

NAME.....INDEX NO.....

School.....

CANDIDATE'S SIGNATURE.....

DATE.....

233/1

CHEMISTRY

PAPER 1

THEORY

2 HRS

MARCH/ APRIL 2015

LAINAKU FORM FOUR EXAM YEAR 2015

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.

(d) Mathematical tables and silent calculators may be used.

(e) All working MUST be clearly shown where necessary

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

(h) This paper consists of 14 printed pages

FOR EXAMINER'S USE ONLY

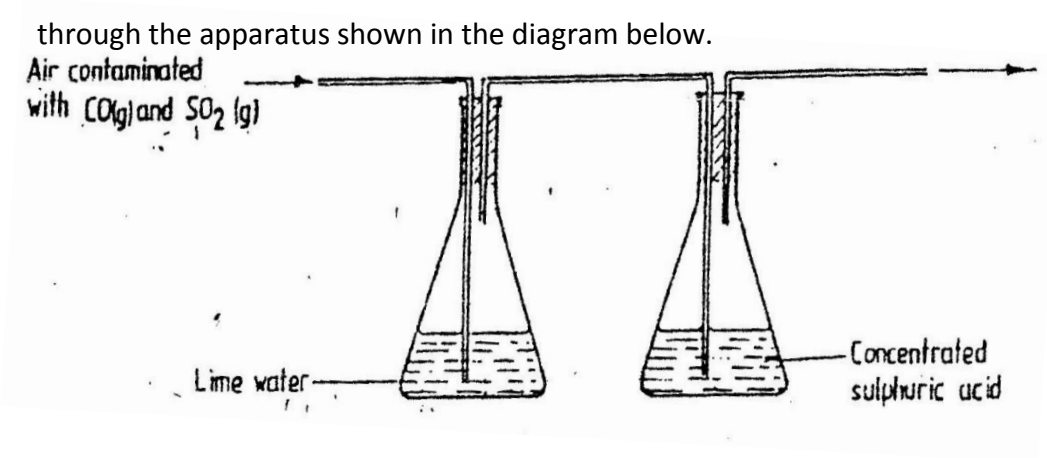
Questions	Maximum Score	Candidate's Score
1 – 30	80	

This paper consists of 14 printed pages.. Candidates should check the question paper to ensure that all the Pages are printed as indicated and no questions are missing.

1. Complete the table below for the characteristics of the sub atomic particles. (2marks)

sub atomic particle	Relative mass	Electrical charge
Proton	1	
Neutron	1	

2. A sample of air contaminated with carbon monoxide and sulphur dioxide was passed through the apparatus shown in the diagram below.



Which contaminant was removed by passing the contaminated air through the apparatus?.

Explain . (2mks)

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3 Explain how you would obtain solid lead carbonate from a mixture of lead carbonate and sodium carbonate powders. (3mks)

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4. (a) Write an equation for the reaction that takes place when carbon (II) oxide gas is passed over heated lead(II)oxide. (1mk)

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(b) State **one** other use of carbon (II) oxide gas . (1mk)

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5. Describe how the following reagents can be used to prepare copper (II) hydroxide , solid copper (II) sulphate, solid sodium hydroxide and distilled water. (3mks)

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6. Aluminium metal is a good conductor and is used for overhead cables. State any other two properties that make aluminium suitable for this use . (2mks)

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7. A given volume of ozone, (O₃) diffused from a certain apparatus in 96 seconds.

Calculate the time taken by an equal volume of carbon (IV) oxide (CO₂) to diffuse under the same conditions (O = 16.0, C = 12.0) (3marks)

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8. (a) What is meant by isomerism? (1mark)

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(b) Draw and name **two** isomers of butane. (2 marks)

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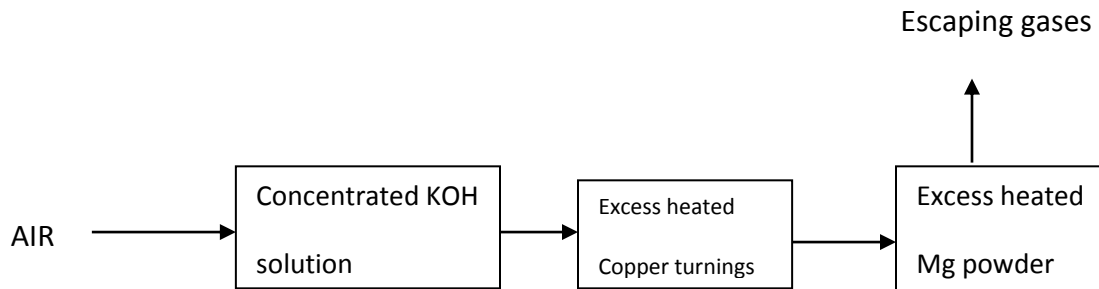
9 The table below shows the relative molecular masses and the boiling points of methane and water

	Relative molecular mass	Boiling point(°C)
Methane	16	-161
Water	18	100

Explain why the boiling point of water is higher than that of methane. (2mks)

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10. Air was passed through several reagents as shown in the flow chart below



(a) Write an equation for the reaction, which takes place in chamber with magnesium powder

(1mk)

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(b) Name one gas, which escapes from the chamber containing magnesium powder. Give a reason for your answer.

