NAME: …………………………………………… INDEX NO: ………………………

DATE: …………………………….CLASS: …………………... SIGNATURE: ………………

233/2
CHEMISTRY
PAPER 2
(Theory)
MAY/JUNE 2014
2 HOURS

BUNYORE-MARANDA (BUMA (II) JOINT EXAMINATIONS
Kenya Certificate of Secondary Examinations

INSTRUCTIONS TO CANDIDATES
1. Write your name, Index number in the spaces provided
2. Sign and write the date of the examination in the spaces provided
3. Answer all the questions in the spaces provided in the question paper
4. Mathematical tables and silent electronic calculators may be used
5. All working must be clearly shown where necessary
6. Slovenly work will be penalized.

FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	11	
2	12	
3	10	
4	10	
5	15	
6	10	
7	12	
	80	

1. Study the table below and answer the questions that follow. The letters do not represent the actual symbols of the element.

Formula of ion	Electronic configuration
E^{2+}	2
D^-	2.8
$C1^-$	2.8.8
B^{3+}	2.8
A^{2+}	2.8

(a) Select elements found in: -

(i) The same group …………………………………………… (1 mark)

(ii) Period three…………………………………………….. (1 mark)

(iii) What is the family name given to the group number to which element E belongs

(1 mark)

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(b) With reasons compare the atomic radius of elements B and A. (2 marks)

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(c) State two industrial uses of element B. (2 marks)

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(d) With reasons, compare the reactivity of E and A. (2 marks)

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(e) Write the formula of the compound formed when D and A react. (1 mark)

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(b) What type of bond is formed when element E reacts with oxygen. Give a reason or your

answer. (2 marks)

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2. Study the flow chart and information in the table below it and answer the questions that follow. The chart shows how certain chemicals can be obtained from a sample of sea water.

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                                      ┌─────────────┐
                                      │  Sea water  │
                                      └──────┬──────┘
              ┌──────────────────────────────┴──────────────────────┐
              ▼                                                      ▼
┌──────────────────────────────────┐                       ┌──────────────┐
│ Mixture of crystalline solids with│                       │  Solution P  │
│ solubility less than 50g per 100  │                       └──────┬───────┘
│ of water                          │                           Chlorine gas
└──────────────┬───────────────────┘                              ▼
            Water                                          ┌──────────────────┐
      ┌────────┴────────┐                                  │ Element Q and R  │
      ▼                 ▼                                  └──────────────────┘
 ┌─────────┐      ┌──────────┐
 │ Salt S  │      │ Solid T  │
 └────┬────┘      └──────────┘
  Sodium carbonate
  solution
   ┌──────┴──────────┐
   ▼                 ▼
┌────────┐     ┌────────────┐
│Solid T │     │ Solution U │
└────────┘     └─────┬──────┘
               Barium chloride solution
               with nitric(V) acid
            ┌──────────┴──────────┐
            ▼                     ▼
     ┌────────────┐      ┌──────────────────────┐
     │ Solution W │      │ White precipitate V  │
     └────────────┘      └──────────────────────┘
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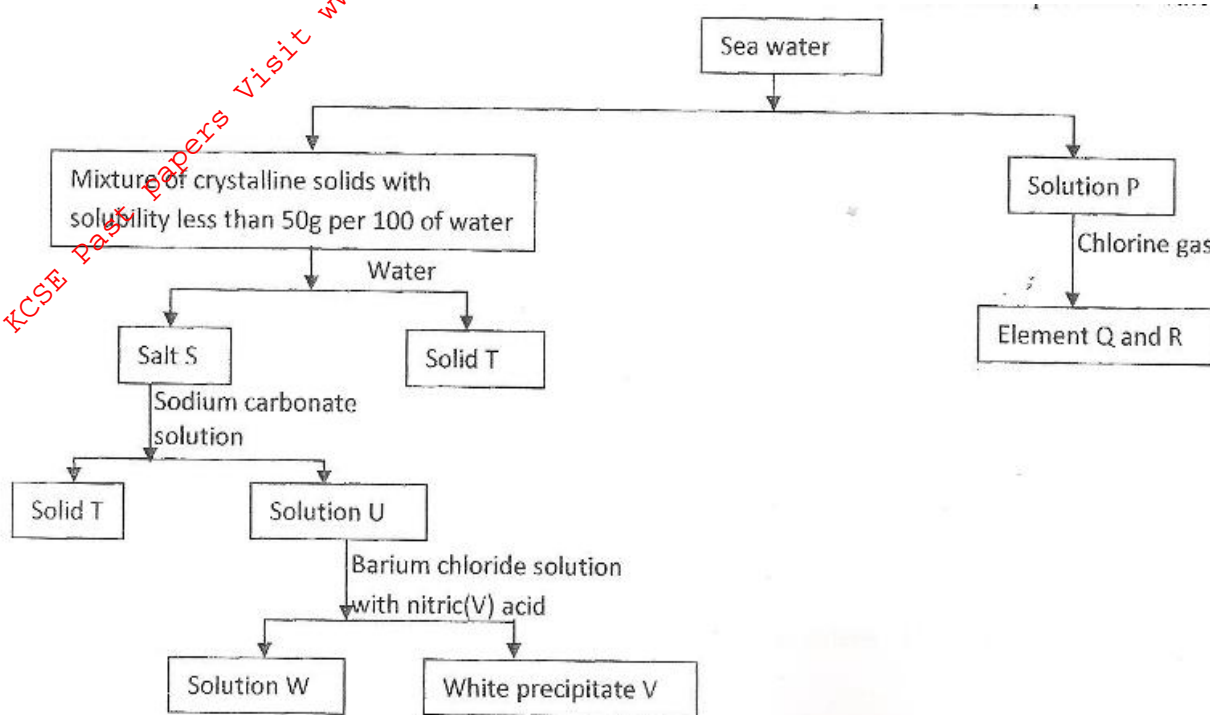
Salt	$MgSO_4$	$CaSO_4$	$MgCl_2$	$CaCl_2$	KCl	NaCl	K_2SO_4	KBr	NaI
Solubility g/10g water	22	0.21	55	83	35	35.6	12	56	160

