CANDIDATE NAME_____ EXAMINATION NUMBER_____

NKHOMA SYNOD 2021 M.S.C.E. MOCK EXAMINATIONS

CHEMISTRY

PAPER I

(100 marks)

4th August, 2021.

Time allowed: 2hours

Instructions

1. This paper contains 14 printed pages. Please check.
2. Fill in your examinations number at the to of each page.
3. This paper contains two section, A and B. In section
4. Answer all the thirteen questions in the spaces provide

Question number	**Tick if answered**	**Do not write in these columns**	
1			
2			
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12			
13			
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SECTION A(70 marks)

Answer **all** questions

1. ai. State any **one** chemical property of alkali metals.

_____(1 mark)

ii. **Figure I** is a diagram showing the structure of an atom.

_____ element

_____ Nucleus

Work out the Molar mass of the atom given that it has 10 neutrons.

(3 marks)

b. Convert 8.9 x 10^{-4} to ordinary note.

(1 mark)

2. a. Aluminium sulphate is given by the formula $(NH_4)_2SO_4$.

i. Find the total number of a atoms in the formula.

(1 marks)

ii. Calculate the percentage of oxygen in the molecule $(NH_4)_2SO_4$

RAM N = 14, H=1, S = 32, O = 16.

(3 marks)

b. **Figure 2** shows electron dot and cross diagram of a compound.

H

——— Z

H x N x H

x

H

i. Write the molecular formular of the iron.

_____

_____(1 mark)

ii. Name the iron in **figure 2** above.

_____(1 mark)

iii. What type of covalent bonding is exhibited at the point labeled Z?

_____

_____(1 mark)

3. a. Element X has a mass of 27 and atomic number 13.

i. To which group of the periodic table does element X belong?

_____(1 mark)

ii. Derive a chemical formula of compound formed between element X and oxygen atom.

(1 mark)

b. Relative atomic mass of chlorine is 35.5 and it has two natural isotopes with masses of 35 amu and 37amu. Calculate the percentage abundance of each isotope of chlorine.

(3 marks)

4. In a titration, 16cm^3 of 0.2m sulphuric acid (H_2SO_4) reacted completely with 10cm^3 of sodium hydroxide(NaoH) solution mixed with phenolphthalein indicator.

   a. State the function of phenolphthalein indicator in the experiment.

   _____

   _____(1 mark)

   b. Write a balanced chemical equation for the reaction between the sulphuric acid and sodium hydroxide solution.

   _____

   _____(2 marks)

   c. Calculate the concentration sodium hydroxide solution.

(3 marks)

5. a. State the difference between cations and anion

_____

_____(1 mark)

b. Using ammonium hydroxide solution test, explain how the following cations can be identified from the solution.

i. Copper (II) ions.

_____

_____

_____(3 marks)

ii. Iron (II) ions

_____

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_____(3 marks)

6. a. i. Draw an energy level diagram for the following reaction

$KOH(aq) + HCl(KCl(aq) + H_2(l) + 57.33KJ$

(3 marks)

ii. Is the reaction in a(i) exothermic or endothermic

_____(1 mark)

iii. Give a reason for your answer in a(ii)

_____

_____(1 mark)

b. State the difference between waste re-using and water recycling.

_____

_____(2 marks)

c. Al(s) $|Al^{3+}¿¿(aq)|Cu^{2+}¿¿(aq)|$ a voltaic cell.

i. Draw a well lebelled cell diagram.

(5 marks)

iii. Indicate the direction of electrons on the diagram

_____(1 mark)

iii. Calculate the EMF of the galvanic cell

$Al - 3e \longrightarrow Al^{3+¿¿} = -1.67V$

$Cu - 2e \longrightarrow Cu^{2+¿¿} = +0.34V$

(2 marks)

7. Calculate the number of mole in 50 grams of ($CaCO_3$), Calcium carbonate.
   RAM: Ca = 40, C = 12, O = 16.

(3 marks)

i. Define "base" according to bronsted - Lowry theory.

_____

_____(1 mark)

ii. Write a chemical reaction to show ionization of ammonia in water.

(2 marks)

c. Explain how propanal can be distinguished from propane.

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_____(3 mark)

8. a. Give any **two** uses of Phosphoric acid.

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_____(2 marks)

b**. Table** below shows melting points and solubility of some alkanols in water.

Name	**Melting point(ºc)**	**Solubility in water**
Ethanol	-117	Soluble
Propanol	-127	Soluble
Butanol	-89.5	Fairly soluble
Pentanol	-79	slightly

i. Explain why propanal is more soluble in water than butanol.

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_____(2 marks)

ii. Explain why the melting points of alkanols are increasing from ethanol to pentanol.

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_____(2 marks)

9. a. Explain the effect of depletion of ozone layer by chlorofluoro carbons on the healthy of human beings.

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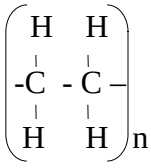
_____(3 marks)

b. Given that a polymer is drawn as follows



i. Name the polymer.

_____(1 mark)

ii. Show the monomer in an equation.

(1 mark)

iii. State the type of polymerization shown by the equation drawn.

_____

_____(1 mark)

10. a. State **two** ways of measuring rate of a chemical reaction.

_____

_____(2 marks)

b. Explain the effect of branching on densities of alkenes.

_____

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_____(3 marks)

SECTION B(30 marks)

Answer **all** questions in this section

11. a. Explain why the melting point of lithium is higher than the melting point of potassium.

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_____(3 marks)

b. The electrolysis of dilute sodium chloride (NaCl) is essentially the electrolysis of water. Using half equations at the anode and cathode, show that this statement is true.

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_____(7 marks)

12. Describe how the components of air are separated using fractional distillation.

____(10 marks)

13. With an aid of a well labeled diagram, describe the hydrological cycle.

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_____(10 marks)

END OF QUESTION PAPER