(2mks)

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11. (a) Other than the enthalpy of combustion, state **one** factor which should be considered when choosing a fuel.

(1mk)

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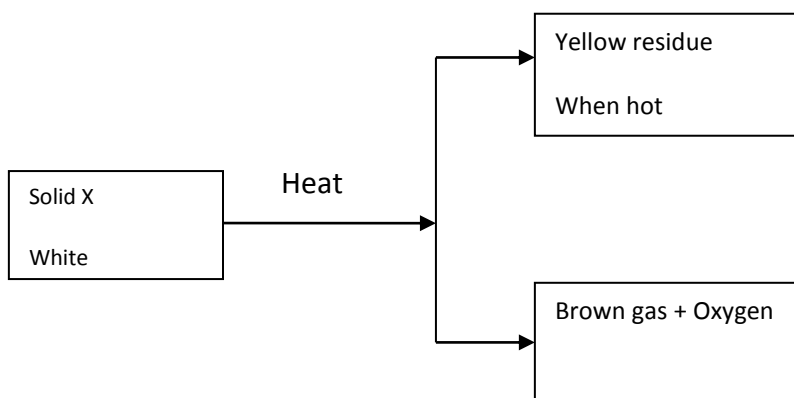
(b) The molar enthalpies of neutralization for dilute hydrochloric acid and dilute nitric (V) acid are - 57.2KJ/mol while that of ethanoic acid is -55.2kJ/mol. Explain this observation. (2 marks)

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12. a) Study the scheme below and answer the questions that follow.



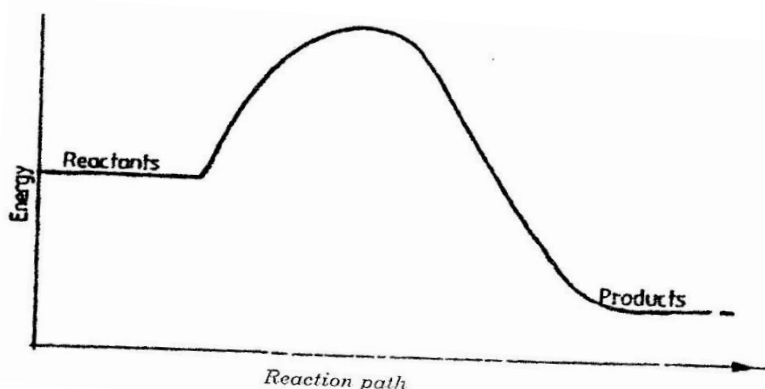
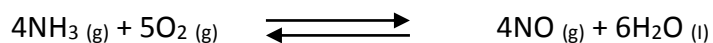
(a) Name (i) Solid X

(ii) The yellow residue (2 marks)

(b) Write an equation for the decomposition of the yellow solid (1mark)

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13. Ammonia can be converted to nitrogen monoxide as shown in the equation below

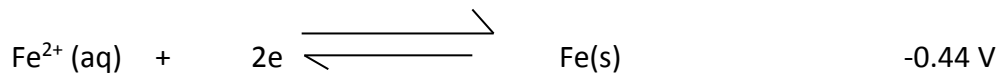
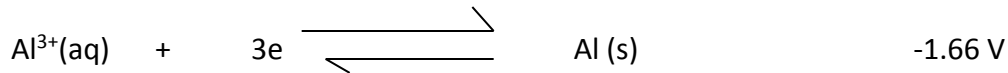
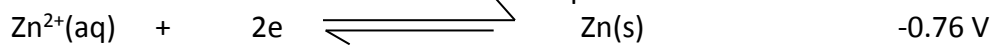


(a) Explain how an increase in temperature would affect the yield of nitrogen(II)oxide
(2mks)

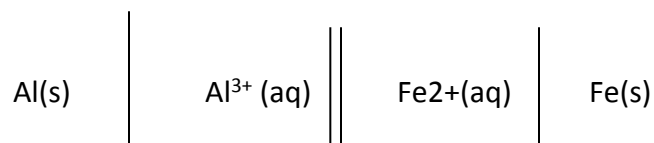
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b) On the energy level diagram above sketch, the energy level diagram that would be obtained if the reaction is carried out in the presence of platinum catalyst. (1 mk)

14. Use the information below to answer the questions that follow:



a). Calculate the E value for the electrochemical cell below (2mks)



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(b) Give a reason why aluminium metal would protect iron from rusting better than zinc metal.

