MARANDA HIGH SCHOOL

The Kenya Certificate of Secondary Education

EXAM 2 FORM 4

233/1 Chemistry (Theory) Paper 1

FEB, 2024 Time: 2 Hours

Name: …… Adm No: ……

Stream: …….. Signature: ……..…..

233/1 Chemistry PP1 - Theory
Monday, 19th Feb, 2024
Mid-Morning
Time: 10.45 am-12.45pm

Instructions to Candidates

a) *Write your name and Admission number in the spaces provided above.*

b) *Sign and write the date of examination in the spaces provided above*

c) *Answer **ALL** the questions in the spaces provided below each question.*

d) *Mathematical tables and silent electronic calculators may be used.*

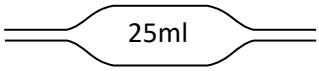
e) *All working **MUST** be clearly shown where necessary.*

f) ***This paper consists of 13 printed pages***

For Examiner's Use Only

Questions	Max. Score	Candidate's Score
1 – 27	80	

1.(a) Name the apparatus shown below. (1 mark)



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(b) Sate **one** safety measure to be taken while using the apparatus shown. (1 mark)

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(c) State the use of this apparatus in the laboratory. (1 mark)

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2.Two papers **A** and **B** were placed at different levels of a non-luminous flame. Paper **A** was placed at the lowest part of the flame while **B** was placed at the tip.

(a) Indicate **below** the observations made on each paper. (2 marks)

Paper **A**

Paper **B**

(b) Explain the observations made on paper **A**. (1 mark)

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3.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	8.0	6.5	7.0
Solution	E	F	G	H	I

(a) Identify the solution with the highest concentration of hydroxide ions. Give a reason for your answer. (1 mark)

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

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(c) Which solution would react most vigorously with magnesium metal? (1 mark)

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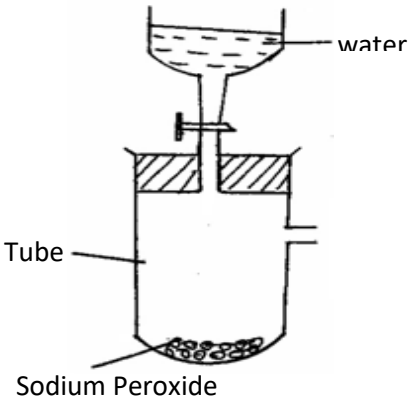
4.The diagram below represents part of a set-up for preparing and collecting a dry sample of oxygen gas.



(a) Complete the diagram. (2 marks)

(b) State **one** commercial use of oxygen gas. (1 mark)

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5.Study the table and answer the questions that follow. The letters are not actual symbols of the elements or ion.

Particle	Number of		
	Protons	Electrons	Neutrons
L	18	18	12
M	17	18	18
N	20	20	20
O	9	9	10
P	19	18	22

(a) With reasons, choose the letters that represent

(i) A cation. (1 mark)

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(ii) An anion. (1 mark)

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(c) Name the chemical family to which element P belongs to (1 mark)

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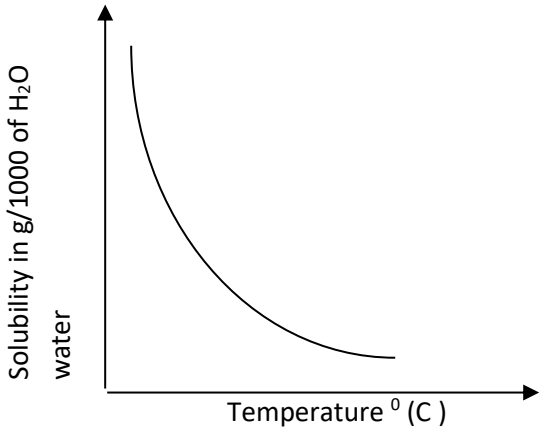
6. The graph below represents the solubility curve of a gas in water



(a) State the conclusion that can be drawn from the curve about the solubility of the gas. (1 mark)

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(b) The solubility of potassium chlorate at 80^0C is 40g per 100g of water. What mass of potassium chlorate will saturate 65g water at 80^0C. (2 marks)

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7.(a) State Graham's law of diffusion. (1 mark)

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(b)Two gases L and M have relative densities 1.98 and 2.90 respectively. They diffuse under similar conditions. If the relative molecular mass of M is 64, determine the relative molecular mass of L. (2 marks)

