**NAME……………………………………………………………..**

**233/2**

**Paper 2**

**(THEORY)**

**2 hours**

**FORM THREE**

**ELERAI MCK GIRLS SECONDARY SCHOOL**

**Kenya Certificate of Secondary Education**

**233/2**

**CHEMISTRY**

**Paper 2**

**2 hours**

**Instructions to candidates:**

• Write your **Name** and **Index number** in the spaces provided **above**.

• **Sign** and write the **date** of examination in the spaces provided **above**.

• Answer **ALL** the questions in the spaces provided in the question paper.

• All working **must be** clearly shown where necessary.

• Electronic calculators and Mathematical tables **may be** used.

**For Examiner’s Use Only**

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| --- | --- | --- |
| **Questions** | **Maximum Score** | **Candidate’s Score** |
| **1** | **10** |  |
| **2** | **11** |  |
| **3** | **12** |  |
| **4** | **12** |  |
| **5** | **12** |  |
| **6** | **12** |  |
| **7** | **11** |  |
| **Total Score** | **80** |  |

1. (a) Below is an incomplete diagram of a set-up of the apparatus used to obtain nitrogen gas

from the air.

Water →

in

Heat

Aspirator

Water

Potassium hydroxide solution

Zinc W

(i) Complete the diagram to show how nitrogen gas is collected. (1mk)

1. State the role of the following:

I Water entering the aspirator. (1mk)

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II Potassium hydroxide solution. (1mk)

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(iii) Write a chemical equation for the reaction that takes place in combustion tube W. (1mk)

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(iv) Nitrogen obtained using the above set-up is not pure. Name **one** major impurity present.(1mk)

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1. If pure nitrogen gas is required, the process in (a) above is modified as represented by the flowchart below. Study it and answer the questions that follow.

Air

KOH(aq)

Liquid air

Process T

Chamber S

Cool to -25°C

Pure nitrogen

U

V

1. Give the identity of:

I Process **T**. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1mk)

II Substances **:** (1mk)

**U** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**V** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(ii) Briefly describe how air is liquefied in chamber S. (2mks)

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(c) State **one** industrial use of nitrogen gas. (1mk)

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2. (a) The electron arrangements of ions A3+ and B2- are 2.8 and 2.8.8 respectively.

Write down the electron arrangement of the elements A and B. (2mks)

**A**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**B** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) Study the information in the table below and answer the questions that follow. The letters are not the actual symbols of the elements.

|  |  |  |
| --- | --- | --- |
| Element | Atomic number | Boiling point (ºC) |
| K | 3 | 1333 |
| L | 13 | 2470 |
| M | 16 | 445 |
| N | 18 | -186 |
| P | 19 | 774 |

1. Which element

I is a gas at room temperature? Explain, taking room temperature as 25ºC. (1½mks)

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II does not form an oxide? Explain. (1mk)

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3. (a) The diagram below represents a set-up intended for the preparation and collection of dry

chlorine gas. Study it and answer the questions that follow.

Manganese

(IV) oxide

Heat

Calcium oxide

Chlorine

Conc. HCl(aq)

(i) Identify **two** mistakes in the set-up and give a reason for each. (2mks)

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(ii) State the role of manganese (IV) oxide. (1mk)

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(b) Chlorine, in the presence of water, is a bleaching agent. Name the substance responsible for the

bleaching action. (1mk)

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(c) Write down an equation for the reaction between dry chlorine and heated iron filings. (1mk)

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(d) Write an ionic equation for the reaction between potassium bromide solution and chlorine. (1mk)

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II (a) Give **two** differences between diamond and graphite. (2mks)

|  |  |
| --- | --- |
| Diamond | Graphite |
|  |  |
|  |  |

(b) Carbon reacts with hot concentrated sulphuric (VI) acid.

(i) What property of carbon is illustrated by this reaction? (1mk)

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(ii) Write down an equation for this reaction. (1mk)

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(c) Carbon (IV) oxide is bubbled into an aqueous solution of sodium hydroxide until it is in excess. A

sample of the resulting solution is heated to dryness in an evaporating dish.

(i) Identify the residue formed. (1mk)

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(ii) Write an equation for the reaction that forms the residue. (1mk)

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**4**. The table below shows the position of the elements in the periodic table. The letters are not the actual symbols of the element.



