SUCCESS PATH PRE-MOCK EXAMINATIONS – 2026

Kenya Certificate of Secondary Education

233/1 – CHEMISTRY (Theory) – Paper 1 **FORM FOUR**

CHEMISTRY PAPER 1
8:00am – 10.00am

Name …… Index Number…..……..……...

Class …… School ……..……...……Signature……...…..

Instructions to candidates

(i) Write your name, index number and class in the **spaces provided above**.
(ii) Sign and write the name of your school in the spaces provided above.
(iii) Answer all the questions in in the spaces provided in the question paper.
(iv) **Non – programmable** silent electronic calculators and KNEC Mathematical tables may be used.
(v) All workings **must** be clearly shown where necessary.
(vi) This paper consists of 13 printed pages.
(vii) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
(viii) **Candidates should answer the questions in English.**

For Examiner's Use Only

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

18	19	20	21	22	23	24	25	26	27	Grand Total	

1. Complete the **Table 1** by writing the observations made when aqueous ammonia and aqueous sodium sulphate are added to solutions containing calcium, aluminum and Iron (II) ions. (3 marks)

Table 1

Ions present	Aqueous ammonia	Aqueous sodium sulphate
Ca^{2+}		
Al^{3+}		
Fe^{2+}		

2. A group of compounds called chlorofluorocarbons have a wide range of uses but they also have harmful effects on the environment.

(a) Give one use of chlorofluorocarbons. (1 mark)

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(b) State one harmful effect of chlorofluorocarbons on the environment. (1 mark)

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3. Element U has atomic number 12 while element V has atomic number 16. How do the melting points of their oxides compare? Explain. (3 marks)

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4. (a) Define the term solubility. (1 mark)

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(b)40 g of a saturated solution yields 15g of salt when evaporated to dryness. Calculate the solubility of the salt. (2 marks)

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5. Hydrogen gas can be prepared by passing steam over heated Magnesium ribbon as shown in the **Figure 1**.

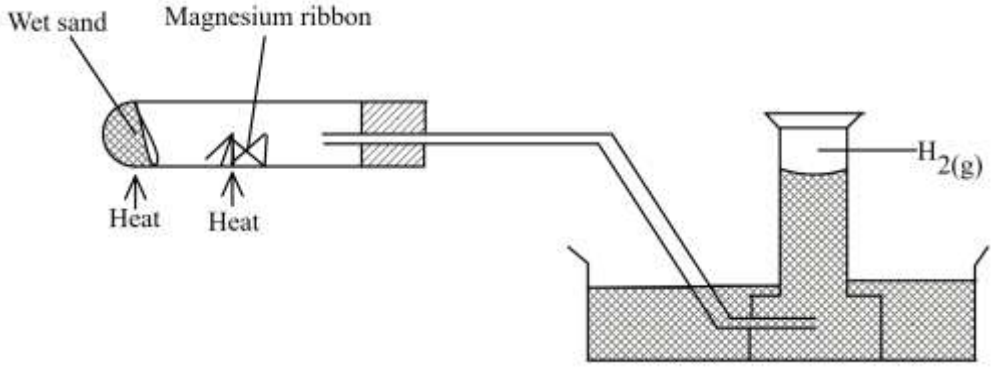

Figure 1

(a) Explain why the delivery tube must be removed from beneath the water before heating is stopped. (1 mark)

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(b) Explain why sodium metal is not suitable for this experiment. (1 mark)

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(c) Give ***two*** reasons why hydrogen is not commonly used as fuel. (1 mark)

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

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(b)Explain why a balloon filled with helium gas deflates faster than a balloon of the same size filled with argon gas. (2 marks)

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7. Copper (II) sulphate reacts with Barium chloride according to the equation below:

$$CuSO_{4(aq)} + BaCl_{2(aq)} \longrightarrow CuCl_{2(aq)} + BaSO_{4(aq)} \quad -17.7 \text{ kJ/mol}$$

Calculate the temperature change when 900 cm^3 of 1 M copper (II) sulphate were added to 600 cm^3 of 1 M barium chloride. (Heat capacity of solution is 4.2 J g^{-1} K^{-1} and density 1 g cm^{-3}) (3 marks)

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8. Using iron filings, describe an experiment that can be conducted to show that oxygen is present in air. (3 marks)

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9. (a) Hydrogen chloride gas can be prepared by reacting sodium chloride with an acid.

