**NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ INDEX NO\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**CLASS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**233/2**

**CHEMISTRY**

**PAPER 2**

**(THEORY)**

**2HRS**

**TERM 1 2014 F4**

**MWAKICAN JOINT EXAM TEAM (MJET) - TERM 1 2014**

**CHEMISTRY**

**PAPER 2**

**(THEORY)**

**2HRS**

**INSTRUCTIONS TO CANDITATES**

1. **Write your name and index number in the spaces provided above**
2. **Answer all the questions in the spaces provided in the question paper**
3. **Mathematical tables and silent electronic calculators may be used**
4. **All working must be clearly shown where necessary.**

**FOR EXAMINER’S USE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTIONS** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| **1** | **10** |  |
| **2** | **13** |  |
| **3** | **12** |  |
| **4** | **11** |  |
| **5** | **11** |  |
| **6** | **10** |  |
| **7** | **13** |  |
| **TOTAL SCORE** | **80** |  |

**This paper consist of 9 printed pages candidates should check the questions paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

1. Study the informatio given below and answer the questions that follow.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ELEMENT | ATOMIC RADIUS (nm) | Ionic radius (nm) | Formula of oxide | Melting point of oxide |
| A | 0.364 | 0.421 | A2O | -119 |
| D | 0.830 | 0.711 | DO2 | 837 |
| E | 0.592 | 0.485 | F2O3 | 1466 |
| G | 0.381 | 0.446 | G2O5 | 242 |
| J | 0.762 | 0.676 | JO | 1054 |

1. Which elements are nonmetals? Give a reason (2mks)
2. What type of bond exists between J and A (1mk)
3. Write the formula of the compound formed when J combines with A (1mk)
4. Explain why the melting point of the ocide of E is higher than that of the oxide of G. (2mks)
5. Give two elements that would react most vigously with each other. Explain your answer (2mks)
6. Which element may be suitable for making untensilx for boiling water? State the property that make the element suitable for this use. (2mks)
7. a) Two hydrocarbons compounds are represented by the formula C3H8 and C3H6
8. To which homologous series does each of them belong?

C3H8 ( ½ mk)

C3H6 ( ½ mk)

1. Describe a chemical test that could be used to distinguish between the two compounds above. (2mks)

b) The scheme below shows a series of reactions starting with ethanol. Study it and answer the questions that follow

Ethanol

CH3 COOH

CH2 =CH2

CH3 CH3

CH4

Compound x

Compound K

(-CH2 –CH2-) n

CH3 COONa

KmnO4 NaoH (aq)

Step I Step W

Step II

Excess Cl 2 U.VLight

1. Give the names of the reactions talking place in
2. Step I (1mk)
3. Step II (1mk)
4. Identify the reagent necessary for the reaction in Step W to take place (1mk)
5. Name compound K and state the type of reaction involved in its formation

Name------------------------------------------- ( ½ mk)

Type of reaction ------------------------------------------- ( ½ mk)

1. Give the name and the stuctural formula of compound X (2mks)

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1mk)

structural formula\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1mk)

1. If the relative molecular mass of K is 44800, determine the value of n (2mks)
2. What is the industrial importance of the reaction taking place in Step II (1mk)
3. State one use of compound K (1mk)
4. In an experiment, 1 g zinc powder was added to copper (II) Sulphate solution of volume 50cm3 in a plastic beaker after taking the initial temperature reading immediately the zinc powder was added the temperature was recorded after a time interval and the values recorded in the table below. Use the table and the data given to answer the questions that follow.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (minutes | 0 | ½ | 1 | 1 ½ | 2 | 2 ½ | 3 | 3 ½ | 4 | 4 ½ | 5 | 5 ½ | 6 | 6 ½ | 7 |
| Temperature (°C) | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 27 | 27 | 27 | 27 | 27 | 26.5 | 26 |