(a) Write the formulae of two anions in solution W. (1 mark)

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(i) Identify elements Q and R (1 mark)

Q …………………………………………………………………………………………

R …………………………………………………………………………………………

(ii) Write an ionic equation for the reaction which produces Q and R.

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(iii) Name salt X …………………………………………………………………………………...

(iv) Name solid T and write the equation for the reaction which produces it.

Solid T ………………………………………………………………………………… (1 mark)

Equation……………………………………………………………………… (1 mark)

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(v)   Write the formulae of the precipitate V.   (1 mark)

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(vi)   Name two salts present in solution W.   (2 marks)

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(b) Explain why seat water is not suitable for washing clothes.   (2 marks)

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(c) Explain why motor vehicles based in Mombasa rust much faster than those based in Nairobi.   (1 mark)

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3.   (a) The chief ore for the extraction of lead metal is galena. Describe how the presence of lead can be identified in an ore.   (2 marks)
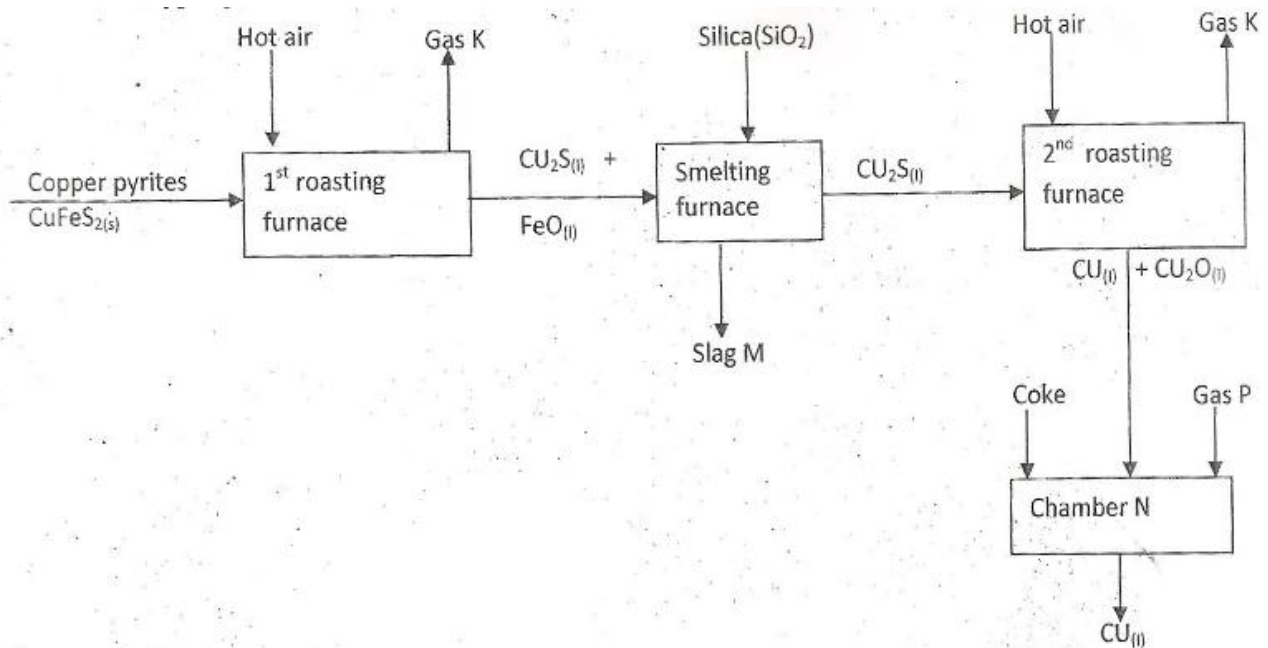
(i)   Name gas K ……………….…………………………………………. (1/2 mk)

