KAPSABET HIGH SCHOOL

233/1 - CHEMISTRY - Paper 1

2 Hours

NAME: …… **ADM NO.:** ……

CLASS ……

CANDIDATE'S SIGNATURE: ……...

DATE: ……

INTERNAL TRIAL 1 2023

Kenya Certificate of Secondary Education (K.C.S.E)

Instructions to Candidates

1. ***Write your name and index number in the spaces provided above.***
2. ***Answer all the questions in the spaces provided.***
3. ***All working must be clearly shown.***
4. ***Non-programmable silent electronic calculators and KNEC mathematical tables may be used.***

For Examiner's Use only

Questions	Maximum score	Candidates score

1 - 25	**80**	

This paper consists of 12 printed pages. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

ANSWER ALL QUESTIONS

1. The pH values of some solutions labeled **E** to I are given in the table **below**. Use the information to answer the questions that follow.

pH	14.0	1.0	9.0	6.5	5.0
Solution	E	F	G	H	I

(a) Identify the solution with the highest concentration of hydroxide ions. Explain (1mk)

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(b). Which solution can be used as a remedy for acid indigestion in the stomach? Explain (1mk)

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(c) Which solution would react explosively with Potassium metal? (1mk)

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2. a) Distinguish between ionization energy and electron affinity (2mks)

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b) The table below shows first ionization energies of metals represented by letters A, B, C and D. The metals are in the same group of the periodic table.

Metal	A	B	C	D
1st ionization energy (kJ/mole	402	496	520	419

Which of the metals has the largest atomic radius? Explain. (2mks)

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3. An element: $^{23}_{11}M$

(a) To which chemical family does it belong? ($^1/_2$mk)

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(b) Write the electron arrangement of the atom. ($^1/_2$mk)

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(c) Draw the structure of its ion. (1mk)

4. (a) Define electrolysis. (1mk)

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(b) During the electrolysis of molten aluminium oxide, write the equations at the;

Anode -

……. (1mk)

Cathode -

……. (1mk)

5. In an experiment to determine the percentage purity of Sodium carbonate produced in the Solvay process , 2.15g of the sample reacted with exactly 40.0cm^3 of 0.5M Sulphuric(VI)acid. Determine the percentage purity of sodium carbonate in the sample.

6. **Y** is a product of gaseous reaction which results in an equilibrium mixture being formed.

Reactants $\rightleftharpoons$ **Y**

The percentage of **Y** in equilibrium at various temperatures and pressure is shown in the following table.

Temperature (^{0}C)	1 atm	100 atm	200 atm
550	**0.77**	**6.70**	**11.9**
650	**0.032**	**3.02**	**5.71**
750	**0.016**	**1.54**	**2.99**
850	**0.09**	**0.87**	**1.68**

Use this data to deduce, giving a reason for each case;

a) Whether production of Y is exothermic or endothermic. (2mks)

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b) Whether production of Y **involves** an increase or a decrease in number of moles of gas present. (2mks)

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7. State and explain what is observed when moist red flowers are dropped in a gas jar containing Sulphur (IV) oxide. (3mks)

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8. A sample of water collected from **River Nzoia** is suspected to contain chloride ions. Describe an experiment that can be carried out to determine the presence of the chloride ions. (2mks)

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9. During distillation in a laboratory the distillate can be collected either by a beaker or a conical flask.

(a) Define the term distillate. (1mk)

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(b) Explain why a conical flask is the most preferred apparatus for the collection of the distillate. (1mk)

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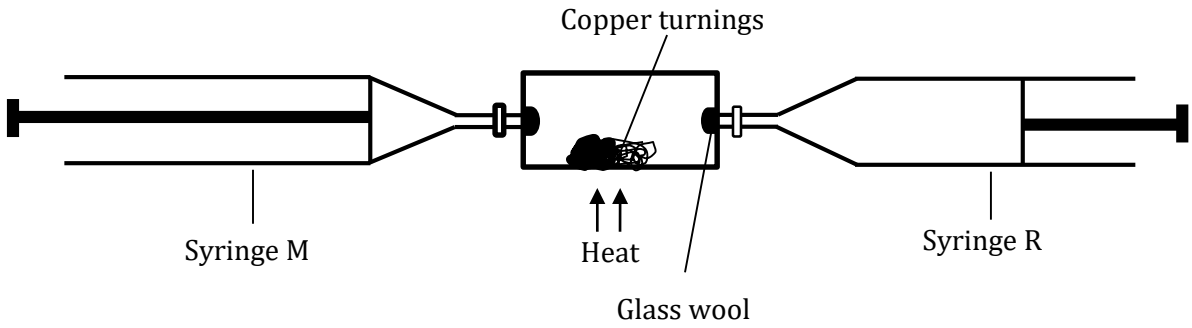
(c) Draw the diagram of a graduated conical flask. (1mk)