(i) Write an equation for the reaction between sodium chloride and the acid. (1 mark)

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(ii) Give ***two*** chemical properties of hydrogen chloride gas. (1 mark)

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(b) Calcium oxide can be used to dry ammonia gas. Explain why Calcium oxide is not used to dry hydrogen chloride gas. (1 mark)

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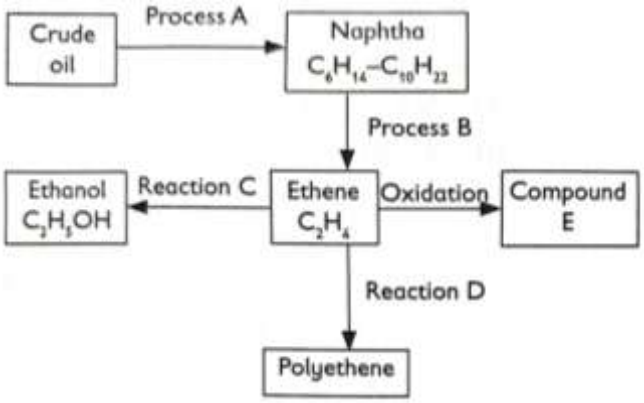
10. The figure below shows a flow chart. Study it and answer the questions that follow.



(a) Name process:

(i) A. (½ mark)

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(ii) B. (½ mark)

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(b) State **one** conduiation necessary for th reaction C to take place. (1 mark)

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(c) Compound C has following pacentage composition by mass; 38.7% carbon, 9.7% hydrogen and 51.6% oxygen. Given that 0.05 moles of comound E has a mass of 3.1g, calculate molecular formula of the E. (2 mark)

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11. The table below shows some properties of three substances. Complete the table by filling in the types of forces and structures in each substance. (3 marks)

Substance	**M.P.°C**	**B.P.°C**	**Electrical conductivity**		**Type of forces**	**Structure**
			Solid	Molten		
X	– 101	–35	Poor	Poor		
Y	650	– 1110	Good	Good		
Z	714	–1142	Poor	Good		

12. The elemets sulphur, phosphorous and chlorine are regarded as having simple molecular structures.

(a) Write the molecular formula of;

(i) Sulphur (½ mark)

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(ii) Phosphorous

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(b) Arrange these three elements in order of their increasing melting point. Explain this trend.

(2 marks)

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13. Use the bond energies below to calculate the heat of reaction for burning of methane. (3 marks)

$CH_4(g) + O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$

Bond	**Bond energy(kJ/mol)**
C - C	435
O - H	464
O = O	497
C = O	803

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14. When excess lead (II) nitrate solution was added to a solution containing sodium chloride, the precipitate formed was found to weigh 5.5g. Determine the amount of sodium chloride in the solution. (Pb = 207, Cl = 35.5, Na = 23). (3 marks)

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15. In an experiment 40cm³ of 0.5M Nitric acid was reacted with excess sodium carbonate and the volume of carbon (IV) oxide produced recorded with time. The experiment was repeated using the same volume and concentration of ethanoic acid and the volume of carbon (IV) oxide produced recorded with time.

(a) Why was sodium carbonate used in excess? (1 mark)