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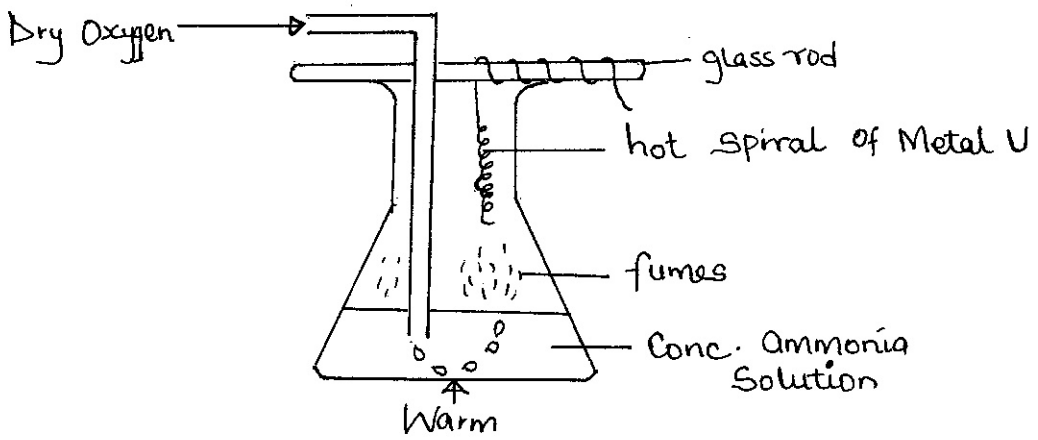
8.Study the diagram **below**:



(a) Give the most likely identity of metal **U**. (1 mark)

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(b)State **two** observations made in the conical flask. (2 marks)

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9.The reversible reaction represented below is for the equilibrium established in the reaction of hydrogen and iodine.

$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$, $\Delta H = -10KJmol^{-1}$

(a) State and explain the effect on the equilibrium of decreasing the pressure. (2 marks)

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(b) State the effect on the equilibrium of lowering the temperature. (1 mark)

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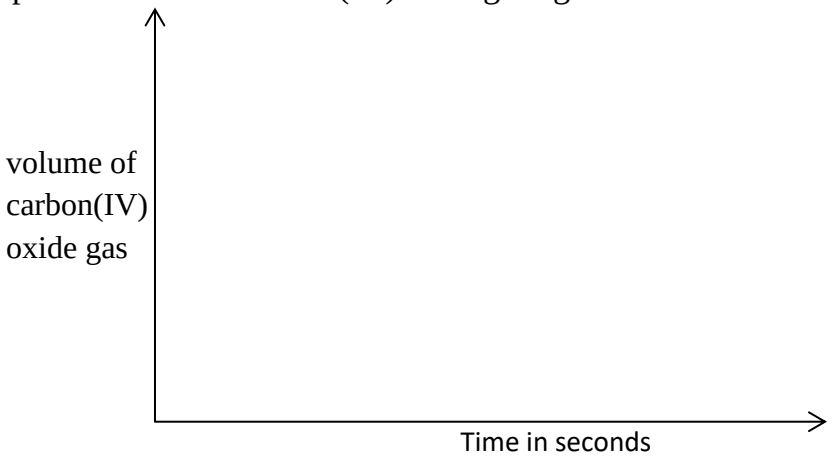
10.Metal carbonate was added to $30cm^3$ of 1M hydrochloric acid in a beaker.

(a) Sketch a graph of volume of carbon(IV)oxide gas against time. (1 mark)



(b) On the same axis sketch another graph when 2M of the hydrochloric acid is used with the same mass of the metal carbonate and labeled it R. (1 mark)

(c) State the factor which affect the rate of reaction in this experiment. (1 mark)

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11.A metal **A** with atomic number 11 burns in chlorine to produce a white solid **B**.

(a) State the following properties of **B**.

(i) Solubility. (1 mark)

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(ii) Electrical conductivity. (1 mark)

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(b)Write an equation to show the formation of **B**. (1 mark)

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12. a) State **one** observation made when a small piece of sodium metal is put in a trough full of water. (1 mark)

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b) Write a chemical equation for the reaction. (1 mark)

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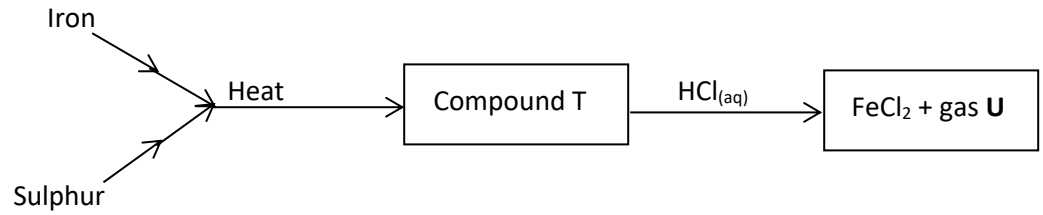
13.Study the flow chart **below** and answer the questions that follow.