10. In an experiment to determine the proportion of oxygen in air, copper turnings were packed in excess in a long combustion tube connected to two syringes of 110cm^3 each in volume. At the beginning of the experiment, syringe R contained 110cm^3 of air while syringe **M** was closed and empty as shown.



Air was passed over the heated copper slowly and repeatedly until there was no further change in volume. 97.5cm^3 of air remained in syringe M.

(a) State and explain the observation made in the combustion tube. (2mks)

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(b) If the volume of air in the **combustion tube** at the beginning of the experiment was 23.8cm^3 and at the end of the experiment reduced to 10cm^3, calculate the percentage of the active part of air. (2mks)

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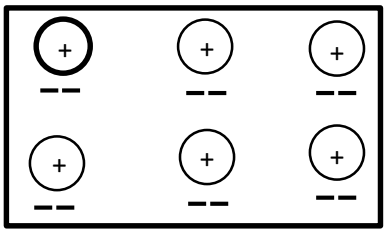
11. Below is a structure of an element X. Use it to answer the questions that follow.



(a) Name the chemical family to which element X belongs. Give a reason. (2mks)

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(b) (i) Define covalent bond. (1mk)

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(ii) Using dots (•) of cross (**x**) diagram, show bonding in Carbon (II) Oxide. (1mk)

12. (a) (i) State ***two*** allotropes of Carbon. (1mk)

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(ii) Explain the differences in their densities. (2mks)

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(b) (i) Name the process used for large scale production of Sodium Carbonate using brine as raw material. (1mk)

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(ii) Write the overall chemical equation for the reaction in the carbonator. (1mk)

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(c) Name two gases recycled in the above process (1mk)

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13. Name the following compounds using the IUPAC system. (3mks)

(i) $CH_3\,CH_2\,CH_2\,CH_2\,C(Br) = CH(CH_3)$

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(ii) $CH_3CH_2CH_2COOCH_2CH_2CH_3$

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(iii) $CH_3CH(CH_3)CHClCHClCH_3$

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14. Describe how to prepare Ethane gas starting with soda lime (3mks)

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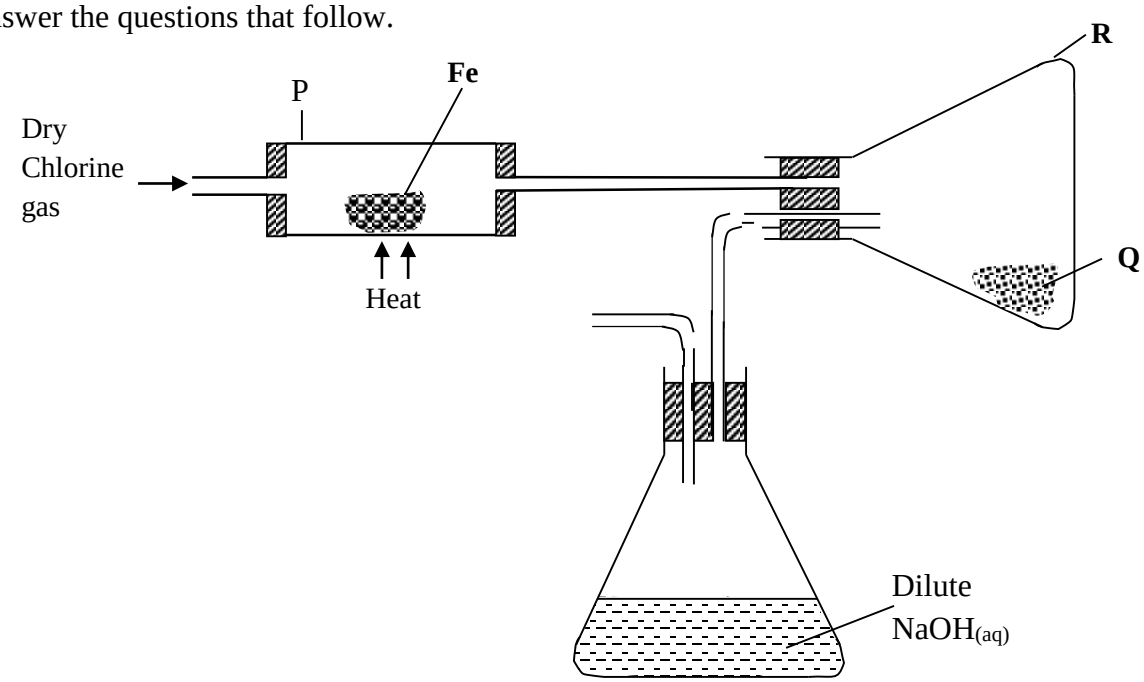
15. The diagram below shows how chlorine reacts with metals in the laboratory. Study it and answer the questions that follow.



