Name:..... Index No: ...../.....

233/1
CHEMISTRY
Paper 1
(THEORY)
Oct./Nov. 2015
2 hours

Candidate's signature: .....

Date: .....

THE KENYA NATIONAL EXAMINATIONS COUNCIL

02315200

Kenya Certificate of Secondary Education
CHEMISTRY
Paper 1
(THEORY)
2 hours

Instructions to Candidates

(a) Write your name 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 silent non-programmable electronic calculators may be used.
*(e) All working **MUST** be clearly shown where necessary.*
(f) This paper consists of 15 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

Questions	Maximum Score	Candidate's Score
1 - 29	80	

1 (a) Give the name of the first member of the alkene homologous series. (1 mark)

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(b) Describe a chemical test that can be used to distinguish butanol from butanoic acid. (2 marks)

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2 (a) Name the raw material from which sodium is extracted. (1 mark)

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(b) Give a reason why sodium is extracted using electrolysis. (1 mark)

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(c) Give **two** uses of sodium metal. (1 mark)

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3 (a) What is meant by lattice energy? (1 mark)

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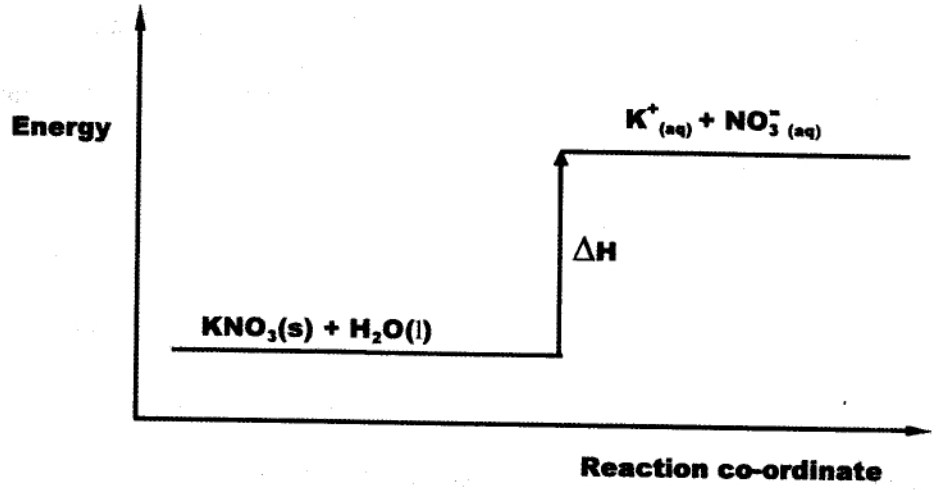
(b) Study the energy level diagram below and answer the question that follows:



What type of reaction is represented by the diagram? (1 mark)

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4 (a) State the Boyles law. (1 mark)

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(b) A gas occupies 500 cm³ at 27°C and 100,000 Pa. What will be its volume at 0°C and 101325 Pa? (2 marks)

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5 Calculate the mass of Zinc oxide that will just neutralise dilute nitric (V) acid containing 12.6 g of nitric (V) acid in water. (Zn = 65.0; O =16.0, H = 1.0, N = 14.0). (3 marks)

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6 Describe how sodium carbonate is used to remove water hardness. (2 marks)

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7 Hydrogen chloride gas can be prepared by reacting sodium chloride with an acid.

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

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

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(c) State **two** uses of hydrogen chloride. (1 mark)

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8 When solid A was heated strongly, it gave off water and a solid residue. When water was added to the solid residue, the original solid A, was formed .

(a) What name is given to the process described? (1 mark)

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(b) Give **one** example of solid A. (1 mark)

