Name: ……Index No.……ADM……

School: …… Class ……..Date: ……..

CHEMISTRY THEORY

233/1

PAPER 1

TIME: 2 HOURS

KASSU JET EXAMINATIONS

JUNE 2023

Instructions to Candidates

(a)Write your name admission and index 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 in the question paper*

(d) KNEC Mathematical tables and electronic calculators may be used for calculations

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

(f) This paper consists of 12 printed pages

(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

(h) Candidates should answer the questions in English

FOR EXAMINER'S USE ONLY

Question	Maximum score	Candidate's score
1 – 28	80	

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

1. State TWO reasons why most apparatus are made of glass ***(2marks)***

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2. A pipette is used to measure exact volume of liquids. Draw a pipette. ***(1 marks)***

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3. An atom exists as an isotope X-30, X-29 and X-33 has relative atomic mass of 30.30, if X-30 is 10% calculate the percentage abundance of the other two isotopes ***(2marks)***

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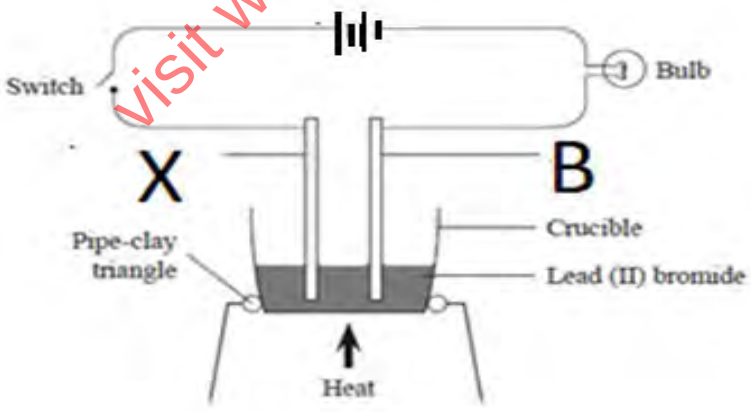
4. The diagram below shows electrolysis of lead (II) bromide



a) Name electrode B ***(1 mark)***

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b) Explain the observation made in electrode X ***(1 mark)***

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5. About $40cm^3$ of oxygen gas were reacted with $100cm^3$ of hydrogen gas.

(a) Determine the volume of residual gas at 105^0C

(3 marks)

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(b) What volume of oxygen was used during the reaction? ***(1 mark)***

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6. Ethene gas can be prepared as follows

$$C_2H_5OH(l) \xrightarrow[Heat]{\text{Solid Q}} CH_2CH_2(g) + H_2O(l)$$

i) Name solid Q ***(1 mark)***

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ii) Give two functions of solid Q in the process ***(1 mark)***

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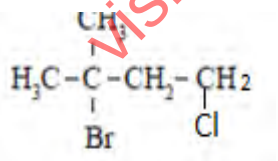
iii) Name the following organic compound ***(1 mark)***



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7. (a) Define the term fractional crystallisation ***(1 mark)***

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(b) A salt solution has a mass of 65g containing 5g of solute. The solubility of this salt is 25g per 100g water at 20°C. 60g of the salt are added to the solution at 20°C. Calculate the mass of the solute that remain undissolved ***(2 marks)***

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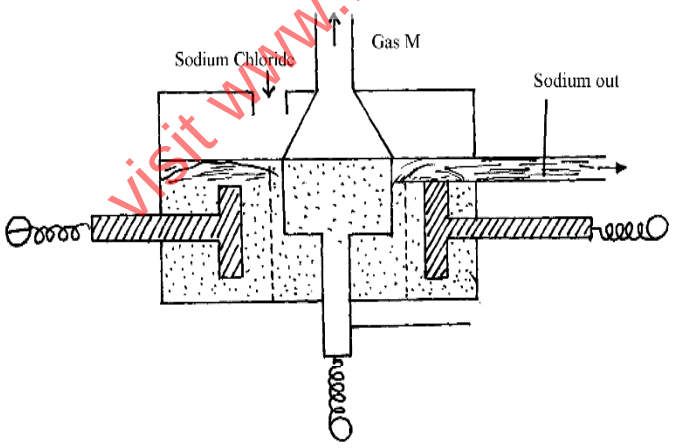
8. A sample of river water was divided into three portions. The table below shows the test carried out on the portions and the observations made.

Test	Observation	Inference
To the first portion, 1 cm^3 of soap solution was added	No lather formed.	
The second portion was boiled, cooled and 1 cm^3 of soap solution was added.	No lather formed.	
To the third portion, 3 cm^3 of aqueous sodium carbonate was added, the mixture filtered and 1 cm^3 of soap solution added to filtrate	Lather formed immediately.	

