

Name of candidate _____ Examination No. _____

MULANJE CLUSTER 2020 MSCE MOCK EXAMINATIONS**CHEMISTRY****PAPER I**

Subject Number: M036/I

THEORY**(100 marks)****Time allowed: 2 hours**

DATE _____

ISTRUCTIONS

1. This paper contains **12 printed pages**. Please check.
2. Fill in your **examination number** at the top of each page.
3. This paper contains two sections, **A** and **B**. In section **A**, there are **ten** short answer questions while in section **B**, there are **three** restricted essay questions.
4. Answer all the **thirteen** questions in the spaces provided.
5. Use of electronic calculators is allowed.
6. The maximum number of marks for each answer is indicated against each question.
7. In the table provided on this page, **tick** against the number of the questions you have answered.

Question number	Tick if answered	Do not write in these columns		Marker's name
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SECTION A (70 MARKS)

1. a. Describe ionization energy

(1mark)

- b. Explain why ionization energy increases as we go from left to right along the **period** in the periodic table?

(2marks)

- c. Explain the trend in **atomic radius** as we go down the groups in the periodic table.

(2marks)

2. a. Explain why alkanes are **saturated** hydrocarbons.

(2marks)

- b. Explain why the use of petroleum products is a danger to the environment.

(2marks)

3. a. What name is given to compounds containing water of crystallization?

(1mark)

- b. Calculate the percentage of water of crystallization in magnesium sulphate pentahydrate, $\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$ (RAM; Mg = 24, S = 32, O = 16, H = 1)





(3marks)

c. Describe **two** ways on how you can prepare a standard solution.



(4marks)

d. Work out the number of **moles** of ammonia gas occupied by **120dm³** at standard temperature and pressure.



(2marks)



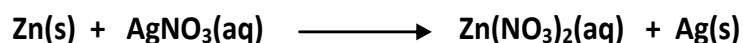
4. a. Describe oxidation in terms of **electrons**.

(1mark)

- b. Work out the oxidation number of **Mn** in MnO_4^-

(2marks)

- c. Use the following equation to answer the questions that follow:



State the substance which is :

- i. an oxidizing agent: _____
 ii. reduced: _____

(2marks)

- d. Calculate the **emf** of an electrochemical cell involving $\text{Cu(s)} \mid \text{Cu}^{2+}\text{(aq)} \parallel 2\text{Ag}^+\text{(aq)} \mid 2\text{Ag(s)}$

given that: $\text{Cu(s)} \mid \text{Cu}^{2+}\text{(aq)}, \quad \epsilon^\ominus = +0.34\text{V}$

$\text{Ag(s)} \mid \text{Ag}^+\text{(aq)}, \quad \epsilon^\ominus = +0.80\text{V} \quad (3\text{marks})$

5. a. An atom has a mass number of **39** and **20** neutrons. Work out the electron configuration for the atom. (2marks)



b. Sodium hydroxide undergoes neutralisation reaction with hydrochloric acid as follows:



i. Name this type of reaction basing on enthalpy change. (1mark)

ii. Draw an energy level diagram for the neutralisation reaction between sodium hydroxide and hydrochloric acid.



(3marks)

c. The conjugate acid-base pairs for the reaction between water molecules are $\text{H}_2\text{O}/\text{H}_3\text{O}^+$ and $\text{H}_2\text{O}/\text{OH}^-$. Write a chemical equation for the reaction.

(2marks)

d. **Figure 1.0** below shows an experiment in which an electric current is passed through a dilute solution of sodium chloride in water.