(a) Name substance **Q**. (1mk)

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(b) Give a reason why substance Q is not collected in the combustion tube P. (1mk)

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(c) Write chemical equation for the reaction that occurs in the conical flask containing Sodium hydroxide. (1mk)

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16. (a) Water sample is found to contain Mg^{2+},Cl^{-}, SO_4^{2-} , and Ca^{2+}. Identify the type of water hardness (1mk)

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(b) Which type of detergent is more suitable with the water sample above. Give a reason (2mks)

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(c) Permanent water hardness cannot be removed by boiling. Explain (1mk)

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17. Starting with lead metal, write procedure on preparation of lead(II) nitrate crystals (3mks)

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18. The following chemical equations show the effects of heat on nitrates.

$2B(NO_3)_{2(s)} \longrightarrow 2BO_{(s)} + 4NO_{2(g)} + O_{2(g)}$

$2ANO_{3\,(s)} \longrightarrow 2ANO_{2(s)} + O_{2(g)}$

$2CNO_{3(s)} \longrightarrow 2C_{(s)} + 2NO_{2(s)} + O_{2(g)}$

a. Arrange elements A, B and C from the most reactive to the least reactive. ($1^1/_2$mks)

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Give one example of element A, B and C. ($1^1/_2$mks)

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19. Copper (II) sulphate crystals, a boiling tube, a test-tube, a beaker and other necessary requirements were used in an experiment to determine the type of change that occurred when the crystals were heated.

(a) Draw a labelled diagram to represent the set-up at the end of the first part of the experiment. (3mks)

(b) After the second part of the experiment was done, state the conclusion that was made about the type of change undergone by copper (II) sulphate crystals when heated. (1mk)

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20. (a). Distinguish between chromatography and a chromatogram. (1mk)

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(b) State the role of chromatography in the administration of international athletics competitions. (1mk)

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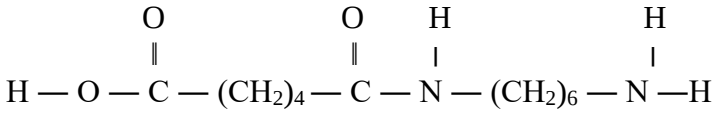
21. Study the polymer shown below.



a) Name the polymer. (1mk)

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b) Identify two monomers that make up the polymer. (2mks)

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c) Give one use of the polymer (1mark)

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22. (a) State Charles law. (1mk)

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(b) A gas occupies 450cm^3 at 27^{0}C. What volume would the gas occupy at 177^{0}C if its pressure remains constant? (2mks)

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23. A colourless liquid was suspected to be water. State two ways to confirm.

(i) Purity of the water. (1mk)

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(ii) That the liquid was water. (2mks)

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24. Use the following information to answer the questions that follow

$\Delta H_{lattice}$ $MgCl_2$ = +2489 kJ/ mol

$\Delta H_{hydration}$ Mg^{2+} = - 1891 kJ/ mol

$\Delta H_{hydration}$ Cl^- = -384 kJ/ mol

a) Calculate the heat of solution of magnesium chloride. (2mks)

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b) Draw an energy level diagram for the dissolving of magnesium chloride (2mks)

25. i) A solution of aqueous sodium hydroxide is added to a gas jar of nitrogen (IV) oxide and shaken. State and explain the observation made (2mks)

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ii) Write the chemical equation for the reaction above (1mk)

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