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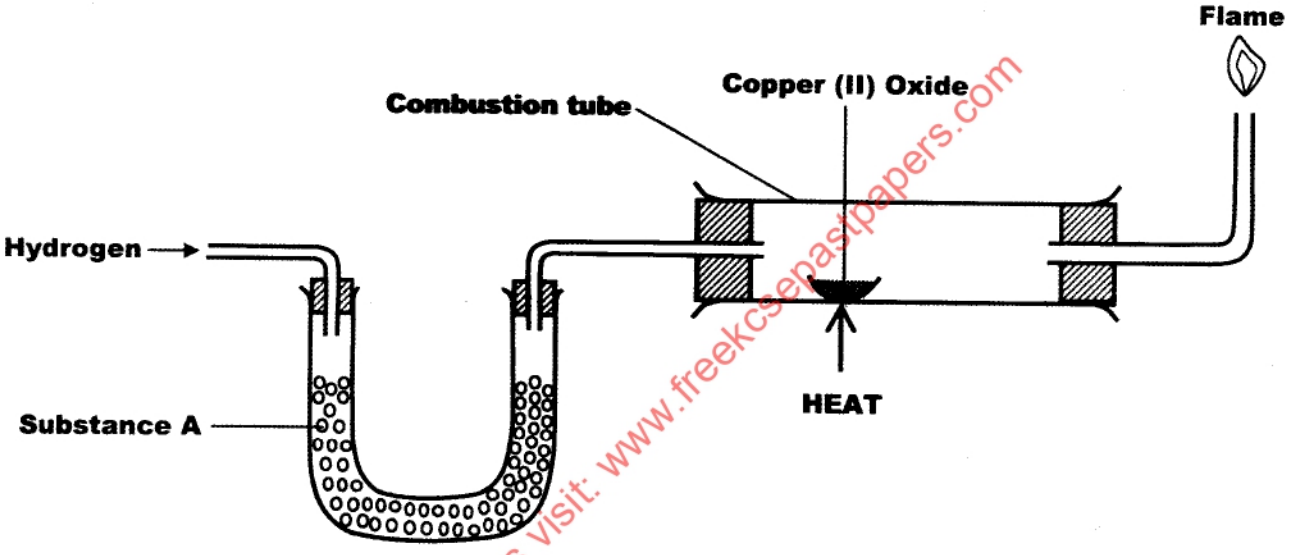
9 The set up below was used to investigate the reaction between dry hydrogen gas and copper (II) oxide.



(a) Name substance **A**. (1 mark)

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(b) State the observation made in the combustion tube. (1 mark)

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.....

(c) Explain the observation stated in (b) above. (1 mark)

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10 The atomic number of an element, T is 15.

(a) Write the electronic configuration of the ion T^{3-}. (1 mark)

.....

(b) Write the formula of an oxide of T. (1 mark)

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11 Dilute sulphuric (VI) acid was electrolysed using **platinum electrodes**.
Name the product formed at the anode and give a **reason for your answer**. (2 marks)

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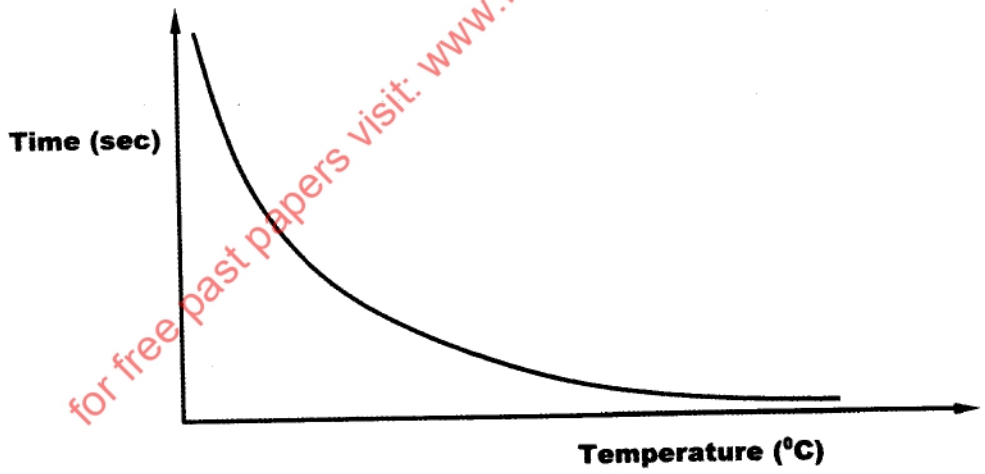
12 The curve shown below shows the variation of time against temperature for the reaction between sodium thiosulphate and hydrochloric acid.



