NAME…….. INDEX NO…….....

233/1 **CANDIDATE'S SIGN……....**
CHEMISTRY
PAPER 1 **DATE…….……...**
(THEORY)
JULY/AUGUST, 2015
TIME: 2 HOURS

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:
(i) Write your **name** and **index number** in the spaces provided **above**.
(ii) **Sign** and write the **date** of examination in the spaces provided **above**.
(iii) Answer **ALL** the questions in the spaces provided.
(iv) Mathematical tables and silent electronic calculators **may be** used.
(v) All working **must be** clearly shown where necessary.
(vi) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

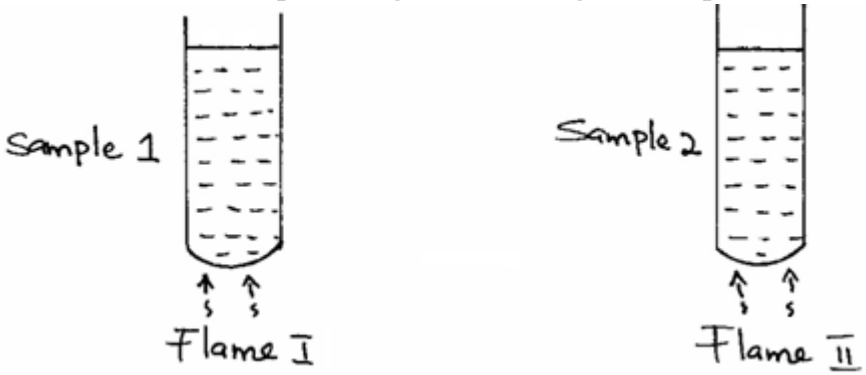
For Examiner's Use Only

Questions	Maximum Score	Candidate's Score
1 – 27	**80**	

1. (a) A patient was given tablets with prescription 2 x 3 on the envelope. Clearly outline how the patient should take the tablets. (1 mark)

_____

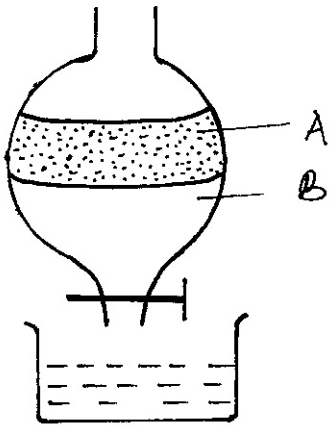
(b) Two samples of equal volumes of water were put in 250cm³ beaker and heated for 10 minutes. Sample 1 registered a higher temperature than sample 2.



State the conditions under which flame I is produced in Bunsen burner. (1 mark)

_____

2. The apparatus below was used to separate a mixture of liquid A and B.



(a) State two properties of the liquids that make it possible to separate them using such apparatus. (2 marks)

_____

_____

3. Describe how solid samples of salts can be obtained from a mixture of lead (II) chloride, sodium chloride and ammonium chloride. (3 marks)

_____

_____

_____

_____

4. An ion of element χ is represented as:

$$^{24}_{12}X^{2+}$$

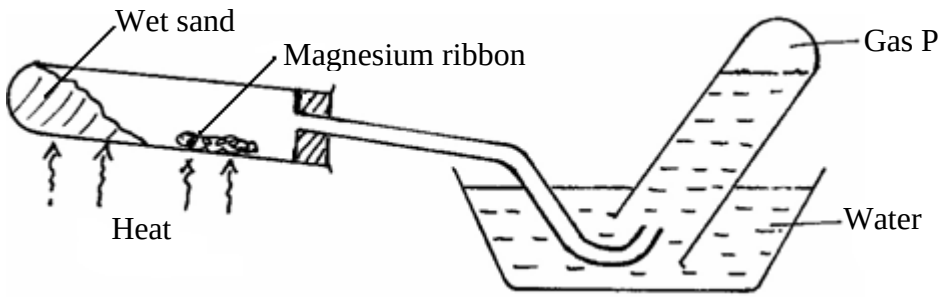
(i) Write electronic configuration of ion of χ. (1 mark)