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(1mk)

15. The grid below shows part of a periodic table. The letters do not represent the actual symbols of the elements

F																			

a) Select the:

(i) element which has the largest atomic radius. (1mk)

.....

(ii) Most reactive non-metal . (1mk)

.....

b) Show on the grid the position of the element J which forms J^{2-} ions with electronic configuration 2, 8, 8. (1mk)

16. A hydrocarbon slowly decolorizes bromine gas in the presence of sunlight but does not decolourise acidified potassium manganate (VII).

(i) Name the homologous series to which the hydrocarbon belongs . (1mk)

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(ii) Give an example of a member of the homologous series named in (i) above. (1mk)

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17. Atoms of element X exists as ${}^{14}_6 X$ and ${}^{12}_6 X$

(a) What name is given to the two types of atoms. (1mk)

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(b) Use dot (·) and cross (x) diagrams to illustrate the atomic structure of ${}^{14}_6\text{X}$. (2mks)

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18. When dilute nitric acid was added to a sample of solid C, a colourless gas that formed a white precipitate with limewater was produced. When another sample of solid C was heated strongly in a dry test – tube, there was no observable change.

Identify the cation and anion in solid C (2marks)

CATION.....

ANION.....

19. Complete the table below by inserting the missing information in the space provided

(2marks)

Name of polymer	Name of monomer	One use of the polymer
	ethene	

20. In an experiment, soap solution was added to three separate samples of water. The table below shows the volumes of soap solution required to form lather with 100cm³ of each sample of water before and after boiling.

	Sample I	Sample II	Sample III
Volume of soap before water is boiled (cm ³)	27.0	3.0	10.6
Volume of soap after water is boiled (cm ³)	27.0	3.0	3.0

(a) Which water sample is likely to be soft? Explain. (2mks)

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(b) Name the type of water hardness in sample III (1mk)

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21. The reaction of ethane with chlorine gas gave a compound of formula C₂ H₅Cl.

a) What condition is necessary for the above reaction to take place? (1mk)

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b) Draw the structural formulae of the compound C₂ H₅Cl. and name it. (2mks)

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22 .Soot is one of the environmental pollutants .

(i) Explain the term pollutant.

(1mk)

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(ii) State how soot is formed from hydrocarbons.

(1mk)

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23. In an experiment, sulphur (Iv) oxide gas was bubbled into water followed by chlorine gas. The resulting colorless solution gave a white precipitate when mixed with a acidified barium chloride solution. Explain these observations. (3mks)

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24. A compound has an empirical formula, C_3H_6O and a relative formula mass of 116. Determine its molecular formula (H = 1.0, C = 12.0, O = 16.0) (3mks)

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25. The table below gives three experiments on the reaction of excess hydrochloric acid and 0.5g of calcium carbonate done under different conditions. In each the volume of gas was recorded at different time intervals.

Experiment	Form of Zinc	Sulphuric acid solution
I	Powder	0.8m
II	Powder	1.0m
III	chips	0.8m

On the axis below draw and label the three curves that could be obtained from such results.

(3mks)



26. Crystals of sodium carbonate decahydrate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) were exposed to air for about four days.

(i) State what was observed. (1mk)

.....

(ii) Name the process that took place. (1mk)

.....

(ii) Write an equation for the reaction that occurred. (1mk)

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27. Explain why molten calcium chloride conducts electricity while silicon (IV) oxide does not.

(2mks)

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28. Calculate the mass of sodium oxide, Na_2O , formed when 3.45 g of sodium burns in air. (Na =23, O=16). (3mks)

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29. The table below gives the first ionization energy of three elements.

Element	A	B	C
1 st ionization energy(kJ/mol)	496	419	520

(i) define the term first ionization energy. (1mk)

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(ii) select the element that is the most reactive. Explain. (2mks)

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30. State the colour of the indicators in the solutions given in the table below: (3mks)

Indicator	Colour in	
	Acid	Base
Litmus	Red	
Methyl orange		Yellow
Phenolphthalein	Colourless	

NAME..... INDEX NO.....SIGNATURE.....

DATE.....

