**Term 2 - 2024**

**CHEMISTRY PP 2**

**FORM FOUR (4)**

**Name**: …………………………………………………………. **Adm** **No**: ……………….

**School**: ……………………………………………………….. **Class**: …………………..

**Signature**: …………………………………………………….. **Date**: …………………...

**233/2**

**Time:2 hours**

**INSTRUCTIONS TO CANDIDATES:**

* *Answer* ***all*** *the questions in the spaces provided.*
* *Write* ***your******Name*** *and* ***Index Number*** *in the spaces provided above.*
* *Mathematical tables and electronic calculators may be used for calculations.*
* *All working* ***must*** *be clearly shown where necessary*

**For Examiner’s Use only.**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| 1 | 12 |  |
| 2 | 13 |  |
| 3 | 13 |  |
| 4 | 12 |  |
| 5 | 11 |  |
| 6 | 11 |  |
| 7 | 08 |  |
| **Total score** | **80** |  |

*This paper consists of* ***14*** *printed pages. Candidates should check the questions to ascertain that all the pages are printed as indicated and no questions are missing.*

**1**. (a) Draw the structures of;

(i) the second member of the alkyne homologous series ; (1 mark)

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(ii) heptanoic acid; (1 mark)

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(iii) 1-butanol. (1 mark)

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(b) State and explain how ethanol could be distinguished from ethanoic acid (2 marks)

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(c) Use the information in the scheme below to answer the questions that follow.

**Compound I**

**Acidified potassium manganate (VII)**

**Step II**

**Ethanol**

**Water and carbon (IV) oxide**

**Step I**

**sodium**

**Products**

**Step III**

**Step IV**

**Ethene**

**Bromine water**

**Step V**

**Step VI**

**Compound J**

**Ethane**

(i) give the name of ;

(I) compound **I** (1 mark)

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(II) compound **J**  (1 mark) ………...................................................................................................................

(ii) Give the name of the reaction which occurs in step **III** (1 mark)

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(iii) Write the equation for the chemical reaction in step **I** (1 mark)

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(iv) Name the reagent and conditions necessary for the reaction step **V**

Reagent (1 mark)

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Condition (s) (1 mark)

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(v) State the observations made in step **II** (1 mark)

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**2.** (a) The diagram below represents the industrial process for the manufacture of ammonia.

Study it and answer the questions that follow.

**Ammonia**

**Catalytic chamber**

**Heat Exchanger**

**Purifier**

**Compressor**

**unreacted gases**

**Condenser**

**Liquid ammonia**

**10%**

**ammonia**

(i) Give the name of the catalyst used in the above process (1 mark)

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(ii) State **two** impurities removed in the purifier. (1 mark)

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(iii) state the other optimum temperature and pressure for this process . (2 marks)

Optimum temperature…………………………………………………..………

Optimum pressure……………………………………………………………….

(iv) Proper ventilation is important when using cleaning products that contain ammonia. Explain why this is important. (2 marks)

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(b) Ammonium nitrate can be prepared by reacting ammonia and dilute nitric (V) acid.

(i) Write an equation for the reaction which occurs. (1 mark)

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(ii) Determine the mass of ammonium nitrate formed in b (i) above given that 720 liters of ammonia was used.( N=14, O=16, Molar gas volume = 24 000 cm3 (4 marks)

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(c) State and explain what would be observed when aqueous ammonia is added dropwise until in excess to a solution of zinc nitrate. (2 marks)

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**3.** The grid below shows part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | | | |  |
| **A** |  |  |  |  |  |  |  | **B** |
|  |  |  | **C** |  | **D** |  | **E** |  |
| **F** | **G** |  |  |  |  | **H** |  |
|  |  |  |  |  |  |  |  |

1. Which element forms an ion of charge - 3? Explain your answer (2 marks)

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1. What is the nature of the oxide formed by element **C**? (1 mark)

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1. Which is the least reactive element? Explain. (2 marks)

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1. Write the chemical equation for the reaction between **F** and water? (1 mark)

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1. How the atomic radii **C** and **E** compare?  (1 mark)

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1. The oxide of **A** is dissolved in water. State, with a reason the most likely pH of the resulting solution. (2 marks)

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1. 22.5 cm3 of a solution of a hydroxide of **F** completely neutralizes 20.0 cm3 of a dibasic acid whose concentration is 0.2 moles per litre. Calculate the concentration of hydroxide of **F** in moles per litre. (3 marks)

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(h) What name is given to the family of **G**? (1 mark)

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**4**. (a) The table below shows the standard reduction potentials for four half cells. Study it and

answer the questions that follow.

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| **Number** | **Half -reaction** | **E0volts** |
| I | Ag+ (aq) + 2ē Ag (s) | + 0.80 |
| II | Cu2+(aq) + 2ē Cu (s) | + 0.34 |
| III | Pb2+(aq)  + 2ē Pb (s) | - 0.13 |
| IV | Zn 2+(aq)+ 2ē Zn (s) | - 0.76 |

1. Identify the strongest reducing agent (1 mark)

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(ii) Predict whether or not a solution of copper (II) nitrate can be stored in a container made of lead (2 marks)

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(iii) In the space provided, draw a labeled diagram of the electrochemical cell that would give the highest emf.

(3 marks)

(iv) Calculate the Eof the electrochemical cell constructed in (iii) above.(1 mark)

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(b) During the electrolysis of aqueous silver nitrate using silver electrodes, a current of 1.2 amperes was passed through the electrolytic cell for 6 hours and 50 minutes.