(a) Name:
(i) Compound **T**……...(½ mark)

(ii) Gas **U**……(½ mark)

(b) Give a chemical test that you could use to identify gas **U**. (1 mark)

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(c) Name a substance that can be used to dry gas **U** (1 mark)

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14.(a) Name the compounds **P** and **T below**.

P - $CH_3CH_2CH_2CH_3$ (½ mark)

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T - $CH_3CHCHCH_3$ (½ mark)

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(b) Describe an experiment you would carry out to distinguish T from P. (2 marks)

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15. 12.5 cm^3 of a sample of sodium hydroxide was required to neutralize 8.3g of benzoic acid (C_6H_5COOH). Calculate the molarity of sodium hydroxide solution. (3 marks)
(C=12,O=16,H=1)

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16.(a) Identify **two** substances that are reacted to regenerate ammonia gas in the Solvay process

(2marks)

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(b) Write down a balanced chemical equation for the reaction above (1mark)

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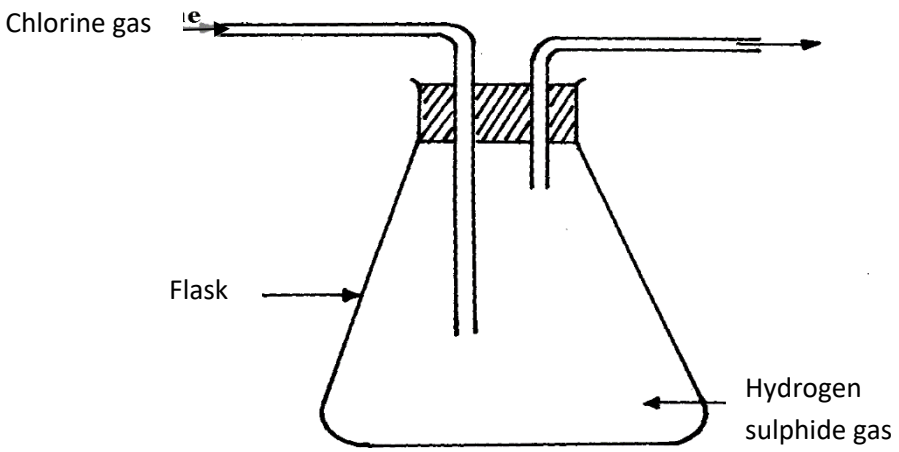
17. The figure below was set by a student to investigate the reaction between chlorine gas and hydrogen sulphide gas:



(a) Write an equation for the reaction that took place in the flask (1mark)

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(b) What observation was made in the flask? (1mark)

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(c) What precaution should be taken in carrying out the experiment? (1mark)

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18. Use the cell representation below to answer the questions that follow:-

$X_{(s)} / X^{3+}_{(aq)} // W^{2+}_{(aq)} / W_{(s)}$

(a) Write the equation for the cell reaction above (1mark)

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(b) If the e.m.f of the cell is 0.30V and E^{θ} value for W^{2+}/W is -0.44volts, calculate the E^{θ} for $X^{3+}_{(aq)} / X_{(s)}$ (2marks)

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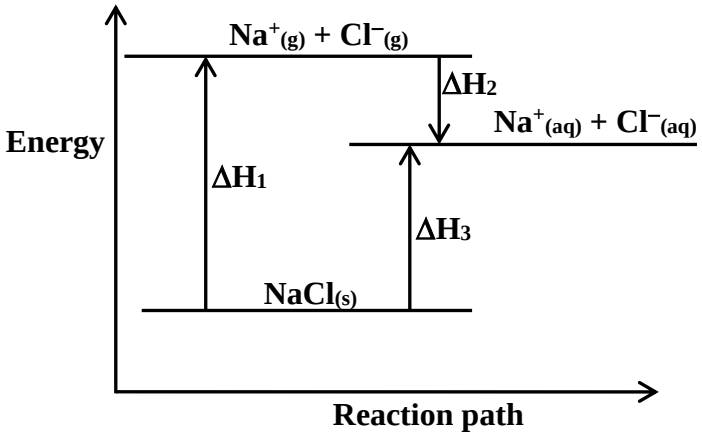
19. Study the diagram below and answer the questions that follow.



a) What does ΔH_2 and ΔH_3 represent? (2 marks)

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b) Write an expression relating ΔH_3 to ΔH_1 and ΔH_2 (1mark)

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20.During extraction of copper, the ore is first concentrated and roasted to produce copper (I) sulphide.