(a) Write the equation for the reaction between sodium thiosulphate and dilute hydrochloric acid. (1 mark)

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(b) Explain the shape of the curve. (2 marks)

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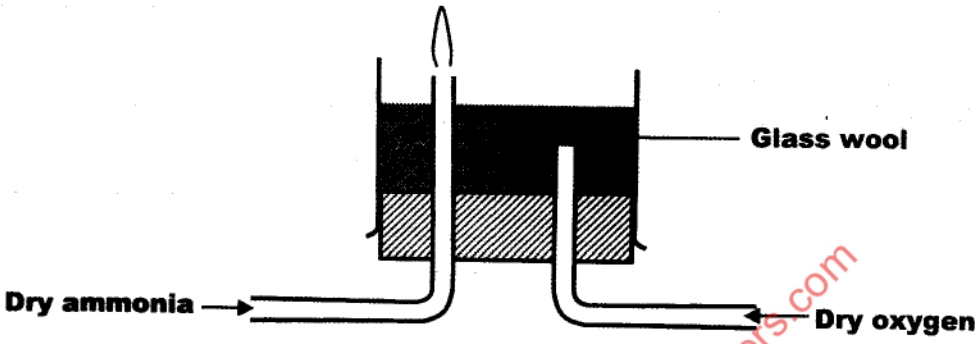
13 Dry ammonia and dry oxygen were reacted as shown in the diagram below.



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

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

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14 The table below shows behaviour of metals R, X, Y and Z. Study it and answer the questions that follow:

Metal	Appearance on exposure to air	Reaction in water	Reaction with dilute hydrochloric acid
R	slowly tarnishes	Slow	Vigorous
X	Slowly turns white	Vigorous	Violent
Y	No change	Does not react	Does not react
Z	No change	No reaction	Reacts moderately

(a) Arrange the metals in the order of reactivity starting with the most reactive. (2 marks)

.....

(b) Name a metal which is likely to be: (1 mark)

(i) X .....

(ii) Y .....

15 Given the following substances: wood ash, lemon juice and sodium chloride.

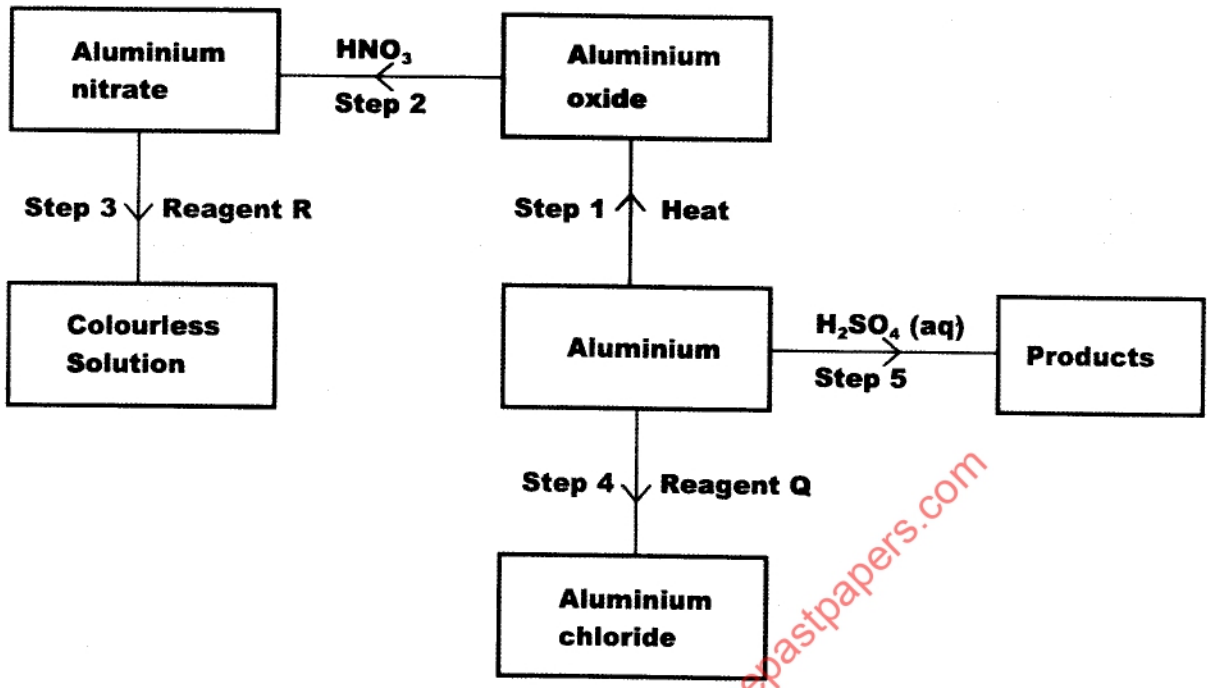
(a) Name **one** commercial indicator that can be used to show whether wood ash, lemon juice and sodium chloride are acidic, basic or neutral. (1 mark)

.....

