NAME: ……………………………………………. ADM NO:…………………….…..

CLASS………………….. CANDIDATE’S SIGNATURE…………………

 DATE: ………………………………………….

**233/2**

**CHEMISTRY**

**Paper 2**

**Oct, 2024**

**Time: 2 Hours**

**MOI GIRLS’ HIGH SCHOOL – ELDORET**

**K.C.S.E Trial Examinations**

233/2

CHEMISTRY

Paper 2

Time: 2 Hours

**INSTRUCTIONS TO CANDIDATES**

* *Write your name and index number in the spaces provided.*
* *Answer* ***all*** *questions in the spaces provided*
* *Mathematical tables and silent electronic calculators* ***may*** *be used for calculations.*
* *All workings* ***must*** *be clearly shown where necessary.*
* *Paper contains* ***12 printed pages****. Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.*

**For Examiners Use Only**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum Score** | **Score** |
| 1 | 11 |  |
| 2 | 10 |  |
| 3 | 11 |  |
| 4 | 11 |  |
| 5 | 15 |  |
| 6 | 11 |  |
| 7 | 11 |  |
| **TOTAL** | **80** |  |

1. Study the periodic table below and use it to answer the questions below.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | E |
| D |  |  | C |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | F |  |
|  |  |  |  |  |  |  |  |  |

1. State the type of structure and the nature of the chloride of element C. (1 mark)

Structure: ……………………………………………………………………………

Nature: ………………………………………………...……………………………

1. Place the following element in the grid:
2. Element A whose ion is A3- and has configuration 2,8 (1 mark)
3. Element B with the lowest first ionization energy (1 mark)
4. The first ionization energies of two elements, D and C at random are 577kJ/mm and 494kJmol-1. Write equations for the 1st ionization energies for elements D and C and indicate their energies. (2 marks)

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1. Under the same conditions, gaseous element E was found to diffuse faster than Nitrogen. Explain this observation (2 marks)

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1. Using (•) and (x) to represent electrons, show bonding in the compounds formed when the following elements react;
2. Hydrogen and Sulphur (H=1, S=16) (1 mark)
3. Aluminum and oxygen (Al=13, O=8) (1 mark)
4. Using the structure of element F, distinguish between covalent bond and van der walls forces. (2 marks)

2. In an experiment to study the rate of reaction between **duralumin** (an alloy of aluminum magnesium and copper) and hydrochloric acid 0.5g of the alloy were reacted with excess 4M hydrochloric acid.

 The data in the table below was recorded. Use it to answer the questions that follow.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (minutes) | 0.0 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 |
| Volume of gas evolved | 0.0 | 220.0 | 410.0 | 540.0 | 620.0 | 640.0 | 640.0 | 640.0 |

 a)i) Plot a graph of total volume of gas produced against time (3 marks)



ii) From the graph, determine the volume of the gas produced at the end of 2½ minutes. (1 mark)

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b) Determine the rate of reaction between the 3rd and 4th minute (1 mark)

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c) Give a reason why some solid remained at the end of the experiment

 (2 marks)

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d) Given that 2.5cm3 of the total volume of gas was from the reaction between magnesium and hydrochloric acid. Calculate the percentage by mass of aluminum present in 0.5g of the alloy. Al=27, M.G.V=24000cm3)

 (2 marks)

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3. a) Use the standard electrode potentials in the table below and answer questions that follow. Letters are not actual symbols.

|  |  |  |
| --- | --- | --- |
| Number | Half cell reactions | EƟ(V) |
| I | 2A+(aq) + 2e- A2(g) | 0.00 |
| II | B2+(aq) + 2e- B(s) | -0.76b |
| III | C+(aq) + e- C(s) | +0.52 |
| IV | D3+(aq) + e- D2+(aq) | +0.77 |
| V | E2+(aq) + 2e- E(s) | -0.19 |
| VI | F2+(g) + 2e- F(s) | +0.34 |

1. Write cell representation for the two half cells when combined gives the lowest e.m.f. (1 mark)

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ii) An electrochemical cell is formed when half cells of number IV and II are combined.

 I Draw a well labelled diagram for the electrochemical cell formed.

 (3 marks)

 II Write the equation for the cell reaction (1 mark)

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iii) predict whether the reaction below can take place (2 marks)

 B2+(aq) + E(s) E2+(aq) + B(s)

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b) The figure below shows a cell used to electrolyze dilute aqueous magnesium sulphate

 I Identify gas Y (1 mark)

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 II Write the equation for formation of gas X (1 mark)

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 III Comment on the change in the concentration of the solution (1 mark)

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 IV State one application of electrolysis (1 mark)

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4. Study the scheme below and then answer the questions that follow.