(i) Write an ionic equation for the reaction that took place at the anode.(1 mark)

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ii) Determine the change in mass at the anode which occurred as a result of the

electrolysis process. (Ag=108 1 F = 96,500C) (3 marks)

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(c) State **one** application of electrolysis other than extraction of metals (1 mark)

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**5**. (a) What is activation energy? (1 mark)

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(b) Oxygen may be prepared in the laboratory by decomposition of hydrogen peroxide using a certain catalyst.

(i) Name the catalyst used; (1 mark)

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(ii) State and explain the effect of the catalyst named in b (i) on the rate of production of oxygen. (1 mark)

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(iii) On the axes below sketch a graph of catalyzed and uncatalysed decomposition of hydrogen peroxide. Label the curves. (2 marks)

**Volume of**

**Oxygen (cm3)**

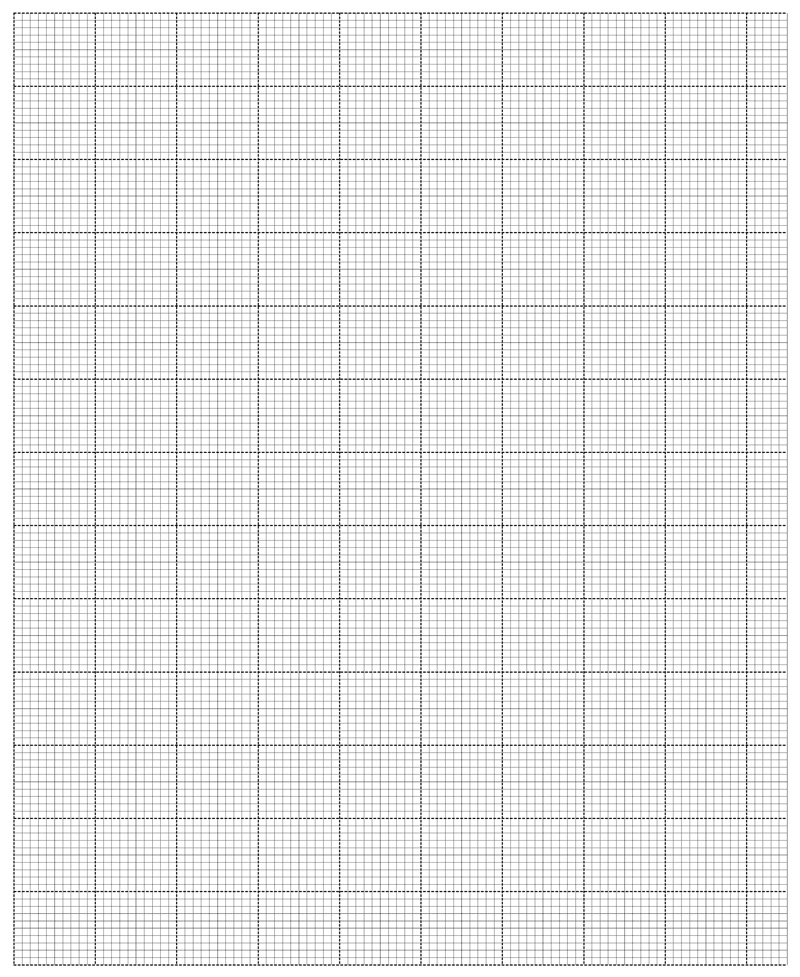
**Time (s)**

(c) 100 cm3 of 0.5 M hydrochloric acid was reacted with a clean 20 millimeters magnesium ribbon. The volume of hydrogen evolved was measured and recorded at 10 seconds interval. The results were recorded as shown in the table below.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **volume of gas ( cm3)** | 0 | 24 | 38 | 48 | 52 | 53 | 53 | 53 |
| **Time in seconds** | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |

(i) (I) On the grid provided, plot a graph of volume (vertical axis) against time.

Label it as **K** (3 marks)



(II) From your graph, determine the rate of reaction between at 38th second.

(2 marks)

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(iii) On the same grid, sketch a curve that would be obtained if the same experiment was repeated using excess 0.8 M hydrochloric acid. Label it as **L**. (l mark)

**6**. (a) (i) Name and give the formula of **two** ores from which copper is extracted.(2 marks)

**Ore Formula**

I…………………………… …………………..

II…………………………. …………………..

(ii) During extraction of copper, the ore is first crushed into fine powder and then concentrated by froth flotation. Why this is important? (1 mark)

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1. One of the gases evolved during copper extraction is sulphur (IV) oxide.

Give **two** ways of preventing the gas from escaping to the atmosphere.

(2 marks)

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(iii) Blister copper is impure copper which is about 97.5 % pure. To obtain pure copper from blister copper electrolysis is done. Draw a set up that can be used to purify copper. (3 marks)

(iv) Give **two** uses of copper (2 marks)

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(v) State **one** way in which the extraction of copper causes environmental pollution. (1 mark)

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**7** (a) Study the flow chart below and answer the questions that follow.

Solid **N**

Solution **P** and Colourlessgas **Q**

Water

**Step I**

2 drops of aqueous sodium hydroxide

**Step II**

White precipitate **S**

Excess aqueous sodium hydroxide

**Step III**

White precipitate **S**

(i) Identify;

I solid **N**  (1 mark)

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II Colourless gas **Q** (1 mark)

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(ii) Give the formula of white precipitate **S** (1 mark)

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(iii) Write the ionic equation for the reaction in step **II** (1 mark)

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(iv) Give **one** use of solution **P** (2 marks)

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(b) Calculate the number of nitrate ions present in 25.0 cm3 of 0.80 M aluminium nitrate solution.(L = 6.0×1023) (3 marks)

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