(ii)   Write an equation for the reaction that takes place in the 1st roasting furnace.

                                                                        (1 mark)

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(iii)   Write the formulae of the cation present in Slag M   (1 mark)

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(iv)   Identify gas P   (1/2 mk)

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(v)   What name is given to the reaction that takes place in chamber N? Give a reason for
        the answer.   (1 mark)

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(c)   The copper obtained from chamber N is not pure. Draw a labeled diagram to show the set
        up you would use to refine the copper by electrolysis.   (2 mark)

(d) Given that the mass of copper obtained from the above extraction was 210kg, determine the percentage purity of the ore (copper pyrites) if 810kg of it was fed to the first roasting furnace. (CU = 63.5, Fe = 56.9, S = (3 marks)

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4. The diagram below represents a set up that was used to obtain dry nitrogen from air. Study it and answer the questions that follow.
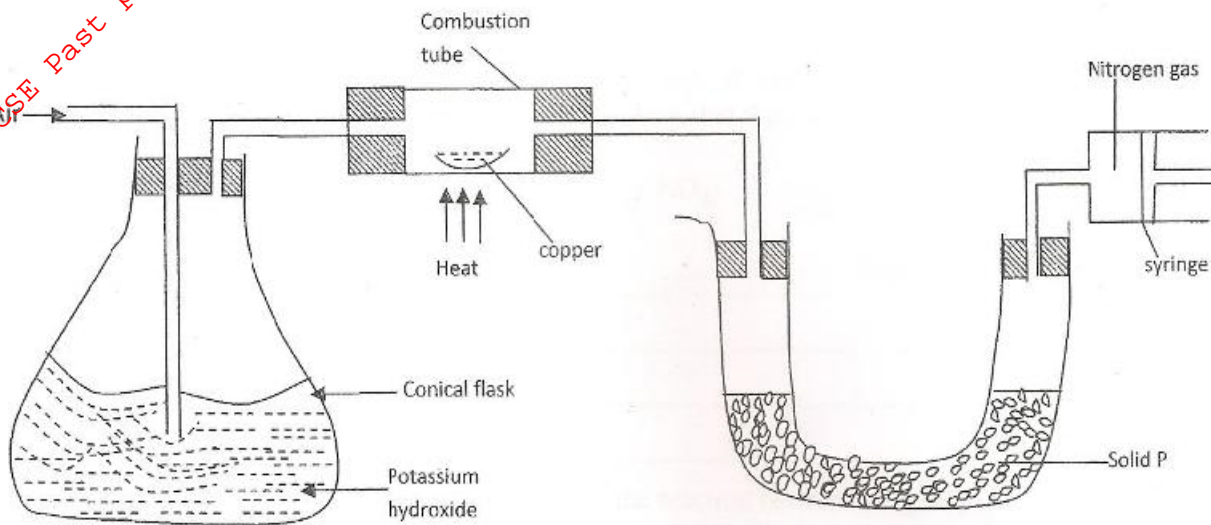
(a) (i) Name solid P. (1 mark)

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(ii) State the observations in the combustion tube. (1 mark)

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(iii) Write down the equation occurring in the conical flask. (1 mark)

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

(1 mark)

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(v)   How would the volume nitrogen gas collected in the syringe if magnesium turnings were used in the combustion tube instead of zinc granules? Explain

(2 marks)

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(c)   Nitrogen forms many compounds in which its oxidation states varies.