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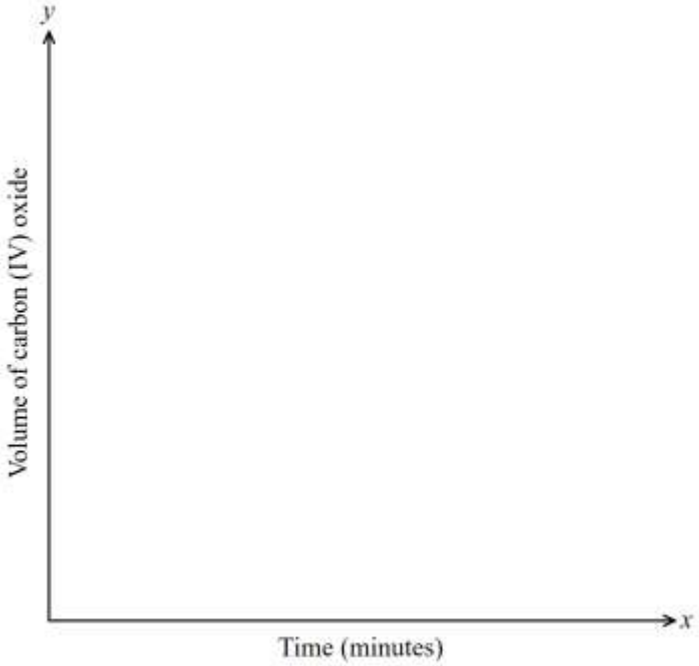
(b) On the graph below, sketch and label the curves of the volumes of carbon (IV) oxide produced against time. (2 marks)



16. Starting with copper metal, describe how a solid sample of copper (II) carbonate can be prepared. (3 marks)

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17. (a) A sample of water in a beaker was found to boil at 101.5°C at 1 atmospheric pressure. Assuming that the thermometer was not faulty, explain this observation. (1 mark)

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(b) Describe an experimental procedure that can be used to extract oil from nut seeds. (2 marks)

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18. (a) State Gay-Lussac's Law. (1 mark)

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(b) 180cm³ of Nitrogen (II) oxide gas was reacted with 400cm³ of Oxygen gas. Calculate the total volume of the gases at the end of the reaction. (2 marks)

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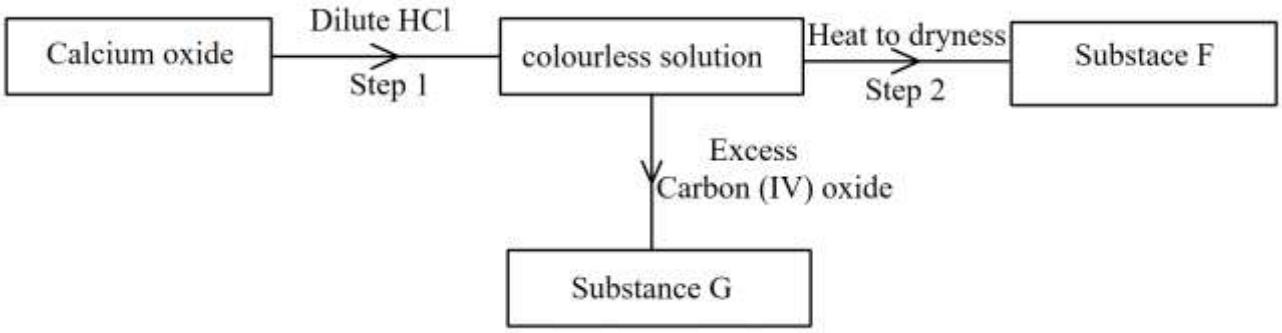
19. Study the flow chart below and answer the questions that follow:



(a)Give the name of the process that takes place in step 1. (1 mark)

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(b)Give the name of substance G. (1 mark)

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(c)Give one use of substance F. (1 mark)

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20. When a sample of concentrated sulphuric (VI) acid was left in an open beaker in a room for two days, the volume was found to have increased slightly.

(a) What property of concentrated sulphuric (VI) acid is shown by the above reaction? Explain. (2 marks)

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(b) State one use of concentrated sulphuric (VI) acid that depends on the property named above. (1 mark)

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21. Name the apparatus that can be used to:

(a) Measure fixed volume of solutions. (1 mark)

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(b) Lower a burning piece of magnesium ribbon into a gas jar. (1 mark)

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(c) Store and keep substances free from moisture. (1 mark)

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22. (a) Explain why a high temperature is required for nitrogen to react with oxygen. (1 mark)

