**Name………………………………………………………. Class…………….**

**Adm. No……………Index No…………………………….Date ………………**

**Candidate’s Signature………………………..**

233/2

**CHEMISTRY**

Paper 2

**Time: 2 Hours**

**END OF TERM TWO FORM 4 EXAMINATION 2019**

## INSTRUCTIONS TO CANDIDATES

1. Write your name and admission number in the spaces provided above.

2. Sign and write the date of the examination in space provided.

3. Answer ALL the questions in the spaces provided in the question paper.

4. All working MUST be clearly shown where necessary.

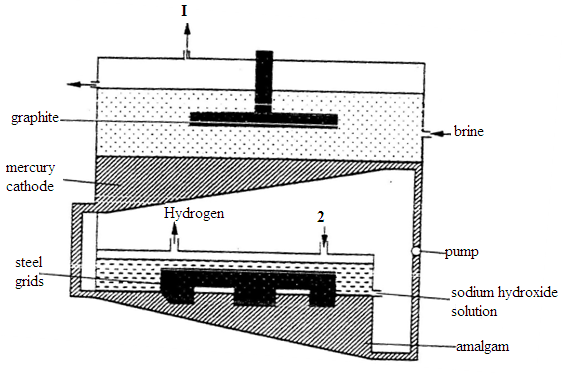
5. Mathematical tables and silent electronic calculators may be used.

6. This paper consists of 10 printed pages. Candidates should confirm this.

**FOR EXAMINER’S USE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| **1** | **10** |  |
| **2** | **14** |  |
| **3** | **8** |  |
| **4** | **11** |  |
| **5** | **13** |  |
| **6** | **12** |  |
| **7** | **12** |  |
| **TOTAL SCORE** | **80** |  |

1. The diagram below represents a mercury cell that can be used in the industrial manufacture of sodium hydroxide. Study it and answer the questions that follow



(a) (i) Name

I. the raw material introduced at 2. (1mk)

II. Another substance that can be used in the cell instead of graphite. (1mk)

(ii) Identify the by – product that comes out at I. (1mk)

(iii) Give

I. One use of sodium hydroxide. (1mk)

II. Two reasons why mercury is recycled. (2mks)

(b) A current of 100 amperes was passed through the cell for five ( 5) hours

(i) Write the equation for the reaction that occurred at the mercury cathode. (1mk)

(ii) Calculate the mass of sodium hydroxide that was produced. (3mks)

(Na = 23.0, O = 16.0, H = 1.0, 1 Faraday = 96500 Coulombs)

1. In an experiment to study the rate for reaction between duralumin (an alloy of aluminium, 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) | Total volume of gas (cm3) |
| 0  1  2  3  4  5  6 | 0  220  410  540  620  640  640 |

1. i) On the grid provided, plot a graph of total volume of gas produced (vertical axis) against time. (3mks)



ii) From the graph, determine the volume of gas produced at the end of 2 ½ minutes. (1mk)

1. Determine the rate of reaction between the 3rd and 4th minute. (2mks)
2. Give a reason why some solid remained at the end of the experiment. (1mk)

1. Given that 2.5cm3 of the total volume of the gas was from the reaction between magnesium and aqueous hydrochloric acid,

(Al = 27.0 and Molar gas volume = 24,000cm3 at 298K).

1. Determine the volume of gas produced when hydrochloric acid reacted with aluminium metal. (1mk)
2. Write a chemical equation of the reaction in (i) above. (1mk)
3. Determine the percentage mass of aluminium present in 0.5g of the alloy. (3mks)

e) State two properties of duralumin that make it more suitable than aluminium in aeroplane construction. (2mks)

1. (a) What method can be used to separate a mixture of ethanol and propanol? (1mk)
2. Explain how a solid mixture of sulphur and sodium chloride can be separated into solid sulphur and sodium chloride crystals. (3mks)
3. The table below gives the solubilities of potassium bromide and potassium sulphate at 00C and 400C

|  |  |
| --- | --- |
| Substance | Solubility g/100g water at |
| 400C 800C |
| Potassium bromide | 55 75 |
| Potassium sulphate | 85 95 |

When an aqueous mixture containing 60g of potassium bromide and 70 g of potassium sulphate in 100g of water at 800C was cooled to 400C some crystals were formed

(i) Identify the crystals. (1mk)

(ii) Determine the mass of the crystals formed. (1mk)

(iii) Name the method used to obtain the crystals. (1mk)

(iv) Suggest one industrial application of the method named in (iii) above. (1mk)

1. a)Give the name of the basic raw material for extraction of aluminium metal. (1mk)

b) Name the method that is used to extract aluminium from the basic raw material in (i) above. (1mk)

c) Write the chemical formula of the major component in the raw material in (i) above. (1mk)

d) i) Name two major impurities in the raw material in (i) above. (2mks)

ii) Explain how the impurities in named in (i) above are removed (3mks)

e) Cryolite is used in the extraction of aluminium from the basic raw material.