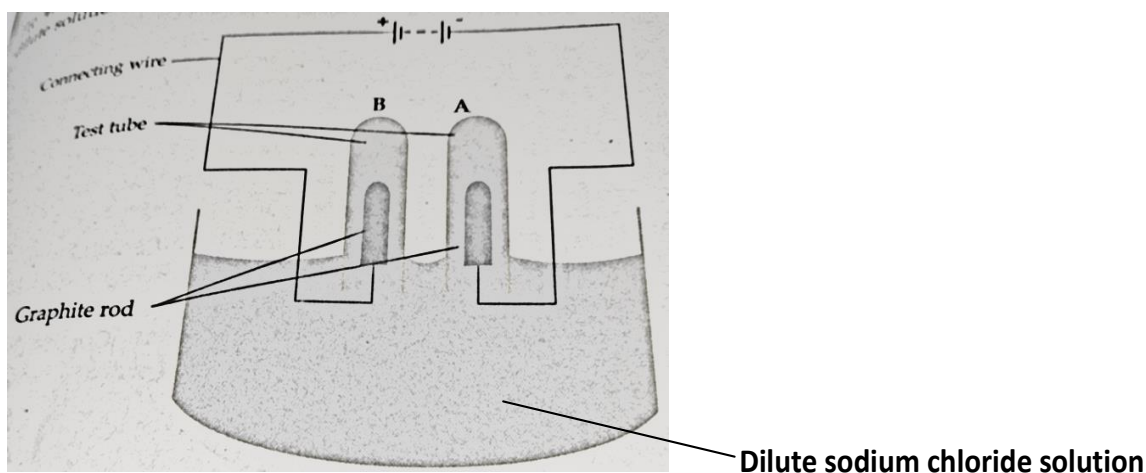


Figure 1.0

- i. Name the gases **A** and **B**

A. _____
 B. _____

(2marks)

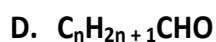
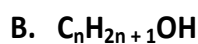
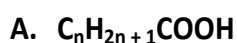
- ii. Which ions are preferentially discharged at electrodes?

(1mark)

- iii. Write the ionic equation for the reaction at the **cathode**.

(2marks)

6. The following are general formulae of organic compounds **A**, **B**, **C** and **D** belong.



- a. To which homologous series does compound **D** belong

(1mark)

- b. State any **one** use of compounds of homologous **D**.

(1mark)

- c. Mention the products formed when compounds of homologous **A** and **B** react.

(2marks)

- d. Describe how compounds of homologous series **B** could be distinguished from compounds of homologous series **C**.

(4marks)

7. a. What are isomers?

(1mark)

- b. Differentiate **position** isomerism from **chain (branched)** isomerism

(2marks)

- c. Explain how the branches on carbon chain affect the melting and boiling points of organic compounds

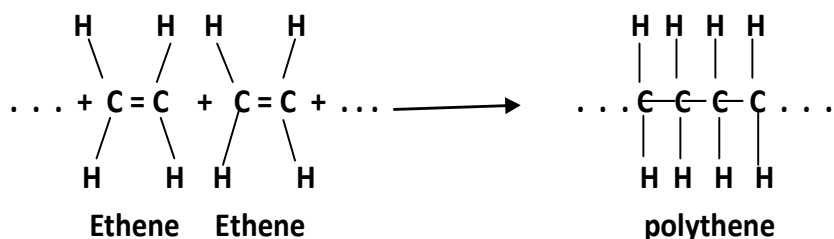
(2marks)

- d. Draw structures of all the isomers of **pentanal**

(2marks)



8. a. Polymerisation of ethene to form polythene can be represented by the following equation:



- i. Name the type of polymerization represented by the equation above.

(1mark)

- ii. Describe how polythene is formed from the ethene molecules.

(2marks)

- b. Give **one** difference between thermosetting plastics and thermosoftening plastics

(1mark)

- c. Give **two** advantages of plastic materials over metallic materials.

(2marks)

- d. Give any **one** use of each of the following polymers:

- i. Polyvinyl chloride (PVC)

(1mark)

- ii. Terylene

(1mark)

9. a. Describe how temporary water hardness can be removed.



(2marks)

b. Describe any **one** economic impact of water hardness.

(1mark)

10. a. What are green house gases?

(1mark)

b. Describe any two ways of mitigating the effects of global warming.

(2marks)

d. State **two** roles of disaster risk management in mitigating the effects of global warming.

(2marks)

SECTION B (30 MARKS)

11. a. Explain the difference in boiling points between ethanol ($\text{C}_2\text{H}_5\text{OH}$) and water (H_2O)

(4marks)

b. With the aid of a labeled diagram describe an experiment that can be carried out to separate a mixture of **ethanol** and **water**.



[illegible]

(6marks)

12. a. Using relevant chemical reaction equations, describe the **contact process**, the method of producing sulphuric acid.



b. Explain why **atomic radius** decreases as we move from left to right along a period in the periodic table.

[illegible]

13. With the aid of a clearly labeled diagram, describe how a **local indicator** for acids and bases can be made from flowers of plants.



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(10marks)

END OF QUESTIONS