_____

(ii) To which group does element χ belong? (1 mark)

_____

5. The set-up below can be used to study the reaction of magnesium and steam.



(a) Name gas **P**. (1 mark)

_____

(b) How would you expect copper to behave compared to magnesium in the combustion tube? (1 mark)

_____

(c) Write the equation for the reaction between magnesium and steam. (1 mark)

_____

_____

6. An approximately χ molar solution of potassium managanate (VII) solution was standardized against precisely 0.1M iron (II) ammonium sulphate $[(NH_4)_3\ Fe\ (SO_4)_2.\ 6H_2O]$ solution. 25.0cm³ of the solution of the iron (II) salt Were oxidized by 24.15cm³ of the manganate (VII) solution. The equation of the reaction is:

$$MnO_{4\,(aq)}^{-} + 5Fe_{(aq)}^{2+} + 8H_{(aq)}^{+} \rightarrow Mn_{(aq)}^{2+} + 5Fe_{(aq)}^{3+} + 4H_2O_{(l)}$$

What is the molarity of the potassium manganate (III) solution? (3 marks)

_____

_____

_____

_____

_____

7. During extraction of iron in the blast furnace, state the uses of the following in the furnace.

(a) Molten slag. (1 mark)

_____

_____

(b) Waste gases leaving the furnace. (1 mark)

_____

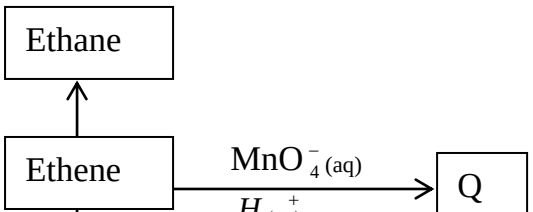
_____

(c) Limestone. (1 mark)

_____

_____

8. The flow chart below gives some reactions starting with ethane. Study it and answer the questions that follow.



(a) Draw the structure of compounds:

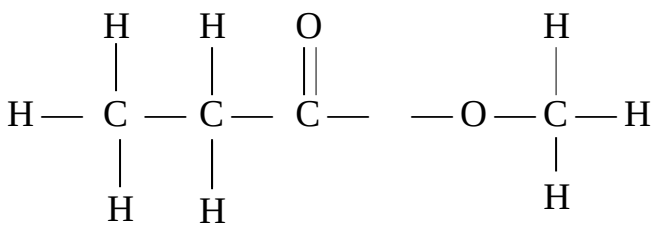
P: (1 mark)

Q: (1 mark)

(b) Write the name of Compound R. (1 mark)

---

9. Study the organic compound below:



(a) In which homologous series does the compound belong to? (1 mark)

(b) Name and draw the structures of two compounds that can be used to prepare the above compound. (3 marks)

10. (a) State **one** factor that can determine the stability of an atom. (1 mark)

(b) Radioactive polonium – 216 decay as shown below.

$$^{216}_{90}Po \rightarrow {}^{208}_{82}Pb + M\,\alpha + n\beta$$

Find the value of M and n. (2 marks)

(c) If after 112 days $\frac{1}{16}$ of polonium remained, calculate the half-life of polonium. (1 mark)

_____

_____

_____

11. A metal oxide has a formula M_2O_3.

(a) Write an equation to show how M form an ion. (1 mark)

_____

_____

(b) Write the formula of the chloride of M. (1 mark)

_____

12. The thermodynamic equation for the formation of ammonia in the Haber process is:

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}, \ \Delta H = -92kJ\ mol^{-1}$$

(a) State and explain one way in which the yield of ammonia can be increased. (2 marks)

_____

_____

_____

_____

13. A certain carbonate, JCO_3, reacts with dilute hydrochloric acid according to the equation below.

$$JCO_3 + 2HCl_{(aq)} \rightarrow GCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$$