1. Plot a graph of temperature against item (3mks)
2. From the graph determine the highest temperature change (1mk)
3. Write an ionic equation for the reaction taking place. (1mk)
4. Draw an energy level diagram for the above reaction (2mks)
5. Calculate the amount of heat given out during the reaction specific heat capacity of the solution is 4.2Jg-1 k-1 and density is 1g/cm3) (2mks)
6. If the molar heat for the displacment displacement reaction is 209 KJ/mole, calculat
7. the moles of copper (II) Sulphate that reacted ( 1 ½ mks)
8. The molarity of the copper (II) Sulphate solution ( 1 ½ mks)
9. A mixture of iron fillings and sulphur was heated strongly. A red glow spread throughout the mixture and a black residue was formed. The cold residue reacts with dilute hydrochloric acid and a gas, which gives a black precipitate with lead (II) Nitrate solution was given off.
10. i) What did the red glow indicate (1mk)

ii) Identify the gas evolved when the black solid reacted with dilute hydrochloric acid (1mk)

iii) Write the formula of the black solid (1mk)

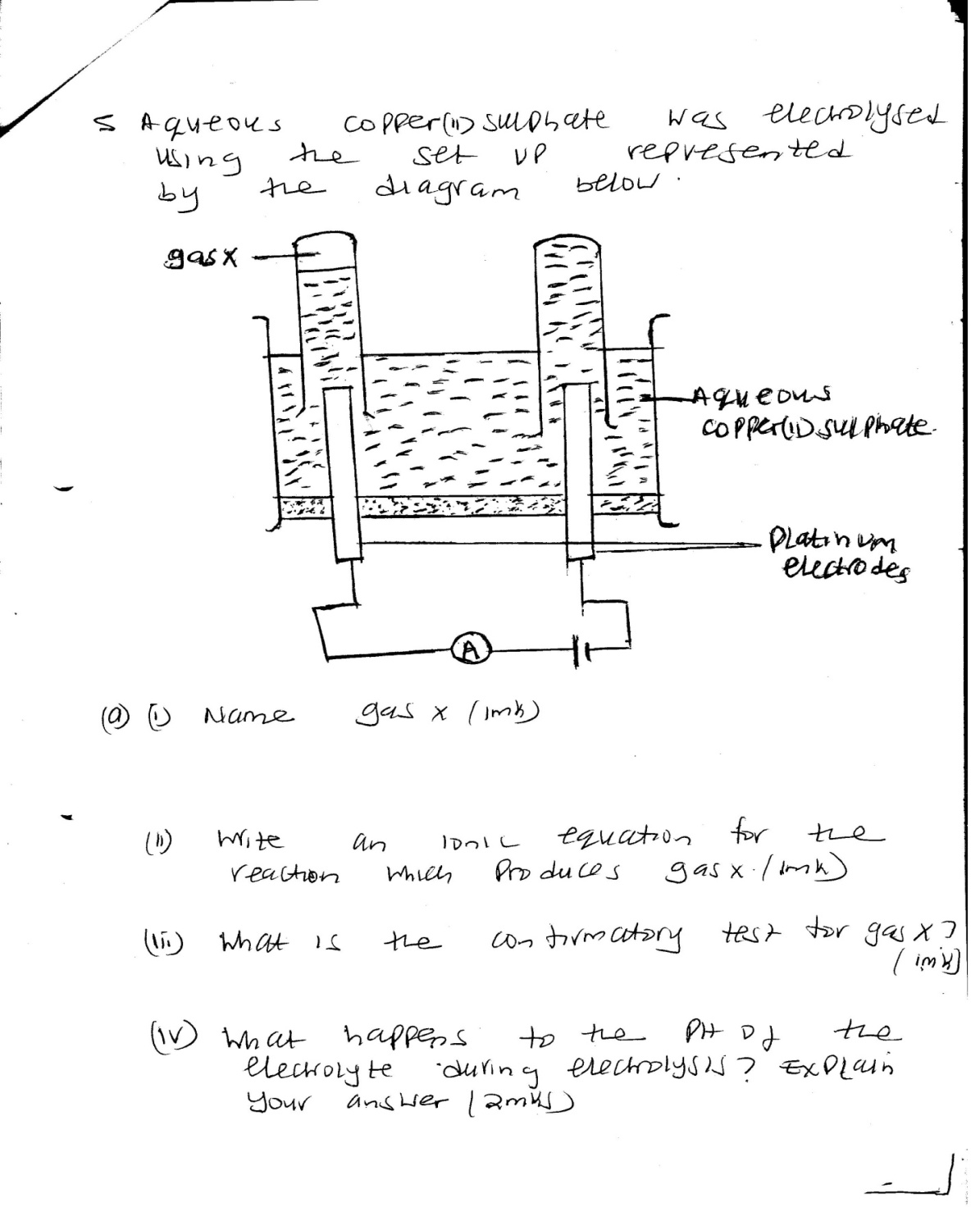
iv) State the observation made when the gas mentioned above is reacted with chroline gas. (1mk)