1. Select an element that can form an ion with a charge of ±2. Explain your answer 2**mark**s

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1. What type of structure would the oxide of C have? Explain your answer 2**mark**s

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1. How does the reactivity of H compare with that of E? Explain your answer 2**mark**s

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1. Explain how you would expect the following to compare
   1. Atomic radius of F and G 1**mark**

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* 1. The pH values of aqueous solutions of the oxide of B and D 1**mark**

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1. Which of the elements is a solid at room temperature? 1**mark**

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1. Draw a diagram to represent an ion of element D 2**mark**s

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**5.** Give the names of the following compounds

1. (i) H H H H H

H - C - C - C - C = C - C - H 1**mark**

H H H CH3 H

………………………………………………………………………………………………………………

(ii)



1**mark**

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1. Study the information in the table below and answer the questions that follow.

|  |  |  |  |
| --- | --- | --- | --- |
| Number of carbon atoms per molecule | 2 | 3 | 4 |
| Relative molecular mass of hydro carbon | 28 | 42 | 56 |

1. Predict the relative formula mass of the hydrocarbon with 5 carbons atoms 1**mark**

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1. Write the general formula of the hydro-carbons in the table 1**mark**

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iii. Draw the structural formula of the hydrocarbon with six carbon atoms 1**mark**

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

**Step I**



1. Name the reagents used in
   1. Step I 1**mark**

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* 1. Step II 1**mark**

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* 1. Step IV 1**mark**

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1. Write an equation for the complete combustion of CH ≅ CH 1**mark**

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1. Explain one disadvantage of the continued use of items made from the compound formed in step III 1**mark**

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**6.** Crystals of hydrated copper (II) sulphate can be prepared using the following procedure. An excess quantity of copper (II) carbonate is added to 100cm3 of 2.0m H2SO4 in a beaker and the mixture is warmed until no further reaction takes place. The mixture is filtered and the filtrate is evaporated until the volume is about 25cm3. The liquid is allowed to cool and the crystals are separated, dried and weighted.

1. Write an equation for the reaction taking place 1**mark**

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1. Why is excess copper (II) carbonate used? 1**mark**

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1. How can you tell whether the reaction has stopped? 1**mark**

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1. Why is it necessary to filter when the reaction has stopped? 1**mark**

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1. Why is the filtrate not evaporated to dryness? 1**mark**

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1. What is the maximum mass of copper (II) sulphate that could be formed from 100cm3 of 2.0M H2SO4? (Cu=64, S=32, O=16)` 3**mark**s

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1. A similar method would be unsuitable for the preparation of lead (II) sulphate. Give reason why? 2**mark**s

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1. It was found out that in the actual preparation the mass of crystals obtained was much less than the maximum mass calculated in (h) above. Explain why? 1**mark**

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**7.** The figure below shows the stages involved in manufacture of compound Z by Solvay process. Study the diagram and answer the questions that follow.







i) Identify compound Z 1**mark**

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ii) Name the three starting materials in this process 1**mark**

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1. Name two substances recycled and state the chambers in which they are regenerated 2**mark**s

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1. Name the substances X and Y 2**mark**s

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1. Give the equations of the reactions which occur in
   1. Chamber II 1**mark**

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* 1. Chamber III 1**mark**

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1. State two commercial uses for compound Y 2**mark**s

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1. Name the by product that can be regarded as a waste in this process. 1**mark**

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8.Use the following information on substances STV and hydrogen to answer the question that follow.

1. T displaces V from a solution containing V ions
2. Hydrogen reacts with the heated oxide of S but has no effect on heated oxide of V.
3. Arrange substance STV and hydrogen in order of increasing reactivity (2mks)
4. Using dots (.) and crosses (x) to represent electrons, draw diagrams to represent the bonding in

i)NH3 (2mks)

ii)NH4

1. State why an ammonia molecule NH3 can combine with H+ to form NH4+ (atomic numbers N = 7 and H=1 (1mk)

9.Explain why the following substances conduct an electric current

1. Magnesium metal (1mk)
2. Molten magnesium chloride (1mk)

c)Explain why burning magnesium continuous to burn in a gas jar containing sulphur- dioxide while a burning splint is extinguished (3mks)

d)What observation would be made if hydrogen sulphide gas was bubbled through a solution of zinc nitrate (1mk)

e)Write equation for the reaction that takes place in (a) above (2mks)