P_4 + 5O_2 \longrightarrow P_4O_{10}$
4. a. Name any four impurities present in hydrogen gas collected by the action of dilute sulphuric acid on granulated zinc.
   b. Suggest the chemicals for the removal of such impurities.
5. a. Name the substances required for the manufacture of hydrogen by Bosch process.
   b. Write the balanced chemical equations between the substances used in Bosch process which results in the formation of hydrogen gas. Are these reactions exothermic or endothermic?
   c. One of the products in Bosch process is carbon monoxide. Explain how this carbon monoxide can be removed to obtain pure hydrogen gas?

ANSWERS

WORKSHEET 1

A. Tick (✓) the correct option.

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

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

1. downward
2. silver nitrate
3. bromine
4. lead
5. anhydrous calcium chloride

C. Complete and balance the following reactions.

1. $Mg + 2HCl \longrightarrow MgCl_2 + H_2$
2. $2Al + 2KOH + 2H_2O \longrightarrow 2KAlO_2 + 3H_2$
3. $Pb + 2NaOH \longrightarrow Na_2PbO_2 + H_2$
4. $2Al + 3H_2O \longrightarrow Al_2O_3 + 3H_2$
5. $C + H_2O \longrightarrow CO + H_2$

D. Match the following.

1.	The process by which vegetable oil changes into vanaspati ghee	Hydrogenation
2.	A liquid which turns anhydrous copper sulphate solution blue	Water
3.	A mixture of carbon monoxide and hydrogen	Water gas
4.	A substance that causes the addition of hydrogen to other substance	Reducing agent
5.	A substance that causes the addition of oxygen to other substance	Oxidising agent

E. Answer the following questions.

1. Sodium (Most active metal)
   Calcium
   Magnesium
   Iron (least active metal)
2. Heated magnesium and iron displace hydrogen from steam.

$$Mg + H_2O \longrightarrow MgO + H_2\uparrow$$

$$3Fe + 4H_2O \rightleftharpoons Fe_3O_4 + 4H_2\uparrow$$

3. a. Substance oxidised: H_2S
   Substance reduced: Br_2
   Oxidising agent: Br_2
   Reducing agent: H_2S

   b. Substance oxidised: HCl
   Substance reduced: MnO_2
   Oxidising agent: MnO_2
   Reducing agent: HCl

c. Substance oxidised: CO

Substance reduced: Fe_2O_3

Oxidising agent: Fe_2O_3

Reducing agent: CO

d. Substance oxidised: P_4

Substance reduced: O_2

Oxidising agent: O_2

Reducing agent: P_4

4. a. Following are the impurities present in hydrogen gas

i. Phosphine (PH_3)

ii. Arsine (AsH_3)

iii. Hydrogen sulphide (H_2S)

iv. Nitrogen dioxide (NO_2)

b. Removal of impurities:

i. Silver nitrate solution absorbs arsine and phosphine.

ii. Lead nitrate solution absorbs hydrogen sulphide.

iii. Potassium hydroxide or caustic potash absorbs nitrogen dioxide.

5. a. Coke, air and water.

b. $\underset{\text{Coke}}{C} + H_2O \longrightarrow \underbrace{CO + H_2}_{\text{Water gas}}$

$\underbrace{CO + H_2}_{\text{Water gas}} + H_2O \longrightarrow CO_2 + 2H_2$

The reactions are endothermic.

c. Carbon monoxide is removed by passing the above mixture, $CO_2 + 2H_2$, through ammoniacal copper (I) chloride solution which absorbs carbon dioxide.

$CO + CuCl + 2H_2O \longrightarrow CO \cdot CuCl \cdot 2H_2O$