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CHEMISTRY PAPER 2 THEORY

MARCH/APRIL 2015

TIME: 2 HOURS

LAINAKU JOINT EXAMINATIONS 2015

INSTRUCTIONS TO CANDIDATES

- Write your name, index number and school in the spaces provided
- Sign and write date of examination in the space provided
- ANSWER ALL questions in the spaces provided.
- ALL workings MUST be clearly shown
- Mathematical tables and electronic calculators may be used

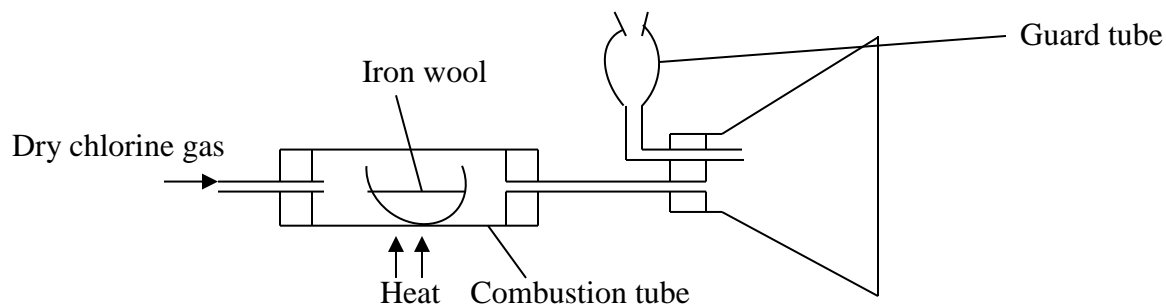
QUESTION	MAX SCORE	CANDIDATE SCORE
1	13	
2	10	
3	10	
4	13	
5	9	
6	11	
7	8	
8	6	
TOTAL SCORE	80	

FOR EXAMINER'S USE ONLY

This paper has 10 printed pages

1. (a) Give the name of one reagent which when reacted with concentrated hydrochloric acid produces chlorine gas. (1mk)

- (b) A student set out to prepare Iron (III) Chloride using apparatus shown in the diagram below.



- (i) Explain why: it is necessary to pass chlorine gas through the apparatus before heating begins. (1mk)
- (ii) Calcium oxide would be preferred in the guard tube. Explain. (1mk)
- (iii) What property of Iron (III) Chloride makes it possible to be collected as shown in the diagram above? (1mk)
- (iv) The total mass of Iron (III) Chloride formed was found to be 0.5g. Calculate the volume of chlorine gas that reacted with Iron. (Fe=56, Cl=35.5 and Molar gas volume at 298 = 24000cm³). (3mks)

- (c) When hydrogen sulphide gas passed through a solution of Iron (III) Chloride, the following observations were made:-

- The colour of the solution changed from reddish brown to green.
- A yellow solid was deposited.

Explain these observations.

(4mks)

(d) State and explain the observations that would be made if a moist blue litmus paper was placed in a gas jar full of chlorine gas. (2mks)

2. The table below gives some elements of the periodic table and their atomic masses, atomic numbers and melting points. The letters are not the actual symbols of the elements.

Element	B	C	D	E	F	G	H	I	J	K
Atomic No	7	8	19	15	2	9	6	16	12	11
Atomic mass	14	16	39	31	4	19	12	32	40	23
Melting point (⁰ C)	-209	-218	63.7	44	-272	-223	Vary	113	669	98

- a) Select **two** elements with oxidation states of -3 (1mk)
- b) Which elements represent the most powerful reducing agent. Explain (1mk)
- c) How does the atomic radius of D compare with that of K. Explain. (1mk)
- d) How do you compare the electrical conductivity of element D and J. Give your reason (1mk)

e) Select **two** elements which when reacted form a compound that conducts electricity both in molten and aqueous state. (1mk)

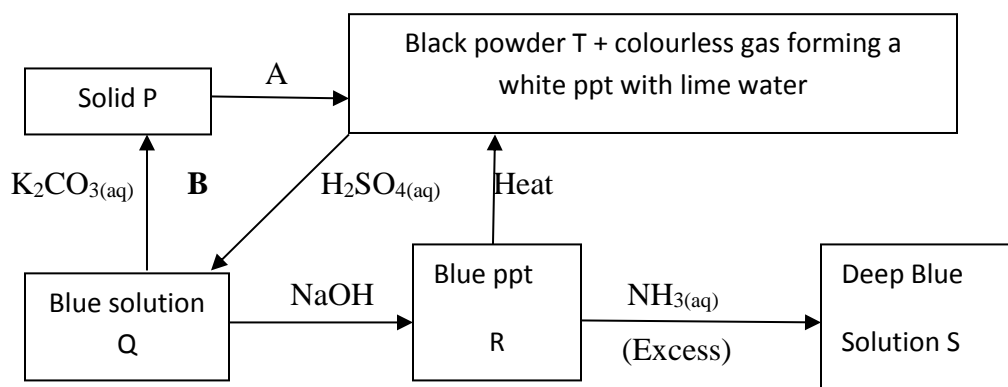
f) Select any two elements which when reacted form a compound that dissolves in water to form an acidic solution. (1mk)

