**Name………………………………………………… Index number………………………….…**

Class………………………………….…….. Date…………………………………

**233/2**

**CHEMISTRY**

**PAPER 2**

**JULY/AUG 2024**

**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.*
* *Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.*

**NAKURU NORTH SUB -COUNTY JOINT MOCK 2024**

**Kenya Certificate of Secondary Education**

**CHEMISTRY**

**PAPER 2**

|  |  |  |
| --- | --- | --- |
| **QUESTIONS** | **MAX. SCORE** | **CANDIDATE’S SCORE** |
| 1 | 12 |  |
| 2 | 13 |  |
| 3 | 10 |  |
| 4 | 13 |  |
| 5 | 12 |  |
| 6 | 11 |  |
| 7 | 9 |  |
| **TOTAL** | 80 |  |

***This paper consists of 11 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no pages are missing.***

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

 ****

1. Name I gas P

**II** gas Q

**III** Substance J (1½ mks)

1. Give the most probable structural formula of product T (1 mk)

I. Name reaction producing substance labeled N (1mk)

1. State the characteristic property of N (1mk)
2. Complete the table below.

|  |  |  |
| --- | --- | --- |
| **Reaction** | **Reagents** | **Condition** |
| **W** |  |  |
| **Z** |  |  |
| **V** |  |  |

 (3mks)

1. I. Name the organic product of reaction U (½mk)

II Write the equation for the reaction represented by U (1mk)

1. What is the specific name of process Y? (½mk)
2. What is the type of reaction represented by Z? (½mk)

 h. Give two reasons why ethanoic acid has a higher melting point than ethanol when both of them have two carbon atoms. (2 mks)

|  |
| --- |
|  |

**2**. (a) State Hess’s law. (1 mark)

1. Use the following information to answer the questions that follow:

C(S) + O2(g) → CO2(g) ΔH = -393KJ/mol

H2(g) +  → H2O(g) ΔH = -296KJ/mol

C4 H10 +  → 4CO2(g)+ 5H2O ΔH = -2877KJ/mol

(i) Draw an energy cycle diagram relating heat of formation and combustion of butane. (2 marks)

(ii) Calculate the heat of formation of butane. (3 marks)

 (c) Distinguish between hydration energy and lattice energy. (2 marks)

(d) The diagram below shows an energy level diagram for the formation of magnesium chloride. Study it and answer the questions that follow.

Energy

MgCl2(S)





ΔHB

ΔHA

ΔHC

1. State the enthalpy changes represented by

A (½ mark)

B (½ mark)

C (½ mark)

 (ii)What is the relationship between ΔH A, ΔHBA and ΔH C . (½ mark)

 (e) (i) Define heat value of a fuel. (1 mark)

1. Give **two** reasons why wood and charcoal are chosen for domestic heating. (2marks

**3.** a) Sulphur is mined using the frasch process which uses superheated water at 170$℃$ and hot compressed air.

 i) Explain how water at 170$℃$ is obtained. (1 mark)

 ii) What is the role of superheated water? (1 mark)

 iii) State the role of compressed air. (1 mark)

b) In an experiment, 3.6g of sulphur were obtained by reacting sulphide with sulphur (IV) oxide as shown in the equation below.

 2H2S (g) + SO2 (g) 2H2O (l) + 3S(s)

Given that the yield of sulphur is 75%. Calculate the volume of SO2 Used at room temperature and pressure. (H = 1, S = 32, O = 16, Molar gas volume at r.t.p is 24dm3) (3 marks)

c) Study the flow chart below and answer the questions that follow.