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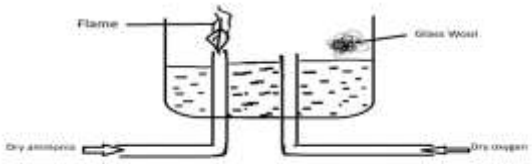
(b) Dry ammonia and dry oxygen were reacted as shown in the diagram below:



(i) What is the purpose of the glass wool? (1 mark)

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(ii) What products would be formed if red hot platinum was introduced into a mixture of ammonia & oxygen? (1 mark)

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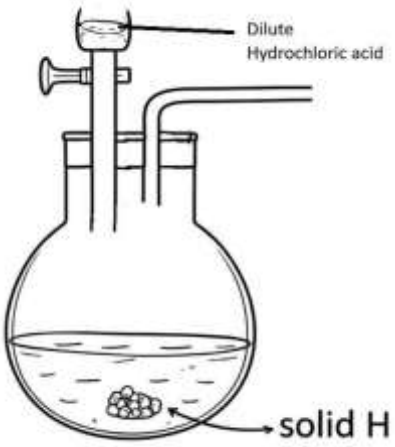
23. The diagram below shows an incomplete set up used to prepare sulphur(IV) oxide in the laboratory.



(a) Identify solid H. (1 mark)

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(b) Complete the set-up above to show how dry sulphur (IV) oxide maybe collected. (2 marks)

24. Temporary water hardness can be removed by boiling

(a) What is hard water (1 mark)

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(b) Write a chemical equation to show how temporary hardness is removed by boiling. (1 mark)

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(c) State one advantage of hard water. (1 mark)

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25. (a) What is a fuel. (1 mark)

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(b) Calculate the heat value of ethanol if its molar enthalpy of combustion is 1360kJmol^{-1}.
(C=12.0, O=16.0, H=1.0) (2 marks)

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26. Use the following chemical equation to answer the equatios that follow:

$$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$$

Identify;

(a) The acid in the forward reaction. Explain. (1 mark)

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(b) A base in the forward reaction. Explain. (1 mark)

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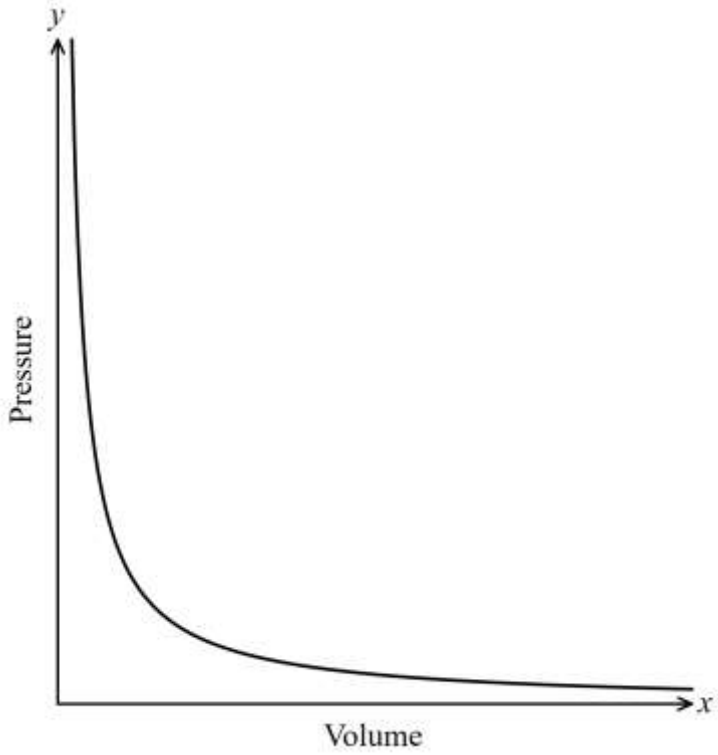
27. The graph below shows the behavior of a fixed mass of a gas at constant temperature.



(a)What is the relationship between the volume and pressure of the gas. (1 mark)

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(b)3 litres of oxygen gas at one atmosphere pressure were compressed to two atmospheres at constant temperature. Calculate the new volume occupied by the oxygen gas. (2 marks)

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