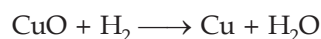


# WORKSHEET 1

## CHAPTER 6 – STUDY OF THE FIRST ELEMENT – HYDROGEN

### A. Tick (✓) the correct option.

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



the substance being reduced is

- 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.

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

### C. Complete and balance the following reactions.

- $\text{Mg} + \text{---} \longrightarrow \text{MgCl}_2 + \text{---}$
- $\text{Al} + \text{KOH} + \text{---} \longrightarrow \text{KAlO}_2 + \text{---}$
- $\text{Pb} + \text{---} \longrightarrow \text{Na}_2\text{PbO}_2 + \text{---}$
- $\text{Al} + \text{H}_2\text{O} \text{---} \longrightarrow + \text{---}$
- $\text{C} + \text{---} \longrightarrow \text{CO} + \text{---}$

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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.**

- Place the metals calcium, iron, magnesium and sodium in order of their activity with water, placing the most active metal first.
- 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.
- In the following reactions, state the substance oxidised, reduced, oxidising agent and reducing agent:
  - $\text{H}_2\text{S} + \text{Br}_2 \longrightarrow 2\text{HBr} + \text{S}$
  - $\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$
  - $\text{Fe}_2\text{O}_3 + 3\text{CO} \xrightarrow[\text{light}]{\text{uv}} 2\text{Fe} + 3\text{CO}_2$
  - $\text{P}_4 + 5\text{O}_2 \longrightarrow \text{P}_4\text{O}_{10}$
- Name any four impurities present in hydrogen gas collected by the action of dilute sulphuric acid on granulated zinc.
  - Suggest the chemicals for the removal of such impurities.
- Name the substances required for the manufacture of hydrogen by Bosch process.
  - 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?
  - 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.  $\text{Mg} + 2\text{HCl} \longrightarrow \text{MgCl}_2 + \text{H}_2$                       2.  $2\text{Al} + 2\text{KOH} + 2\text{H}_2\text{O} \longrightarrow 2\text{KAlO}_2 + 3\text{H}_2$   
3.  $\text{Pb} + 2\text{NaOH} \longrightarrow \text{Na}_2\text{PbO}_2 + \text{H}_2$                       4.  $2\text{Al} + 3\text{H}_2\text{O} \longrightarrow \text{Al}_2\text{O}_3 + 3\text{H}_2$   
5.  $\text{C} + \text{H}_2\text{O} \longrightarrow \text{CO} + \text{H}_2$

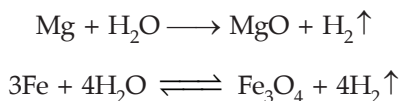
### D. Match the following.

- |  |                 |
|--|-----------------|
| 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.



3. a. Substance oxidised:  $\text{H}_2\text{S}$   
Substance reduced:  $\text{Br}_2$   
Oxidising agent:  $\text{Br}_2$   
Reducing agent:  $\text{H}_2\text{S}$   
b. Substance oxidised:  $\text{HCl}$   
Substance reduced:  $\text{MnO}_2$   
Oxidising agent:  $\text{MnO}_2$   
Reducing agent:  $\text{HCl}$

- c. Substance oxidised: CO  
 Substance reduced: Fe<sub>2</sub>O<sub>3</sub>  
 Oxidising agent: Fe<sub>2</sub>O<sub>3</sub>  
 Reducing agent: CO
- d. Substance oxidised: P<sub>4</sub>  
 Substance reduced: O<sub>2</sub>  
 Oxidising agent: O<sub>2</sub>  
 Reducing agent: P<sub>4</sub>
4. a. Following are the impurities present in hydrogen gas
- Phosphine (PH<sub>3</sub>)
  - Arsine (AsH<sub>3</sub>)
  - Hydrogen sulphide (H<sub>2</sub>S)
  - Nitrogen dioxide (NO<sub>2</sub>)
- b. Removal of impurities:
- Silver nitrate solution absorbs arsine and phosphine.
  - Lead nitrate solution absorbs hydrogen sulphide.
  - Potassium hydroxide or caustic potash absorbs nitrogen dioxide.
5. a. Coke, air and water.
- b. 
$$\underset{\text{Coke}}{\text{C}} + \text{H}_2\text{O} \longrightarrow \underbrace{\text{CO} + \text{H}_2}_{\text{Water gas}}$$
- $$\underbrace{\text{CO} + \text{H}_2}_{\text{Water gas}} + \text{H}_2\text{O} \longrightarrow \text{CO}_2 + 2\text{H}_2$$
- The reactions are endothermic.
- c. Carbon monoxide is removed by passing the above mixture, CO<sub>2</sub> + 2H<sub>2</sub>, through ammoniacal copper (I) chloride solution which absorbs carbon dioxide.
- $$\text{CO} + \text{CuCl} + 2\text{H}_2\text{O} \longrightarrow \text{CO} \cdot \text{CuCl} \cdot 2\text{H}_2\text{O}$$