1. Other than sulphur, name **two** other possible identities of solid A. (1 mark)

ii) Write an ionic equation for the formation of the white precipitate. (1 mark)

iii) State and explain the observation made when dilute hydrochloric acid is mixed with the white precipitate. (1 mark)

iv) State and explain the observation made when blue litmus papers were dipped into solution L. (1 mark)

**4.** Use the table below to answer the questions that follow. (The letters are not actual symbols of the elements)

|  |  |  |
| --- | --- | --- |
| **Element** | **Atomic number** | **M.P (0C)** |
| ABCDE | 1113141719 | 97.86601410-10163.7 |

 a) Select an element which is

 i) A poor conductor of electricity. (l mk)

 ii) The most reactive non-metal. (1 mk)

b) To which period of the periodic table does element E belong? (l mk)

c) Element E losses its outermost electron more readily than A. Explain. ( 2mks)

e) Use dots (•) and crosses (**x)** to represent the valence electrons and show the bonding in the compound formed between element **C** and **D**. (2mks)

 (f) Explain why the melting point of element **B** is higher than that of element **A** (2mks)

 (g) Write an equation for the reaction that takes place between element **A** and **water**. (1 mk)

 h) Describe how a solid mixture of the sulphate of element **E** and **Lead (II) sulphate** can be separated into solid samples. (3mks)

**5.** a) Iron is obtained from haematite using a blast furnace shown below. Study it and answer the

 questions that follow.

Raw materials (Haematite)

Hot Air

Molten iron

Hot air

Slag

2300 C

4700C

 Y 17900C Y

1. Four raw materials are required for the production of iron. Three of these are haematite, hot air and coke. Give the name of the fourth raw material and its use. (1 mark)

I Name

II Use

1. Name another Iron ore other than the one shown in the blast furnace. (1 mark)
2. State one physical property of slag other than density that allows it to be separated from molten Iron as shown in the figure. (1 mark)
3. Iron from the blast furnace contains about 5% carbon.

I. Describe how the carbon content is reduced. (1 mark)

II. Why is it necessary to reduce the carbon content? (1 mark)

1. Explain why temperature in the region marked Y is higher than that of the incoming hot air (1 mark)
2. Describe the process which led to the formation of iron in the blast furnace (3 mark)

1. Give a reason why the melting point of the Iron obtained from the blast furnace is 12000C while that of pure iron is 15350C (1 mark)
2. One of the components of the waste gases is Nitrogen (IV) oxide. Describe the adverse effects it has on the environment. (2 marks)

**6.** The equation below is for the manufacture of ethanol by direct hydration of ethane.

**H2O (g) +C2H4 (g  C2H3OH (g) H= -46kJmol-1**

1. State the effect an increased in pressure will have on the equilibrium yield of ethanol and give a reason for your answer. (2mks)

(b) In an experiment, excess solid calcium carbonate was added to 100cm3 of 0.2M hydrochloric acid at

 20oC . The volume of carbon (IV) oxide produced was measured at regular time interval. The results of

 the experiment are as shown in the table below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (seconds) | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| Volume of carbon(IV)oxide(cm3) | 0 | 18 | 30 | 40 | 48 | 53 | 57 | 58 | 58 | 58 | 58 |

1. Draw a diagram of suitable apparatus for the experiment. (2mks)
2. On the grid provided plot of volume of CO2 produced against time. (3mks)
3. On the grid plot a graph you would expect if the acid was kept at 30oC. (1mk)
4. What is the rate of reaction if the volume of hydrogen per minute between 4th and 5thsecond(1mk)
5. Other than raising the temperature state two ways by which the rate of reaction would be increased. (2mks)

**7.** Use standard potential for elements G, M, N,P and Q given below to answer the questions that

 follow.

 Eθ volts

 G+ (aq) + e- G(s) -2.71

 M2+ (aq) + 2e- M(s) -2.37

 2N+ (aq) + 2e- N2(g) 0.00

 P2+ (aq) + 2e- P(s) +0.34

 ½ O2 (g) + e- Q (g) +2.87

(a) (i) Which element is likely to be hydrogen? Give a reason to your answer. (2mks)

 (ii) What is the Eθ of the strongest oxidizing agent? (1mk)

 (iii) Calculate the Eθ value of the electric chemical cell constructed using M and P. (2mks)

(b) During the electrolysis of aqueous copper (II) sulphate using copper electrodes a current of 0.8 amperes

 was passed through the cell for 10hours.

 (i) Write ionic equation for the reactions that took place at the cathode. (1mk)

 (ii) Determine the change in mass of the anode which occurred as a result of the electrolysis process. (Cu = 63.5, 1 Faraday = 96500 Coulombs) (3mks)