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

Acid	Base	Neutral

16 The flow chart below shows various reactions of aluminium metal. Study it and answer the questions that follow:



(a) (i) Other than water, name another reagent that could be R. (1 mark)

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(ii) Write the formula of reagent Q. (1 mark)

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(b) Write an equation for the reaction in step 5. (1 mark)

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17 (a) One of the allotropes of sulphur is rhombic sulphur, name the other allotrope. (1 mark)

.....

(b) Concentrated sulphuric (VI) acid reacts with ethanol and copper.
State the property of the acid shown in each case. (2 marks)

(i) Ethanol .....

(ii) Copper .....

18 Study the standard electrode potentials in the table below and answer the questions that follow.

	E^{θ} volts
$Cu^{2+}_{(aq)} + 2e \rightarrow Cu_{(s)}$;	+ 0.34
$Mg^{2+}_{(aq)} + 2e \rightarrow Mg_{(s)}$;	- 2.38
$Ag^{2+}_{(aq)} + e \rightarrow Ag_{(s)}$;	+ 0.80
$Ca^{2+}_{(aq)} + 2e \rightarrow Ca_{(s)}$;	- 2.87

(a) Which of the metals is the strongest reducing agent? (1 mark)

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(b) What observations will be made if a silver coin was dropped into an aqueous solution of copper (II) sulphate? Explain. (2 marks)

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19 A radioactive substance weighing M kg took 1900 years for the original mass to reduce to 15 kg. Given that the half life of the radioactive substance is 380 years;

(a) Determine the original mass of the radioactive substance. (2 marks)

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(b) State **two uses of radioactivity in medicine.** (1 mark)

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20 A crystal of iodine, heated gently in a test tube gave off a purple vapour.

(a) Write the formula of the substance responsible for the purple vapour. (1 mark)

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(b) What type of bond is broken when the iodine crystal is heated gently? (1 mark)

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(c) State **one** use of iodine. (1 mark)

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21 **Describe how samples of lead (II) sulphate, ammonium chloride and sodium chloride can be obtained from a mixture of the three.** (3 marks)

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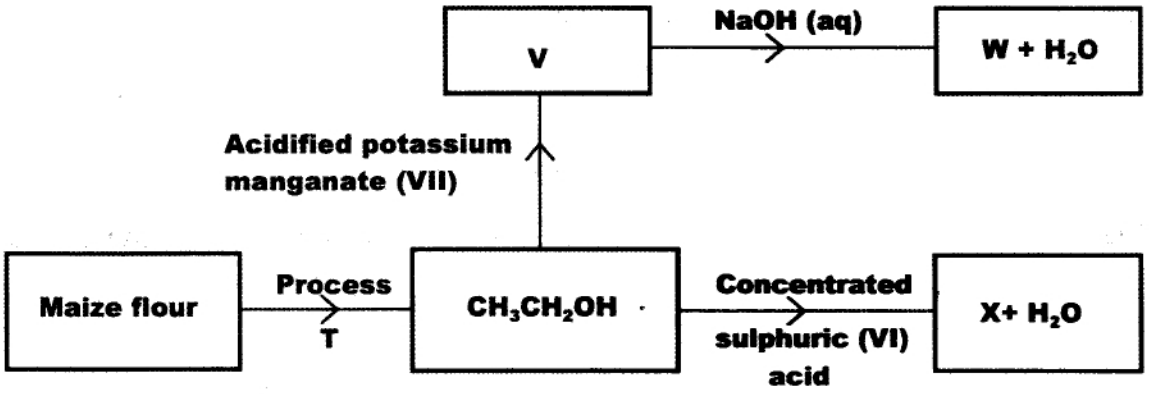
22 Study the flow chart below and use it to answer the questions that follow.