If 1gof the carbonate reacts completely with $20cm^3$ of 1M hydrochloric acid, calculate the relative atomic mass of J. (C = 12, O = 16). (4 marks)

_____

14. (a) What is meant by the term solubility? (1 mark)

(b) The mass of a solution A is 120g. This solution has 8g of salt A dissolved in it. The solubility of this salt is 25g/100g of water at 30°C. 55g of salt A are added to the solution at 30°C. How much of salt A will remain undissolved. (2 marks)

15. (a) Using electrons in the outermost energy level, draw the dot (•) and cross (X) diagrams to represent bonding in.

(i) C_2H_6 (C = 6, H = 1) (1 mark)

(ii) NH4Cl (N = 7, H = l, Cl = 17) (1 mark)

(b) The formula of a complex ion is $[Cu(NH_3)_4]^{2+}$ name the type of bond that is likely to exist between copper and ammonia in the complex. (1 mark)

_____

16. (a) State Hess's law. (1 mark)

_____

_____

_____

(b) Study the information below and answer the questions that follow.

$MgCl_{2(S)} \rightarrow Mg^{2+}_{(g)} + 2Cl^{-}_{(g)}$, $\Delta H_1 = -2487kJ\ mol^{-1}$

$MgCl_{2(S)} + (aq) \rightarrow MgCl_{2(aq)}$, $\Delta H_2 = -5142kJ\ mol^{-1}$

$2Cl^{-}_{(g)} + (aq) \rightarrow 2Cl^{-}_{(aq)}$, $\Delta H_3 = -762kJ\ mol^{-1}$

(a) Name the enthalpies H_1 and H_2. (2 marks)

H_1_____

H_2 _____

(b) Determine the enthalpy for the reaction: (2 marks)

$Mg^{2+}_{(g)} + (aq) \rightarrow Mg^{2+}_{(g)}$

_____

_____

_____

_____

17. (a) Give two reasons why carbon (IV) oxide is used as a fire extinguisher. (1 mark)

_____

_____

(b) State the function of tartaric acid in baking powder. (2 marks)

_____

_____

_____

_____

18. (a) When an electric current of 0.5A was passed through a molten chloride of J for 32 minutes and 10 seconds, a mass of 0.44g of J was deposited at the cathode. (IF = 96500C).

(a) Calculate the quantity of electricity used. (1 mark)

_____

_____

_____

(b) Determine the value of χ if the ion of metal J is represented as $J^{\chi+}$. (R.A.M of J = 44). (1 mark)

_____

_____

_____

19. (a) What is meant by the term basicity of an acid. (1 mark)

_____

_____

_____

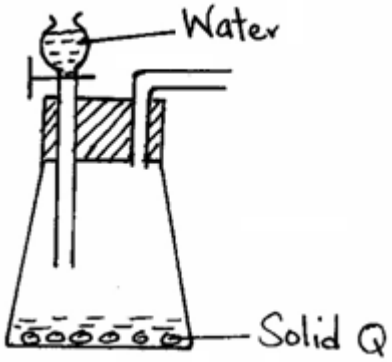
(b) Describe briefly how potassium sulphate can be prepared using $50cm^3$ of 1M potassium hydroxide. (3 marks)

_____

_____

_____

20. The diagram below represents a set-up used to prepare oxygen gas.



(a) Name substance Q. (1 mark)

(b) Complete the set-up to show how oxygen gas is collected. (1 mark)

(c) Write the equation for the reaction that occur. (1 mark)

21. The table below shows some solutions and their PH values.

Solution	PH value
P	1.5
Q	6.0
R	14.0
S	8.0

Which of the above solution.

(a) Is strongly basic. (1 mark)

(b) Reacts with sodium carbonate more vigorously. (1 mark)

(c) Is ammonia solution. (1 mark)

22. In an experiment, a jar containing sulphur (IV) oxide was inverted over another jar containing hydrogen sulphide gas.