(i) What is meant by oxidation state?   (1mark)

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(ii)   Below is an equation for the reaction between an oxide of sulphur and an oxide of nitrogen. Using the oxidation number of sulphur or nitrogen, show that the reaction is a redox.
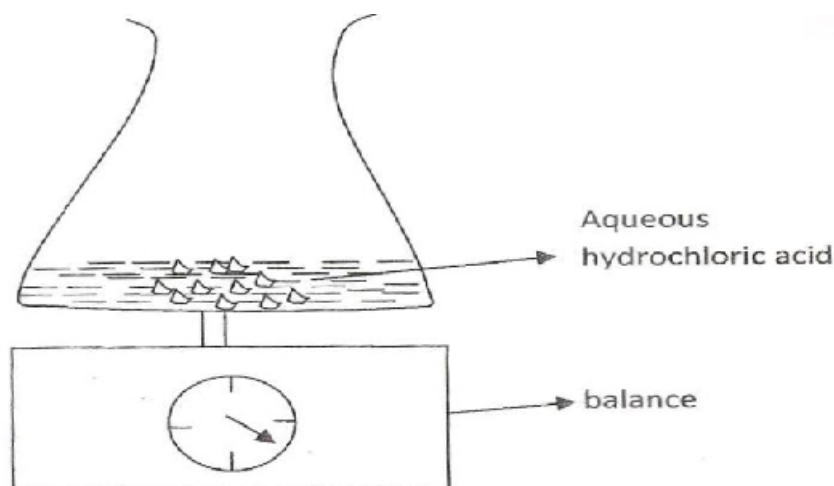
$$SO_{2(g)} + NO_{2(g)} \longrightarrow SO_{3(g)} + NO_{(g)}$$ (3 marks)

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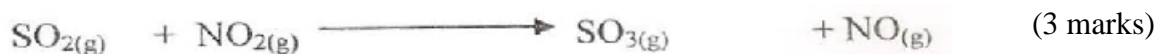
5.   During an experiment, a form four student studied the reaction between 120g of pellets of brass and aqueous hydrochloric acid at 25^0C as shown; and readings on the balance were recorded at regular intervals.

The results are given in the table below

| Time in seconds	Reading on the balance (g)	Total loss in mass (g)
0	600	0.00
20	599.50	0.50
40	598.84	0.88
60	598.66	1.16
80	598.54	1.34
100	598.50	1.46
120	598.50	1.50
140	598.50	1.50
160	598.50	1.50

(a) Explain why the readings on the balance decreased with time during the first 120 seconds and then remained constant. (1 mark)

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(b) Show how a gaseous product of the reaction is collected on the diagram. (2 marks)