(a) Name process T. ..... (1 mark)

(b) Give the formula of W. ..... (1 mark)

(c) State **two** uses of X. (1 mark)

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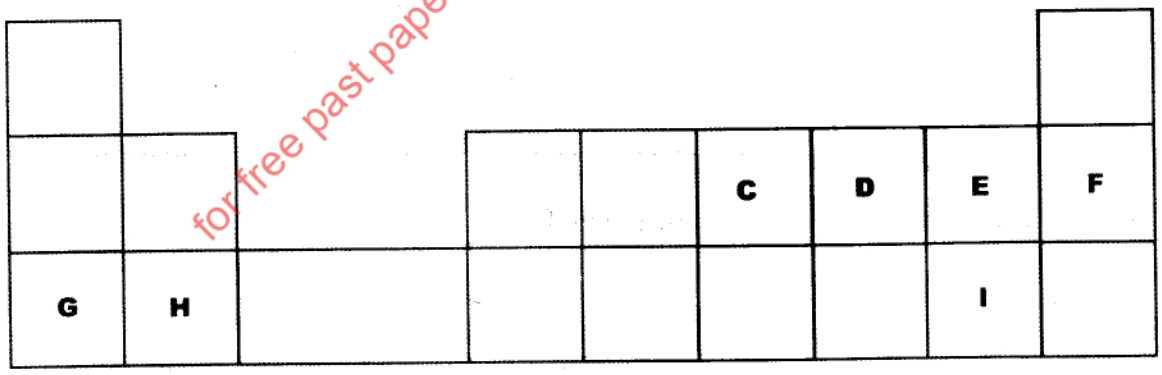
23 The table below is part of the periodic table. The letters are not the actual symbols of the elements. Study it and answer the questions that follow.



(a) Select an element which is stored in paraffin in the laboratory. (1 mark)

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(b) How do the ionic radii of E and I compare? Explain. (2 marks)

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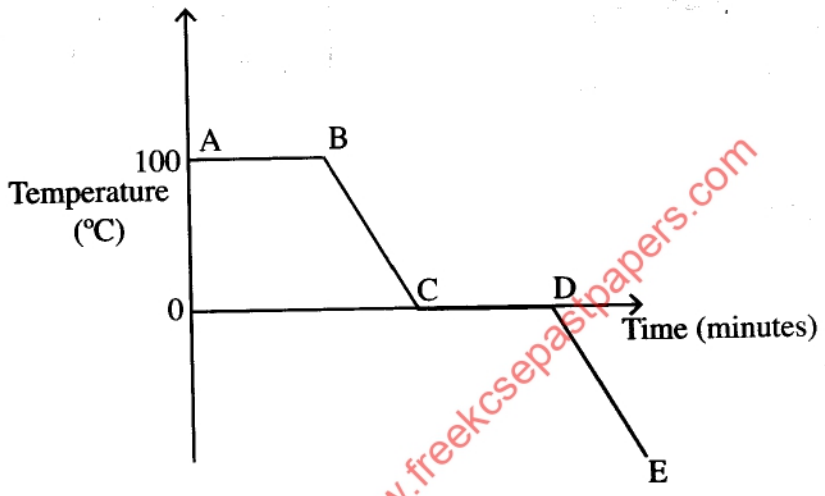
24 The graph below is a cooling curve for water. Study it and answer the questions that follow.



(a) Explain what happens to the molecules of water in the region BC in terms of kinetic theory. (2 marks)

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(b) In what state is the water in the region DE? (1 mark)

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25 Starting with barium nitrate solution, describe how a pure sample of barium carbonate can be prepared in the laboratory. (3 marks)

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26 A hydrocarbon contains 14.5% of hydrogen. If the molar mass of the hydrocarbon is 56, determine the molecular formula of the hydrocarbon. (C = 12.0; H = 1.0) (3 marks)

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27 (a) Describe how carbon (IV) oxide can be distinguished from Carbon II Oxide using calcium hydroxide solution. (2 marks)

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(b) What is the role of carbon (IV) oxide in fire extinguishing? (1 mark)

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28 (a) State **one** source of alkanes. (1 mark)

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(b) Ethane gas was reacted with 1 mole of bromine gas. State **one** observation made during this reaction. **(1 mark)**

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29 **An electric current was passed through several substances and the results obtained recorded in the table below.**

Substance	Physical state at room temperature	Conductivity	Products	
			Anode	Cathode
A	Liquid	Does not conduct	-	-
B	Solid	Conducts	-	-
C	Liquid	Conducts	Green gas	Grey solid
D	Liquid	Conducts	Brown gas	Grey solid
E	Liquid	Conducts	-	-

Which of these substances is likely to be:

(a) **magnesium** ..... (1 mark)

(b) **hexane** ..... (1 mark)

(c) **lead (II) bromide ?** ..... (1 mark)

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