Complete the table by filling in the inferences ***(3 marks)***

9. The following diagram represents extraction of sodium by the Down's cell



(a) What is the function of heat resistant wall ***(1 mark)***

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(b) Why is the anode made of graphite? ***(1 mark)***

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(c) How are the electrolytic products separated from reacting? ***(1 mark)***

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(d) Explain why it is possible to separate components at the cathode ***(1 mark)***

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10. Describe how a mixture of sodium chloride and lead chloride can be separated in the laboratory. ***(3marks)***

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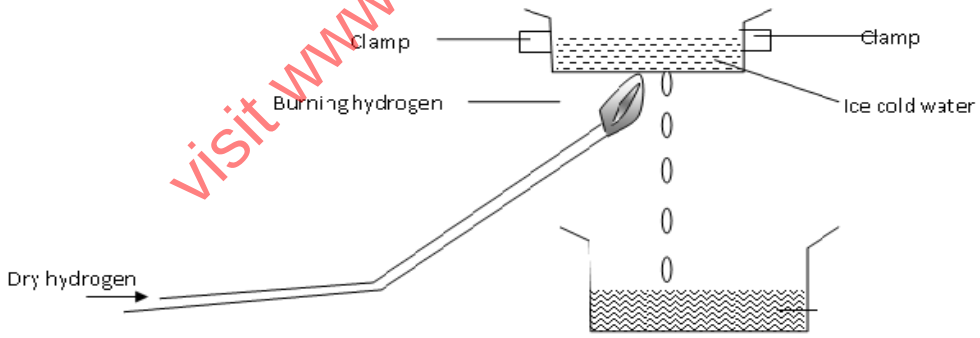
11. Study the diagram below and answer the following questions.



(i) Write equation that produce the flame in the experiment. ***(1 mark)***

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(ii) What is the aim of the experiment? ***(1 mark)***

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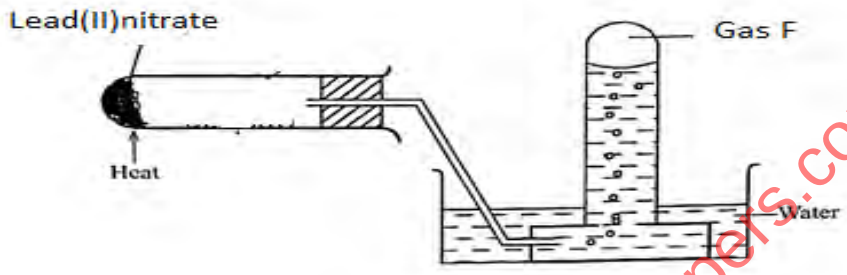
12. Form 2 students arranged the set up below to study some properties of heating Lead(II) nitrate strongly.



(i) State the observation during the experiment. ***(1 mark)***

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(ii) Write down a balanced chemical equation for the reaction ***(1 mark)***

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(iii) Describe a chemical test for gas F ***(2 marks)***

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13. Distinguish a dry salt from anhydrous salt. ***(1 mark)***

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14. 2.56g of hydrocarbon contains carbon to hydrogen in the ratio of 5.1. If the molecular mass is 128. Calculate the molecular formula of the hydrocarbon ***(3 marks)***
(C=12, H=1)

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15. Chlorine water is a bleaching agent. Describe the bleaching action of chlorine using relevant equation. ***(3marks)***

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16. During electrolysis of dilute Magnesium Sulphate, using inert electrode. Explain

(i) The effect on concentration of the electrolyte during electrolysis. ***(2 marks)***

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(ii) The difference in volume of the gasses produced at each electrode. ***(2 marks)***

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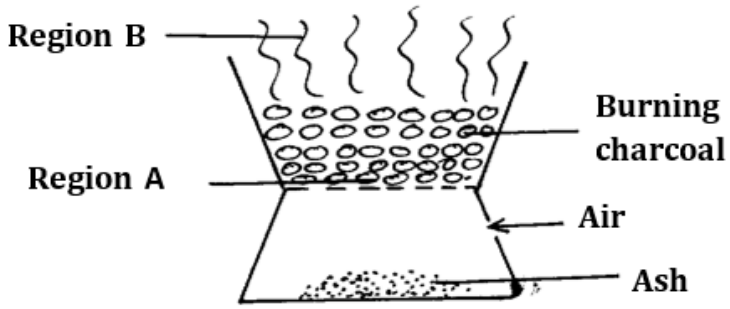
17. The diagram below shows a 'jiko' when in use. Study it and answer the questions that follow



(a)Identify the gas formed at region **B** ***(1mark)***

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(b)Using an equation, explain what happens at region **A** ***(2 marks)***

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18. (a) What is half- life? ***(1mark)***

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(b) The half-life of protactinium - 234 is 1.17 minutes. Determine the mass that decays in 5.85 minutes starting with 100 g of the sample. ***(2 marks)***

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19. Given the following substances: sodium carbonate, orange juice and sodium bromide.

