STUDENT NUMBER: _____

MARANATHA ACADEMEY

2022 MSCE MOCK EXAMINATIONS

CHEMISTRY

PAPER I
(100 Marks)

Time Allowed: 2 hours

INSTRUCTIONS:

a) Write your official name and class on top of every page.

b) The paper contain two sections; **A** and **B**, on **eleven (11)** printed pages. Please check.

c) In section **A,** there are **ten (10)** short answer questions.

d) In section **B,** there are **3** descriptive questions.

e) Answer all the questions in spaces provided.

f) The maximum number of marks for each answer is indicated against each question.

g) Use of electronic calculators is allowed.

h) In the table provided on this page, **tick** against the number of questions you have answered.

i) Hand in your paper to the invigilator when time is called to stop writing.

Question Number	Tick if Answered	Do not write in this column
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

Section A
(70 Marks)

1. **a.** Niobium atom is represented by $^{93}_{41}Nb.$ Calculate the:

Number of electrons: _____

Number of neutrons: _____

2marks

b. Mention charge possessed by each of the following sub atomic particles.

Proton:_____

Neutron:_____

2marks

c. What is the valency of sulphur whose atomic number is 16?

_____

1mark

d. Name **any** instrument that would be used to **accurately** measure mass of a sample in the laboratory.

_____

1mark

e. Analysing data is one of stages in scientific investigation. Suggest **any one** activity that chemists do at this stage.

_____

1mark

2. **a.** In **table 1**, letters **P, Q** and **R** represent isomers of pentanol with their boiling points. Use it to answer questions that follow.

Table 1:

Isomer	P	Q	R
Boiling point(°C)	18	78	31

i. Which of these isomers is a straight chain? Give a reason for the answer.

_____

_____

_____

2marks

ii. Identify the isomer that has the smallest density.

_____

1mark

b. Briefly explain why aldehydes and ketones undergo similar chemical reactions.

_____

_____

_____

2marks

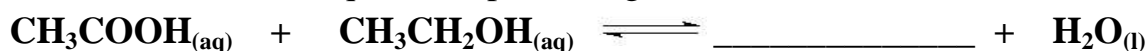**c.** Explain why boiling point of ethanoic acid is higher than that of ethanol despite both having hydrogen bonding.

_____

_____

_____

2marks

d. Below is a chemical equation representing a chemical reaction:

$CH_3COOH_{(aq)}$ + $CH_3CH_2OH_{(aq)}$ ⇌ _____ + $H_2O_{(l)}$

i. Complete the chemical equation above.
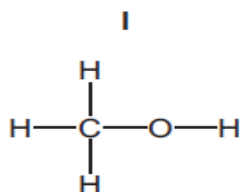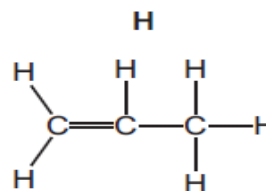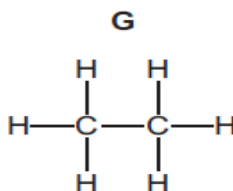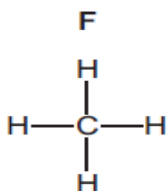
1mark

ii. Name the **main** product in the above chemical equation.

_____

1mark

3. Consider the following organic compounds labelled; **F, G, H, I, J** and **K**.
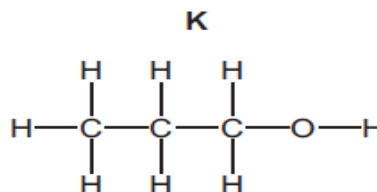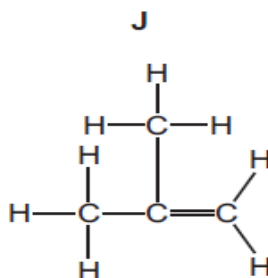
a. Identify unsaturated hydrocarbons from the list.

_____

1mark

b. Give a reason for your answer to question **3.a.**

_____

_____

2marks

    c. Which of these organic compounds is the main constituent of natural gas?

_____

1mark

    d. Name the polymerisation product for the reaction of monomer units of **H**.

_____

1mark

4. a. Define **activation energy**.

_____

_____

1mark

    b. List **three** points that govern the collision theory.

_____

_____

_____

3marks

    c. Food stored in the fridge takes longer to rot. Explain this in terms of rates of reactions.

_____

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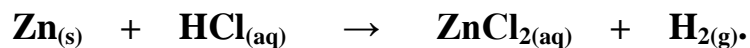
_____

3marks

b. Zinc metal reacts with hydrochloric acid according the chemical eqaution:

$$Zn_{(s)} \quad + \quad HCl_{(aq)} \quad \rightarrow \quad ZnCl_{2(aq)} \quad + \quad H_{2(g)}.$$

Sketch two graph lines, on the same volume (v) of H_2 gas against time (t) graph, to demonstrate effects of temperature on rate reaction.

4marks

5. a. State **any two** environmental problems associated with synthetic polymers.

_____

_____

2marks

b. Describe how water works as a coolant in the human body.