(a) State and explain the observation that was made. (2 marks)

(b) State two conditions necessary for the reaction to take place. (2 marks)

23. Two reagents that can be used to prepare chlorine gas are potassium manganate (VII) and hydrochloric acid.

(a) Write an equation for the reaction. (1 mark)

(b) Give the formula of another reagent that can be used instead of potassium manganate (VII). (1 mark)

(c) Using an equation illustrate how chlorine bleach coloured substances. (1 mark)

24. (a) Distinguish between ionization energy and electron affinity. (2 marks)

(b) Explain why fluorine is more reactive than iodine. (2 marks)

25. 280cm³ of nitrogen gas diffuse through a porous plug in 70 seconds. How long will it take 400cm³ of carbon (IV) oxide gas to diffuse through the same porous plug. (C = 12, O = 16, N = 7). (3 marks)

_____

_____

_____

_____

26. An iron spoon was to be electroplated with silver. Sketch the set-up that could be used. (2 marks)

27. Write the equation for decomposition of:

(a) Sodium nitrate. (1 mark)

_____

_____

(b) Copper (II) nitrate. (1 mark)

_____

_____

NAME…….. INDEX NO…….....

233/2 **CANDIDATE'S SIGN……..……..**
CHEMISTRY
PAPER 2 **DATE……..……**
(THEORY)
JULY/AUGUST, 2015
TIME: 2 HOURS

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 2
(THEORY)
TIME: 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.
(d) KNEC Mathematical tables and silent electronic calculators **may be** used.
(e) All working **must be** clearly shown where necessary.
(f) Candidates should answer the questions in English.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	13	
2	11	
3	11	
4	11	
5	13	
6	10	
7	11	
Total Score	80	

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

Chemistry Paper 2 *Turnover*

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

Element	A	B	C	D	E	F	G	H
Atomic no.	11	12	13	14	15	16	17	16
Boiling point (°C)	890	1110	2470	2360	280	445	-34.7	-186
Formulae of oxide		BO			E_2O_3	FO_2		xxxx
Boiling point of oxide (°C)	1193	3075	2045	1728	563	-72	-91	xxxx

(a) (i) Write the electronic arrangement for ion of element **C** and **F**. (1 mark)

_____

_____

(ii) To which period and group do element **B** belongs. (1 mark)

Period _____

Group _____

(b) Explain the difference in boiling points of element **B** and **F**. (2 marks)

_____

_____

_____

_____

(c) Write the formula of the compound formed between elements **B** and **G**. (1 mark)

_____

(d) The chloride of **A** has a higher boiling point than that of **C**. Explain. (2 marks)

_____

_____

_____

(e) Complete the table to show the formulae of the oxides. (2 marks)

(f) Select an oxide that reacts with hydrochloric acid and potassium hydroxide. Explain. (1 mark)