b) i) When chlorine gas is passed over heated iron wool, a chloride of iron is formed. Write an equation for the formation of the chloride (1mk)

ii) Calculate the mass of iron required to react completely with 0.12 litres of chlorine at room temperature and pressure. (Fe = 56, Cl=35.5, molar gas volume at r.t.p = 24dm3 ) (3mks)

iii) Calculate the amount of chloride of iron formed in (II) above (Fe – 56, Cl =35.5, molar gas volume at r.t.p = 24dm3) (3mks)

1. Aquesous copper (ii) sulphte was electrolysed using the set up represented by the diagram below.



1. i) Name gas x (1mk)

ii) Write an ionic equation for the reaction which produces gas x (1mk)

iii) What is the confirmatory test for gas x? (1mk)

iv) What happens to the PH of the electrolyte during electrolysis? Explain your answer (2mks)

1. If the above set-up copper electrodes were used instead of platinum electrodes, write the electrode half equations at the anode and cathode

Anode \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1mk)

Cathode \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1mk)

1. What happens to the colour ofl the electrolyte during electrolysis using platinum electrodes. Explain (2mks)
2. State two applications of electrolysis (2mks)
3. Study the flow chart below and answer the questions that follow

Colourless solution I

V residue

white PPt II

Colourless solution II

few drops of NaOH(aq) filter and heat

white PPt I

Dilute hydrochloric acid

warm

Residue V was Reddish brown when hot and yellow when cold

1. identify
2. White PPt. I (1mk)
3. the anion present in colourless solution II (1mk)
4. Residue V (1mk)
5. write an ionic equation for the reaction of colourless solution I with few drops of NaoH soution (1mk)
6. Write the observation that would be made when ammonia solution is added dropwise till in excess to the colourless solution I (1mk)
7. i) Define heat of solution (1mk)

ii) Use the information in th energy cycle diagram below to answer the questions that follow.

1. Give the name of the nergy represented by

H1 (1mk)

H2 (1mk)

1. Given that H1 =2237KJ Mol amd H3 = -2378KJ mol Calculate the value of H2 (2mks)
2. Use the flow chart below to answer the questions that follo

Brine

Q

Heat

R

Slaker T

Heat

S

Ammonia Ammoniated brine

Ammonia NH4Cl & NaHCO3

Cacl2 NH4Cl

water Substance Y NaHCO3

Water

Limestone

(CaCo3)

Substance X

Na2 Co3

1. i) Name the substances labelled

X ( ½ mk)

Y ( ½ mk)

ii) Name two subsances being recycled in the process reperesented by the flow chart.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( ½ mks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( ½ mk)

iii) Name the process that take plac in

S\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1mk)

R\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( 1mk)

iv) Give one use of calcium chloride (1mk)

v( Write the equations for the reactions takng place in

Q (1mk)

T (1mk)

1. Write an equation to show how sodium carbonate can be used to soften hardwater. (1mk)
2. Give another commercial use of sodium carbonate besides softening hard water. (1mk)
3. X grams sodium carbonate reacted completely with 30cm3 of dilute hydrochloric acid to produce 672cm3 of carbon (iv) oxide gas at S.T.P (1 mole of gas occupies 22.4dm3 at S.T.P) C =12.0, O = 16.0, Na = 23.0)
4. Write the equation for the reaction (1mk)
5. Calculate the concentration of the acid in moles pe litre (2mks)
6. Calculate the value of x (2mks)