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(c) (i) Draw a graph of total loss in mass against time. (3 marks)
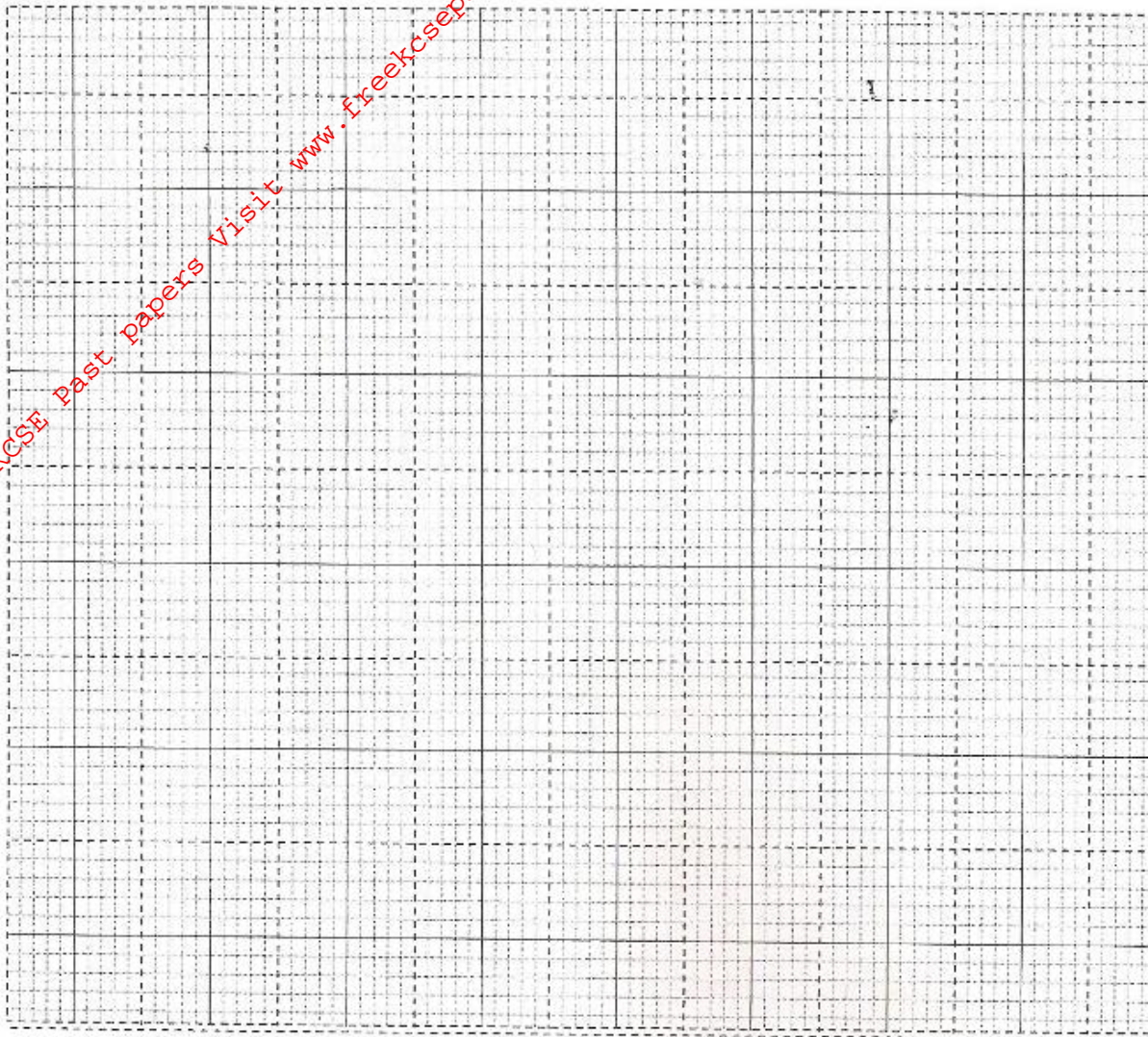
(ii)   From the graph determine the rate of reaction 50 seconds after the start.   (2 marks)

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(d) Write an equation for the reaction in the flask.   (1 mark)

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(e) Calculate the mass of copper contained in brass (H = 1, Zn = 65.4)   (3 marks)

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(f) Calculate the total mass in grams that was left after the experiment in the conical flask. (1 mark)

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(g) Apart from temperature change, state two other ways in which the reaction in the experiment can be speeded up. (2 marks)