_____

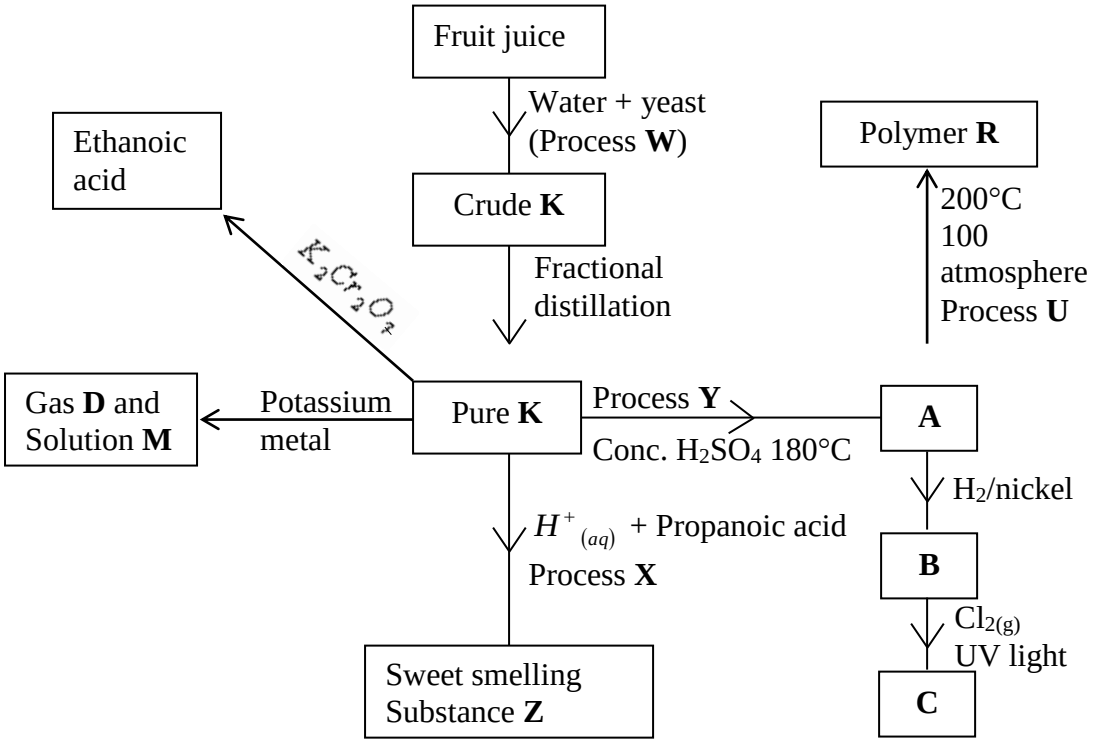
_____

_____

(g) Determine the oxidation state of **F** in its oxide. (1 mark)

_____

2. Study the reaction scheme below and answer the question that follows.



(a) (i) Give the names of the following substances. (2½ marks)

A _____

B _____

C _____

D _____

K _____

(ii) Give the structural formular of substance **M**. (1 mark)

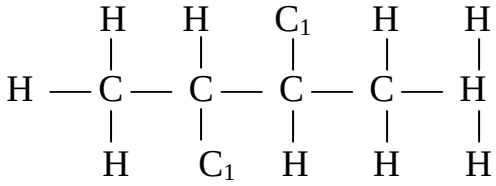
(iii) Name the processes marked as: (3 marks)

W _____

X _____

Y _____

(b) The compound below was formed when one mole of a hydrocarbon reacted with one mole of chlorine gas.



(i) Give the structure of the hydrocarbon. (1 mark)

(ii) Draw and name two isomers of the hydrocarbon. (2 marks)

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

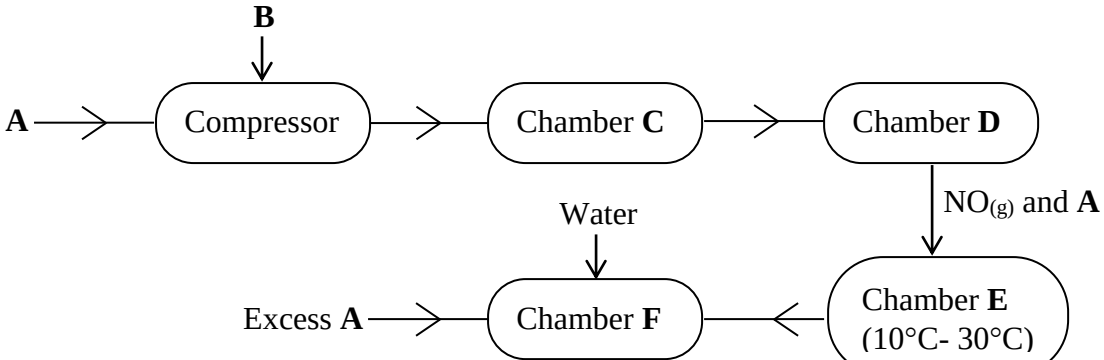
_____

(d) Draw and name substance **Z**. (1 mark)

_____

_____

3. The flow chart below illustrates the major steps in the manufacture of nitric (V) acid. Study it and answer the questions that follow.