g) In which period and group do elements D and G belong? (1mk)

i) Explain why the melting point of element K is higher than that of element D (1mk)

j) How does the atomic radius of K and I compare. Explain (2mks)

3. Study the flow chart below and answer the questions that follow.



(a) Name processes (2 mks)

- i) A
- ii) B

b) Name substances: (2mks)

- (i) Solid P
- (ii) Colourless gas

(b) Give balanced stoichiometric equations for the reactions:

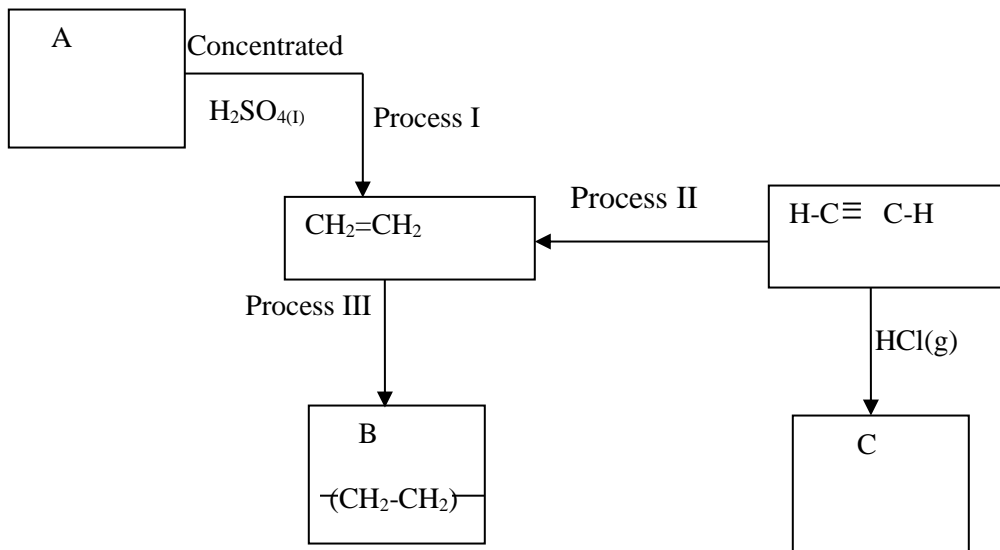
(i) Producing solid P (1mk)

(ii) Giving the blue precipitate R (2mks)

(iii) Thermal decomposition producing black powder T (1mk)

(iii) Producing deep blue solution S (2mks)

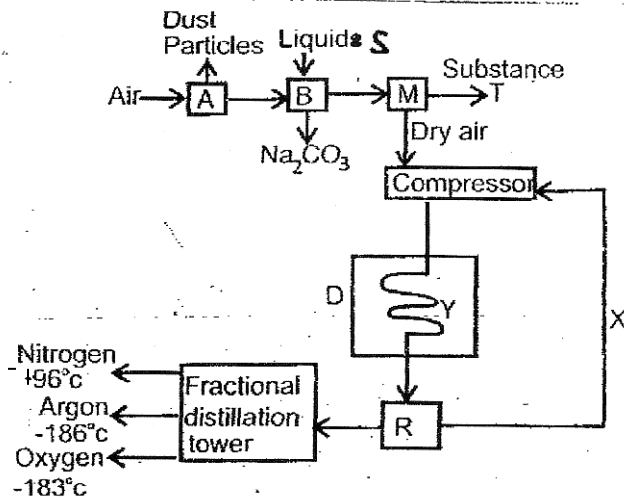
4. Study the flow chart below and answer the questions that follow.