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6. Study the scheme below and answer the questions that follow.
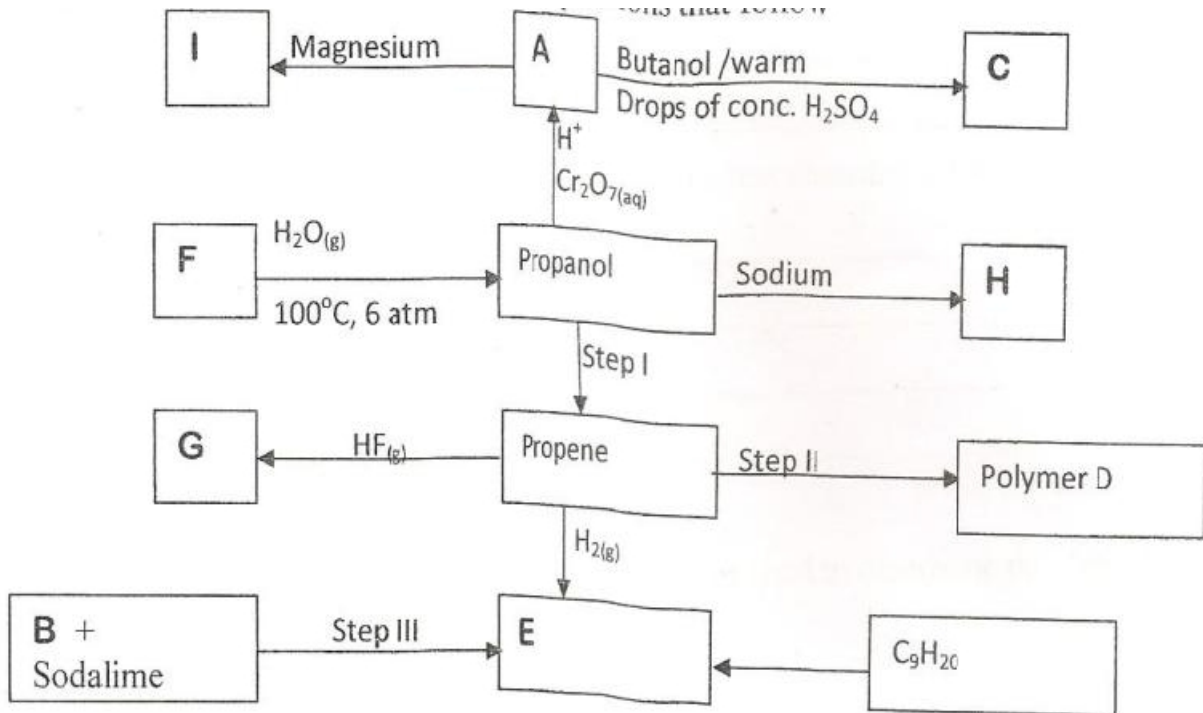
(a) Name the following compounds. (1 mark)

F …………………………………………………………………………………………..

I.……………………………………………………………………………………………

(b) Name and draw the structural formula of compounds G and H. (2 marks)

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(c) Write down chemical equations for;

(i) Reaction of compound A and butanol (1 mark)

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(ii)   Reaction in step II (1 mark)

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(d) Name the process that takes place in step IV (1 mark)

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(e) Name the conditions necessary for propene to form compound E. (1 mark)

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(f) Describe how you can distinguish between compound A and propanol. (3 marks)

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7.   (a) (i) Apart from ethanol, name two liquid fuels. (1 mark)

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(ii) State two factors that should be considered when choosing a fuel for cooking.

(2 marks)

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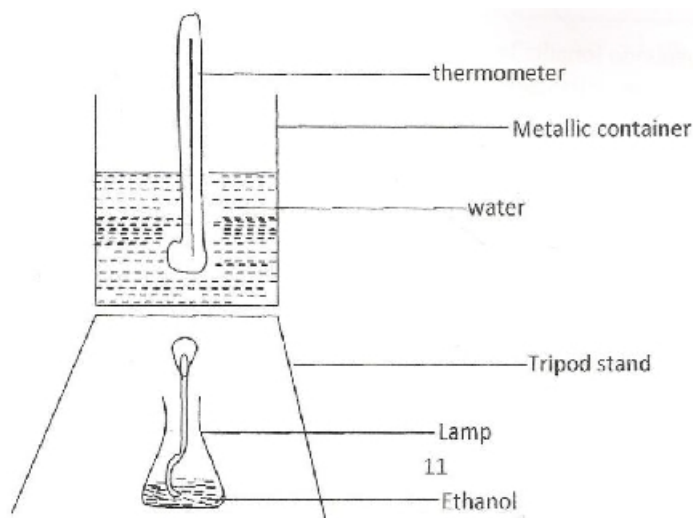
During the experiment, the data given below was recorded.

Volume of water = 500cm^3

Initial temperature of water = 25^{0}C

Final temperature of water = 46.5^{0}C

Mass of ethanol + lamp before burning = 125.5g

Mass of ethanol + lamp after burning = 124.0g

Calculate;

(i) Heat evolved during the experiment (Density of water = 1g/cm^3, specific heat capacity of water = 4.2J/g/k. (3 marks)

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(ii) Molar heat of combustion of ethanol (C = 12.0, O = 16.0, H = 1.0) (2 marks)

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(c) Write the equation for the complete combustion of ethanol. (1 mark)

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(d)   The experiment value of molar heat of combustion of ethanol obtained in (b) (ii) above is lower than the theoretical value. Give two reasons for this variation.   (2 marks)

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(c)   Why is the water in the container continuously stirred with thermometer?   (1 mark)

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