(a) Give reason for purifying the raw materials **A** and **B**. (1 mark)

_____

(b) Name the substances: (1 mark)

A _____

B _____

(c) Name the parts labeled **D**, **E** and **F**. (3 marks)

D _____

E _____

F _____

(d) Write chemical equations for the reactions taking place in:

(i) Chamber **D**. (1 mark)

_____

_____

(ii) Chamber **F**. (1 mark)

_____

_____

(e) Name any other condition required in chamber **D** apart from maintaining temperature at 900°C. (1 mark)

_____

(f) A mixture that comes out is 65% nitric (V) acid and 35% water. How could the concentration of nitric (V) acid be increased? (1 mark)

_____

(g) Give **one** use of nitric (V) acid. (1 mark)

_____

(h) When copper metal is reacted with dilute nitric (V) acid, a brown gas is evolved. Explain. (1 mark)

_____

_____

_____

4. 150g of powdered brass (an alloy of zinc and copper) were added to excess 0.5M hydrochloric acid in a conical flask placed on top of a pan balance. The changes in mass of the flask and its contents with time were recorded in the following table. This experiment was carried out at room temperature.

Time (in seconds)	0	10	20	30	40	50	60
Mass in grams of flask and its contents	255.0	253.0	251.9	251.2	251.1	251.0	251.0

(a) Write an equation for the reaction that took place. (1 mark)

_____

_____

(b) State and explain the relationship between the mass of the flask and its contents with time. (2 marks)