(a) Name the ore from which copper is commonly extracted. (1mark)

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(b)Write an equation for the reaction in which copper (I) sulphide is produced by roasting the ore in air. (1mark)

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(c)Give **one** use of copper metal. (1mark)

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21. **Y** grams of a radioactive isotope take 120days to decay to 3.5grams. The half-life period of the isotope is 20days

(a) Find the initial mass of the isotope (2marks)

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(b) Give **one** application of radioactivity in agriculture (1mark)

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22. Given the following bond energies.

C – C (347kJ mol^{-1})

C – H (413kJ mol^{-1})

C = C (612kJ mol^{-1})

H – H (435.9kJ mol^{-1})

Calculate the enthalpy change of hydrogenation of ethene. (3 marks)

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23.Describe how a dry sample of copper(II) chloride crystals may be prepared starting with solid copper metal. (3 marks)

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24.A hydrated salt of copper has the formula $CuSO_4.nH_2O$. About 25g of the salt was heated until all the water evaporated. If the mass of the anhydrous salt is 16.0g. Determine the empirical formula of the hydrated salt. (Cu = 64, S = 32, O = 16) (3 marks)

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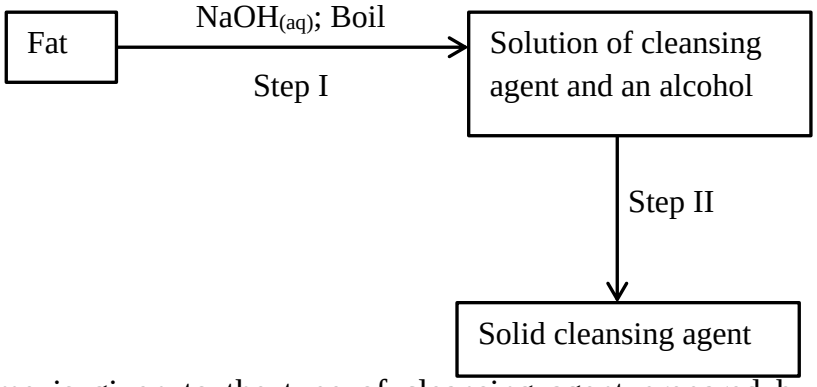
25. The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



i) What name is given to the type of cleansing agent prepared by the method shown in the scheme? (1 mark)

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ii) Name one chemical substance added in step II (1 mark)

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iii) What is the purpose of adding the chemical substance named in (ii) above? (1 mark)

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26.A current of 4 A was passed through dilute sulphuric (VI) acid for 6 hours and 24 minutes. Calculate the volume of oxygen gas produced at the anode.

(1F = 96500C, molar gas volume = 24.0dm^{-3}) (3 marks)

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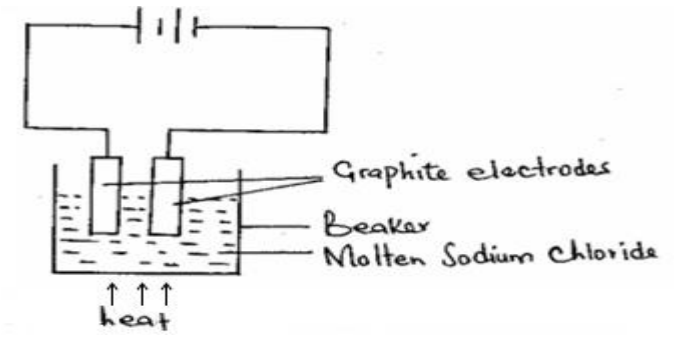
27.The diagram below represents an experiment which was carried out by a student to investigate the effect of passing an electric current on molten sodium chloride.



(a) Molten sodium chloride is a binary electrolyte. State the meaning of the term binary electrolyte. (1 mark)

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(b) State one observation made at the anode. (1 mark)

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(c) Show the direction of flow of electrons on the set-up. (1 mark)

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