- a)
- i) Name process I (1mk)
 - ii) Name process II (1mk)
 - iii) Name process III (1mk)

- iv) Give the conditions necessary for process I to occur.(1mk)
 - v) Give the conditions necessary for process II to occur.(1mk)
 - vi) Name compound C. (1mk)
 - vii) Name the reagent A. (1mk)
- b) Complete combustion of one mole of a hydrocarbon produced four moles of Carbon (IV) Oxide and four moles of water only .
- i) Write the formula of the hydrocarbon. (1mk)
 - ii) Write the equation for the combustion reaction. (1mk)
- c) An organic compound T contains 50% Oxygen;12.5% Hydrogen and 37.5% Carbon. The organic compound has a relative molecular mass of 32.
- i) Determine the molecular formula of the compound T. (3mks)
 - ii) Draw the structural formula of the compound T. (1mk)

5. Fractional distillation of liquid air is used to produce oxygen gas used in hospitals to patients with breathing problems. Study it and then answer the questions that follow.



- (a) What processes takes place in chambers:-

(4mks)

A:

B:

C:

D:

- (b) Name:

(2mks)

(i) Liquid S:

(ii) Substance T:

- (c) Explain why part Y in chamber D is curved.

(1mk)

(d) State **two** large scale use of oxygen gas other than the one mentioned. (2mks)

6. In an experiment to determine heat of displacement of Copper by Iron, 50cm³ of 0.2M Copper

(II) Sulphate was reacted with excess iron fillings. The following results were obtained.

Initial temperature of Copper (II) Sulphate solution = 25.0°C

Final temperature of the solution = 31.0°C

Mass of iron = 1.0g

(Assume density of solution = 1.0g/cm³, specific heat capacity = 4.2Jg⁻¹K⁻¹)

a) Calculate;

i) Heat evolved during the reaction. (2 marks)

ii) Molar heat of displacement. (2 marks)

iii) Write a thermochemical equation for the reaction above. (2 marks)

iv) Why were iron fillings used in excess? (1 mark)

b) Draw an energy level diagram for the reaction. (3 marks)

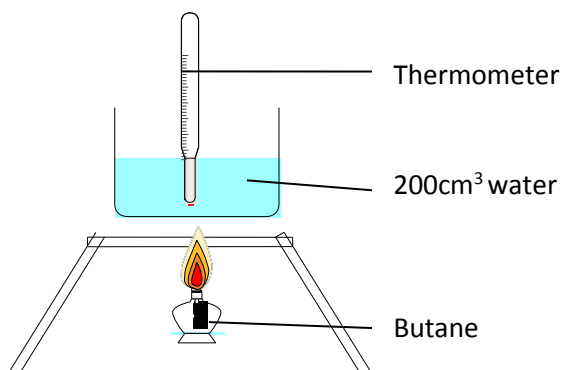
c) What is a fuel? (1 mark)

7. Butane is a gas at room temperature and pressure, it is used to melt bitumen to apply on roads.

a) Write an equation for complete combustion of butane. (1mk)

b) Define the term standard enthalpy of combustion. (1mk)

c) The set up below was used to determine the enthalpy change for combustion of butane.



The temperature rose from 22°C to 70°C when 1g of butane was burnt

Calculate the energy change and hence molar enthalpy. (specific heat capacity 4.2 kJ/kg/K,

density 1 gcm⁻³)

(2mks)

(d) Given the following enthalpies of combustion data:

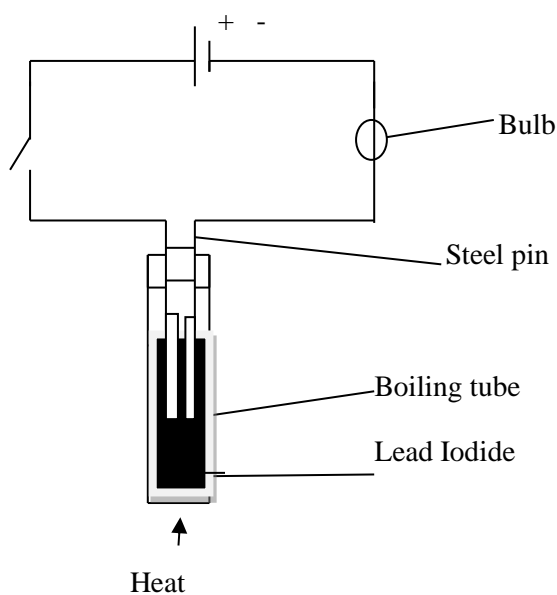
Carbon $\Delta H = -393 \text{ KJmol}^{-1}$

Hydrogen $\Delta H = -286 \text{ kJ mol}^{-1}$

Butane $\Delta H = -232 \text{ kJ mol}^{-1}$

Draw an energy cycle diagram and use it to calculate the enthalpy of formation of butane (4mks)

8. The diagram below shows a setup that was used by a student to investigate the effect of an electric current on molten lead (II) iodide.