Concentrated ore chamber I

Powdered ore

Copper ore

B

 Grind Mixed with water

 Step I oil and air Process II

 Roasting

 Step III

Air

 Gas A Gas A

FeSiO3 (slag)

Blister copper

Chamber III

Substance C

Brown liquid D

 Step IV Roasting Cu2S SiO2

 Step VI

1. Write the formula of major copper ore B ……………………………….. (1 mark)
2. Name the process II (1 mark)

………………………………………………………………………………………

1. Identify Gas A (1 mark)

………………………………………………………………………………………

1. Write an equation for the reaction of substance C with copper (I) sulphide in step IV (1 mark)

………………………………………………………………………………………

1. State one environmental hazard associated with the process involved in the above scheme (1 mark)

………………………………………………………………………………………

f)i) Draw a simple diagram showing a set-up that is used in electrolytic . purification of copper (2 marks)

 ii) Write half-equation for the reaction at the anode in set up above (1 mark)

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g) A green rocky material is suspected to be ore Pyrites. Describe how presence of copper(II) ions in the ore can be confirmed. (3 marks)

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5. Study the scheme below and answer the question.

Gas Q + liquid P

Water + reagent

 Limited air

 Liquid p Step IX step I

H-C = C-CI

 H H

H – C = C - H

 Step VIII step III Step V

 Excess air substance

Gas L Step II H2 N

H-C = C-H

 H H

 KmnO4/H+ Step VI

R Polymer K

 Step IV

Ethanol

1. Name reagents used in; (2 marks)

Step I …………………………………………………………………………..

Step II ………………………………………………………………………….

Step III …………………………………………………………………………

Step IV …………………………………………………………………………

1. Identify substances (3 marks)

L ………………………………………… P ……………………………………

Q ………………………………………... N ……………………………………

K ………………………………………… R ……………………………………

1. Draw structural formulae for (2 marks)

R

K

1. The structures represents two cleansing agents

R – COO-Na+

R – OSO3-Na+

Give one advantage and one disadvantage of using each one of them. (2 marks)

|  |  |  |
| --- | --- | --- |
| Detergent  | Advantage | Disadvantage  |
| R-COO-Na+ |  |  |
| R-OSO3-Na+ |  |  |

1. Ethanol reacts with ethanoic acid under certain conditions to form a pleasant compound.
2. What is the general name of the compounds to which the pleasant compound belong. (1 mark)

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1. Write the formula of the pleasant smelling compound (1 mark)

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1. When the alkane, hexane is heated to high temperature, one of the products is ethane.
2. Write the equation for the reaction (1 mark)

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1. Name the process described in (i) (1 mark)

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1. State observation made when propanol reacts with;
2. Acidified potassium dichromate VI solution (1 mark)

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1. Sodium metal (1 mark)

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6. A student of Moi Girls’ High school carried out an experiment to determine molar heat of neutralization of hydrochloric acid and sodium hydroxide solutions. They reacted 25cm3 of 0.3M hydrochloric acid with 25cm3 of 0.3M sodium hydroxide solution and obtained the following results.

 Mass of plastic container = 45.0g

 Initial temperature of acid = 24.0°C

 Initial temperature of alkali = 24.0°C

 Mass of the container and acid-alkali mixture = 95.0g

 Final temperature of the acid-alkali mixture = 28°C

 Density of water = 1g/cm3

 Specific heat capacity of water = 4.2kJ/kg/k

 a)i) what is meant by the term molar heat neutralization (1 mark)

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 ii) Why should the plastic beaker be covered with a tissue paper (1 mark)

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iii) Write an ionic equation for the neutralization of hydrochloric acid by sodium hydroxide (1 mark)

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iv) Calculate the heat evolved in the reaction (2 marks)

v) Determine molar heat of neutralization for the reaction (2 marks)

vi) Draw a well labelled energy-level diagram for the reaction (1 mark)

b) Explain why molar heat of neutralization of a strong base and a weak acid is less than that of a strong base with a strong acid. (2 marks)

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c) State **two** factors that should be considered when choosing a fuel (2 marks)

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7. a) Sulphur has two allotropes, their transition temperature is 96°C. Study the flowchart below and answer questions that follow.

 Above 96°C

Allotrope B

Allotrope A

Gas E

Black solid

 Below 96°C

 Step I hot concentrated Step II Iron powder

 Nitric (V) acid and heat

 dilute

Brown gas + solution D + water

 HCl

1. Name the identity of: (3 marks)

I Allotrope A …………………………………………………………..

II Allotrope B ………………………………………………………….

III Solution D …………………………………………………………..

1. Write the chemical equation for formation of gas E (1 mark)

………………………………………………………………………………………

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1. Describe a test that can be done to confirm water in step I is pure (2 marks)

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b) The set-up below shows preparation of Sulphur (VI) oxide gas. Study it and answer questions that follow.

1. Identify;

I Gas B ………………………………………………….. (1 mark)

II Solid P ………………………………………………….. (1 mark)

1. Write a chemical equation to show that reaction that occurs in the combustion tube. (1 mark)

………………………………………………………………………………………

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1. What is the significance of;

I passing oxygen and gas B through concentrated sulphuric (VI) acid before passing over substance P (1 mark)

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II Connecting Guard tube to boiling tube containing crystals of sulphuric (VI) oxide gas. (1 mark)

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