_____

_____

_____

2marks

c. Basing on inertness of nitrogen element, list **any two** uses of nitrogen.

_____

_____

_____

2marks

    d. Briefly explain how rural electrification would assist in reducing pollution of the environment.

_____

_____

_____

_____

2marks

    e. Explain how ozone gas is:

      i. Protective:

_____

_____

_____

1mark

      ii. Harmful:

_____

_____

_____

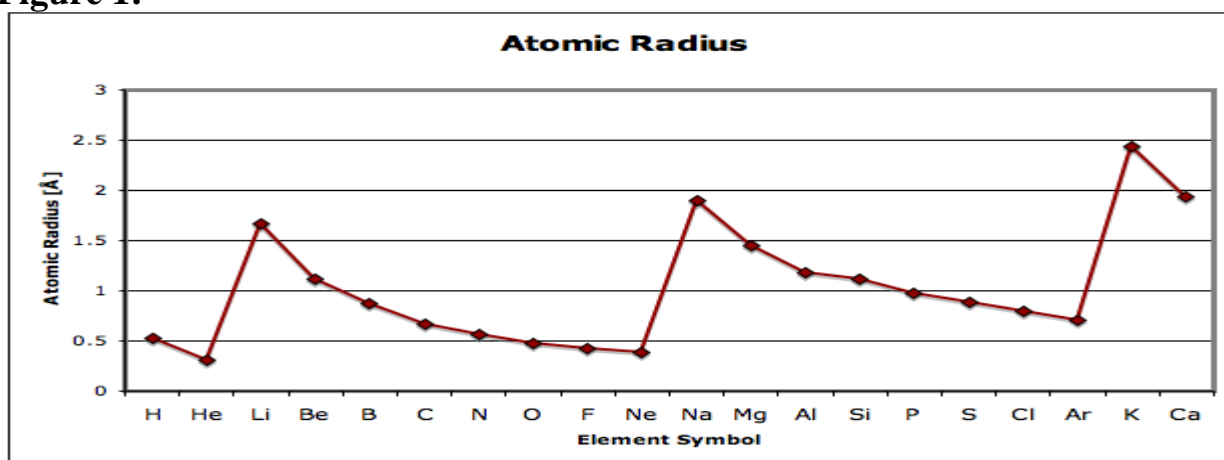**1mark**

6. **a. Figure 1** is a graph that shows atomic radii of the first 20 elements. Use it to answer questions that follow.

Figure 1:

Atomic Radius

    i. Approximate atomic radii values for element:

      O:_____

      S:_____

      Si:_____

3marks

    ii. Give reason for trends in approximated atomic radii for the following pairs of elements:

    O and **S:**

_____

_____

_____

2marks

    S and **Si:**

_____

_____

_____

2marks

7. Chlorine and Lithium has atomic number of **17** and **12**, respectively.

    a. Write electron configuration for:

        i. Chlorine ion:

        _____

1mark

        ii. Magnesium ion:

        _____

1mark

    b. Draw a dot and cross diagram for the compound formed between Magnesium and Chlorine.

3marks

    c. Name the compound formed in question **7.b.**

_____

1mark

8. Graphite and Diamond are both carbon elements. Briefly explain why:

    a. Graphite conducts electricity while diamond does not.

_____

_____

2marks

b. Diamond is harder than graphite.

_____

_____

_____

2marks

9. a. Workout percentage by mass of carbon in $Ca(HCO_3)_2$.
RAMs are: (Ca = 40, H = 1, C = 12, O = 16).

4marks

b. Define **limiting reagent** of a chemical reaction.

_____

_____

1mark

c. A chemical reaction was expected to produce 16 g of a product. After the chemical reaction is completed the product weighed 12.5 g. Calculate the percentage yield for the reaction.

3marks

10. a. Chiku carried out a set of experiments on metal displacements reactions.
It was established that order of reactivity of metals starting with the most reactive was as follows: **Mg Zn Cu**
Complete the following chemical equations:

$Zn_{(s)}$ + $CuSO_{4(aq)}$ $\rightarrow$ _____

$Zn_{(s)}$ + $MgSO_{4(aq)}$ $\rightarrow$ _____

$Mg_{(s)}$ + $CuSO_{4(aq)}$ $\rightarrow$ _____

3marks

b. Consider the reaction: $H_2S + Cl_2 \rightarrow 2H^+ + 2Cl^- + S$

    i.   Identify a reducing agent

_____

                                                                      1mark

    ii.   Write the reduction half equation.

_____

                                                                      1mark

Section B
(30 marks)

11.a. Briefly describe why electrolysis of dilute sulphuric acid is said to be electrolysis of water molecule.

_____

_____

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_____

                                                                      4marks

b. Using a piece an electric plug and a piece of a PVC pipe, describe how you would identify the plastics as thermosets and thermoplastics.

_____

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                                                                      6marks

12. With the help of a well labeled diagram, explain how you can electroplate an iron spoon with silver metal.

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10marks

13. Describe stages of a scientific investigation.

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10marks

END OF QUESTION PAPER