- a) Explain what happens to lead iodide during the electrolysis. (2 marks)
- b) Give two reasons why solid lead (II) iodide does not conduct electricity? (2mks)
- c) Write equations to show the reaction taking place; (2 marks)
- i) At the cathode

ii) At the anode

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NAME..... index No. signature-----

DATE.....

233/3

CHEMISTRY PAPER 3 PRACTICAL

MARCH/APRIL, 2015

TIME: 2¼ HOURS

LAINAKU JOINT EXAMINATION – 2015

INSTRUCTIONS TO CANDIDATES:

- Write your name and index number and school in the spaces provided.
- Sign and write the date of examination in the spaces provided above.
- Answer **ALL** questions in the spaces provided in this question paper.
- You are **NOT** allowed to start working with the apparatus for the first 15 minutes of 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All workings **MUST** be clearly shown where necessary.
- Mathematical tables and electronic calculators may be used.

FOR EXAMINER'S USE ONLY:

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	11	
2	11	
3	18	
TOTAL SCORE	40	

The paper has 8 printed pages

1. You are provided with:

- 2.7g of metal carbonate (M_2CO_3) , solid Q
- A solution R which is 0.3 M hydrochloric acid .

You are required to determine the atomic mass of M in M_2CO_3 .

Procedure

Put all the solid in the provided empty 250 ml. beaker . Measure 100ml. of distilled water using a measuring cylinder and pour it in the beaker with solid Q. Swirl the beaker with the mixture to ensure all solid dissolves. Put the solution in a 250ml. volumetric flask. Rinse the beaker with about 100ml. of distilled water and put in the volumetric flask. Top up the solution with distilled water up to the mark. Transfer all this solution Q into **the 250ml beaker**

Fill the burette with solution R up to the mark .

Pipette 25.0cm^3 of solution Q into a clean conical flask. Add 3drops phenolphthalein indicator and titrate against solution R. Record your results in the table 1. Repeat the procedure two more times and complete the table.

Table 1

Experiment	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution R used (cm^3)			

(4mks)

(a) Determine the average volume of solution R used

(1mk)

(b) Write a balanced chemical equation which took place between Q and R (1mk)

(c) Calculate the number of moles of R used (1mk)

(d) (i) calculate the number of moles of Q, M_2CO_3 in the 25.0 cm^3 (1mk)

(ii) Calculate the molarity of Q. (1mk)

(e) Determine the concentration of Q in grams per litre (1mk) --

(f) Calculate the relative atomic mass M in M_2CO_3 (C= 12, O= 16) (1mks)

2. You are provided with:

- 0.25M copper (II) sulphate solution
- 1.0g of magnesium powder

You are required to:

Determine the molar heat of displacement of copper (ii) ions

Procedure

Using a measuring cylinder, measure 25.0 ml. of 0.25M copper (ii) sulphate solution into a clean 100ml. plastic beaker. Using a thermometer measure the temperature after every 30 seconds. At exactly 60 seconds add all magnesium powder into the copper (II) sulphate in the beaker. Continue stirring the mixture with the thermometer and record the temperature after every 30 seconds up to 360 seconds. Record the temperature in the table 2 below.