State its function (1mk)

f) Aluminium is a reactive metal yet utensils made of aluminium do not corrode easily. Explain this observation. (2mks)

1. a) The table below shows properties of chlorine, bromine and iodine.

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Formula | Colour and state room temperature | Solubility in water |
| Chlorine  Bromine  Iodine | Cl2  Br2  l2 | i…………………  Brown liquid  iii………………… | Soluble  ii………………….  Slight soluble |

Complete the table by giving the missing information in (i),(ii) and (iii). (3mks)

b)Chlorine gas is prepared by reacting concentrated hydrochloric acids with manganese (iv) oxide.

i) Write the equation for reaction between concentrated hydrochloric acid and manganese (iv) oxide. (1mk)

ii) What is the role of manganese (IV) oxide in this reaction. (1mk)

c) i)Iron (II) chloride reacts with chlorine gas to form substance E. Identify substance E. (1mk)

ii) During the reaction in c(i) above,6.30g of iron(II) chloride were converted to substance E. Calculate the volume of chlorine used. (3mks)

(Cl = 35.5, Molar gas volume at room temperature = 24000cm3, Fe =56)

d) Draw and name the structure of the compound formed when excess chlorine gas is reacted with ethane gas. (2mks)

e) Give two industrial uses of chlorine. (2mks)

1. (a) The list below shows the formulae of some organic compounds. Use it to answer the questions that follow.

V1. CH3CH2CH2OH

V2. CH3CH2CH3

O

V3 ‘ CH3CH2CH2 C – OH

V4. CH3CH2CH = CH2

V5. CH3CH2CH2CH3

(i) Select two compounds which

I are not hydrocarbons (1mk)

II Belong to the same homologous series (1mk)

(ii)Identify the compound that is likely to undergo polymerization. Give a reason for your answer. (2mks)

(b) The structures below represent two cleansing agents:

R – COO- Na+

R – OSO3- Na+

In the table below, give one advantage and one disadvantage of using each one of them. (2mks)

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

Under certain, ethanoic acid ( C2H4O2) and ethanol (C2H5OH) react to form a pleasant smelling compound.

1. What is the general name of compound to which the pleasant compound belong? (1mk)

1. Write the formula of the pleasant smelling compound. (1mk)
2. Give one use of ethanoic acid other than the formation of the pleasant smelling compounds. (1mk)
3. Write the equation for the reaction between dilute ethanoic acid and solid potassium carbonate (1mk)

(c) Fibres are either synthetic or natural. Give one:

(i) Example of a natural fibre (1mk)

(ii) Advantage of synthetic fibres have over natural fibres (1mk)

1. The grid below represents periodic table. Study it and answer the questions that follow.

The letters do not represent the actual symbols of the elements.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  | A |
| B |  |  |  | G |  | H | E | C |
|  | J |  | I | L |  |  |  |  |
| D |  |  |  |  |  |  | M |  |

I (a) Indicate on the grid the position of an element represented by letter N whose electronic configuration of a divalent cation is 2:8:8. (1 mark)

(b) Name the bond formed when **D** and **H** react. Explain your answer. (2 marks)

(c) Write an equation for the reaction between **B** and water. (1 mark)

(d) How do the atomic radii of **I** and **L** compare. Explain. (2 marks)

(e) In terms of structure and bonding explain why the oxide of **G** has lower melting point than oxide of **L**. (2 marks)

II Study the information given below and answer the questions that follow:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Formula compound | NaCl | MgCl2 | Al2C16 | SiC14 | PC13 | SC12 |
| B.P(ºC) | 1470 | 1420 | Sublimes  At 800ºC | 60 | 75 | 60 |
| M.P(ºC) | 800 | 710 | -70 | -90 | -80 |

1. Why is the formula of aluminium chloride given as and not ? (1 mark)
2. Give **two** chlorides that are liquid at room temperature(25°c). Give a reason.(2 marks)

(c) Give a reason why  has a lower melting point than MgCl2 although both Al and Mg are metals. (1 mark)