(a) Name **one** commercial indicator that can be used to show whether sodium carbonate, orange juice and sodium bromide are acidic, basic or neutral. ***(1mark)***

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(b) Classify the substances in 15 (a) above as acids, bases or neutral. ***(2 marks)***

Acid	
Base	
Neutral	

20. A reaction is described as "having reached equilibrium". What does this statement mean regarding the amounts of the reactants and products? **(1 mark)**

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21. Suggest **two** ways in which the equilibrium concentration of $SO_{3(g)}$ can be increased in a closed container, if the only chemical equilibrium is; ***(2 marks)***

$$SO_{2(g)} + \frac{1}{2}O_{2(g)} \rightleftharpoons SO_{3(g)} \quad \Delta H = -98.3kJ$$

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22. Industrial process of production of $NO_{(g)}$ is represented by reaction:

$$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$$

The reaction is carried out at elevated temperatures to drive the reaction towards the formation of the product. After sufficient products has formed the reaction mixture is quickly cooled. Explain. ***(2 marks)***

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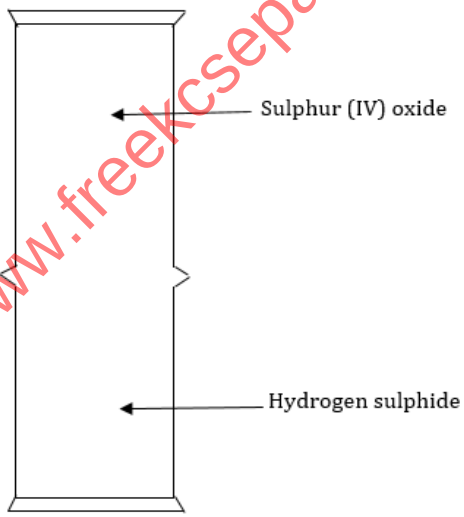
23. The Diagram below may be used to react hydrogen sulphide and Sulphur (IV) oxide. Study it and answer the questions that follow.



(a) What is observed in the jars? **(1 mark)**

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(b) Write an equation for the reaction. **(1 mark)**

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(c) What is the role of Sulphur (IV) oxide in the reaction? **(1 mark)**

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24. Element A atomic no. 6 and element B atomic no. 13 react to form a compound.

(i) Using dots (•) and crosses (×) show bond formed in the above compound.

(1 mark)

(ii) Explain why the compound above has very high melting point. ***(1 mark)***

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(iii) Explain how the compound above will conduct electricity. ***(1 mark)***

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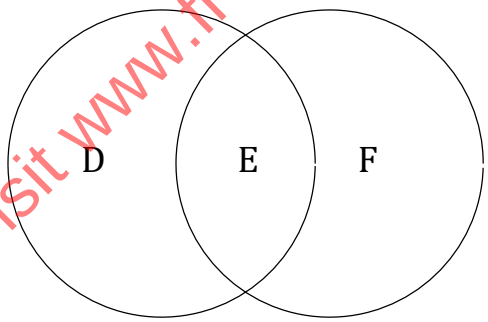
(iv) The diagram below shows relationship of basic and acidic oxides. In which region will compound of A and B fall? Explain. ***(1 mark)***



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25. $100cm^3$ of gas X takes 30 seconds to diffuse through a porous plug, whereas $300cm^3$ of oxygen gas takes 120 seconds. Calculate the relative molecular mass of gas X (O=16)

(3 marks)

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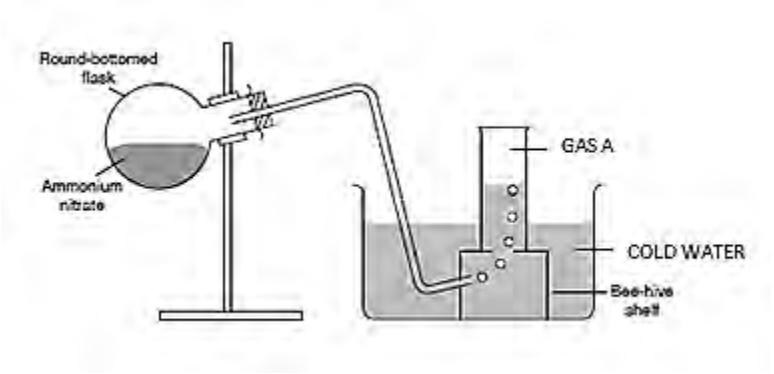
26. Ammonium nitrate was heated as shown below



a)Identify gas A ***(1 mark)***

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b) Identify a mistake in the set up and give a reason ***(2 marks)***

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c) Gas A was passed over heated copper in a combustion tube, state the observation made ***(1 mark)***

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27. State Hess's law ***(1 mark)***

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b). Given the following energies

$C_4H_{10}\ (g) + {}^{13}/_{2}O_2\ (g) \longrightarrow 4CO_2\ (g) + 5H_2O\ (l)$; ΔH_1 - 7160kJmol^{-1}

$C_{(graphite)} + O_2\ (g) \longrightarrow CO_2\ (g)$; ΔH_2 = -393kJmol^{-1}

$H_2\ (g) + {}^{1}/_{2}O_2\ (g) \longrightarrow H_2O\ (g)$ ΔH_3 = -286kJmol^{-1}

Draw energy circle diagram linking of formation of butane to its heat of combustion and heat of combustion and heat of combustion of carbon and hydrogen ***(2 marks)***

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c) Use the energy circle to calculate the heat of formation of butane ***(2 marks)***

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28. a)What is a fuel ***(1mark)***

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b) State two factors to consider when choosing fuel ***(2 marks)***

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THE END