Table 2

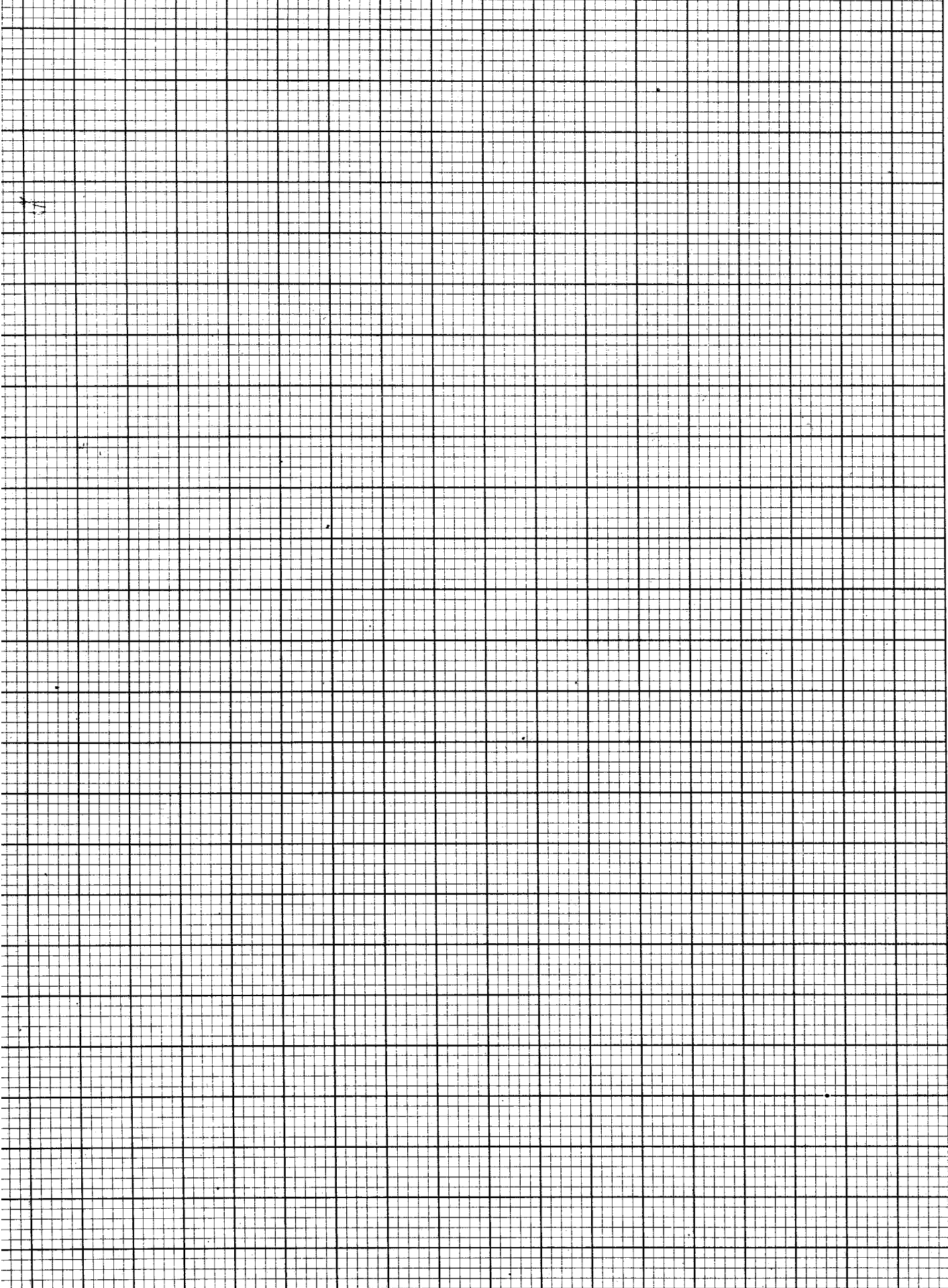
Time in seconds	0	30	60	90	120	150	180	210	240	270	300	330	360
Temperature in °C			X										

(4mks)

(a) Plot a graph of temperature against time in seconds on the grid provided (3mks)

(b) From the graph determine the change in temperature, Δt . Show it on the graph (1mk)

(c) Calculate the number of moles of copper (II) sulphate used in the reaction (1mk) ----



(d) Calculate the amount of heat evolved in the reaction above. (Specific heat of solution is 4.2kJ/kg/K , density of solution is 1g/cm^3 . (1mk)

(e) Calculate the amount of heat evolved when 1 mole of copper (II) sulphate ions is displaced. (1mks)

3. (a) you are provided with solid S. carry out the tests below and fill the table with observations and inferences.

(i) Heat a spatula end full of solid S in a clean dry test tube.

Observations	Inferences
(1mk)	(1mk)

(ii) Put a spatula end full of solid S in a boiling tube. Add about 10ml. of distilled water and shake to dissolve the solid. Divide the solution into 4 portions.

Observations	Inferences
($\frac{1}{2}$ mk)	($\frac{1}{2}$ mk)

(ii) To the first portion, add sodium hydroxide solution drop wise till in excess

Observations	Inferences
(1mk)	(1mk)

(ii) to the second portion, add ammonia solution till in excess

Observations	Inferences
(1mk)	(1mk)

(iii) To the third portion, add three drops of lead (II) nitrate solution

Observations	Inferences
(1mk)	(2mk)

(iv) To the fourth portion, add three drops of acidified barium nitrate solution

Observations	Inferences
(1mk)	(1mk)

3 (b) You are provided with a liquid T. You are to carry out the tests below and record you observations and inferences in the spaces provided.

(i) Dip a clean glass-rod into liquid T on and ignite.

Observations	Inferences
(1mk)	(1mk)

(ii) To about 3ml. of liquid T in a test tube add equal amount of distilled water and shake the mixture.

Observations	Inferences
1mk)	1mk)

(ii) To about 5ml of liquid of T in a test tube add 2drops of acidified potassium manganate (VII) solution and warm

Observations	Inferences
(1mk)	1mk)