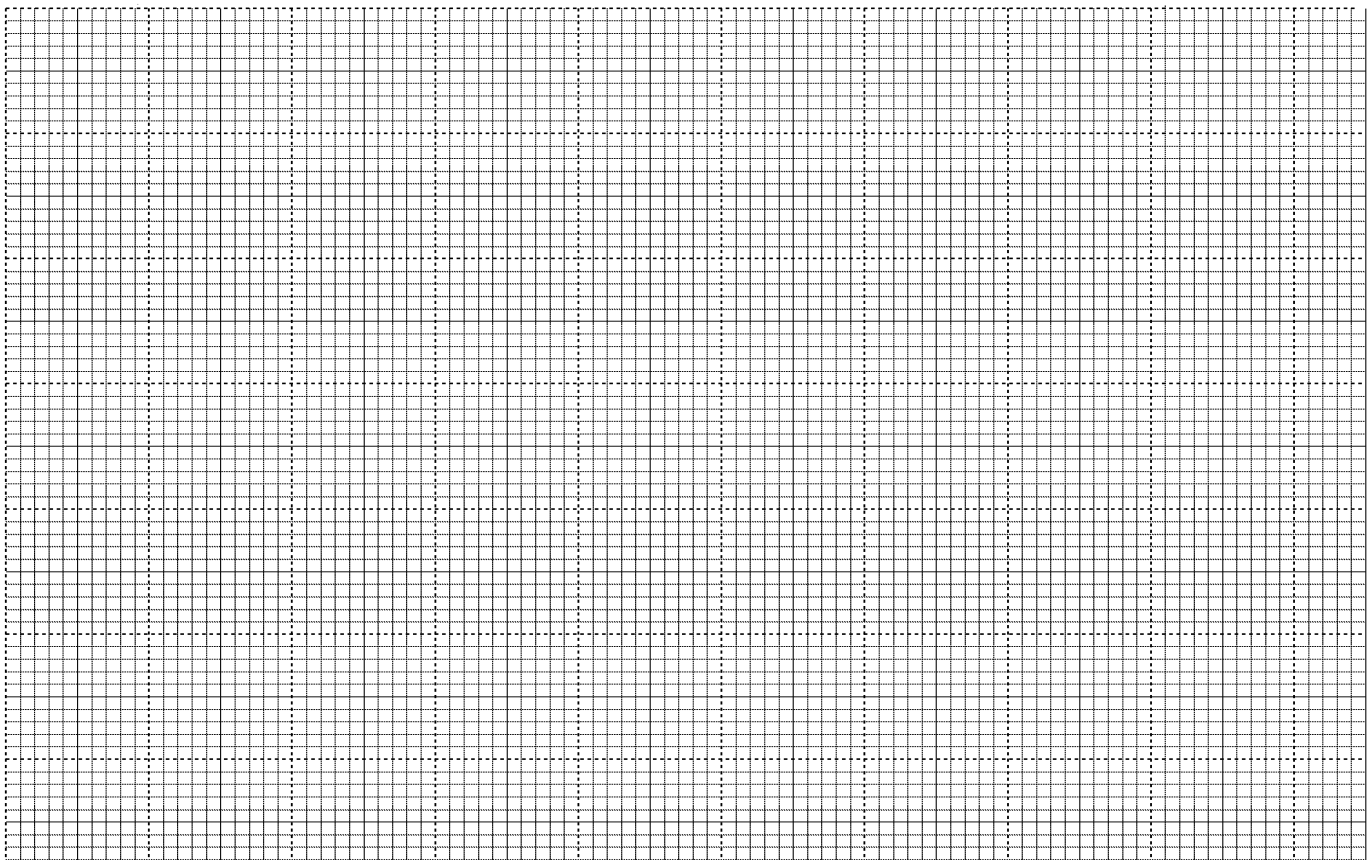
_____

_____

(c) What observations was made in the flask at the end of the reaction? (1 mark)

_____

(d) (i) Plot a graph of mass of the flask and its contents against time. (3 marks)



(ii) Using the graph determine rate of the reaction at the 20th second. (2 marks)

(iii) How would the rate in 4d(ii) above be affected if the reaction was carried out using 0.5M hydrochloric acid at 45°C? Explain. (2 marks)

_____

_____

_____

5. (a) Use the reduction potentials below to answer the questions that follow.

	E^{θ} (Volts)
$Q^{2+}_{(aq)} + 2e^{-} \rightarrow Q_{(S)}$	-2.38
$B^{2+}_{(aq)} + 2e^{-} \rightarrow B_{(S)}$	-1.14
$D^{2+}_{(aq)} + 2e^{-} \rightarrow D_{(S)}$	$+0.80$
$Fe^{3+}_{(aq)} + 3e^{-} \rightarrow Fe_{(S)}$	-1.66

$C^{+}_{(aq)} + e^{-} \rightarrow C_{(S)} \quad -0.76$

(i) Select the strongest reducing agent. Explain. (1 mark)

_____

_____

_____

(ii) Calculate the e.m.f value of electrochemical cell obtained when elements **B** and **D** are paired together. (1 mark)

_____

_____

_____

(iii) Write an ionic equation for the reaction that occurs when metal **Q** is immersed into a solution containing $C^{+}_{(aq)}$ ions. (1 mark)

_____

_____

(iv) State and explain whether the reaction given below occurs or not.

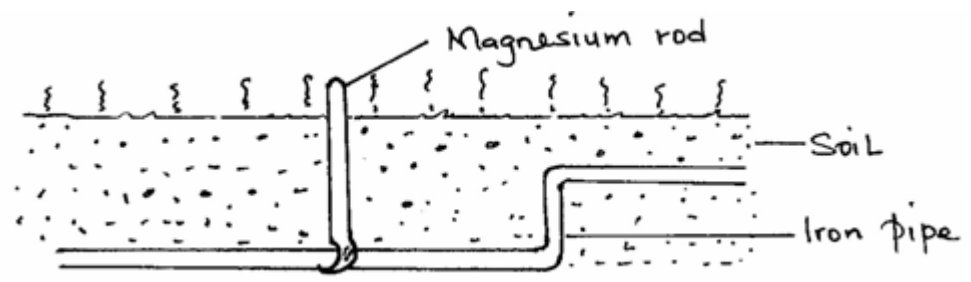
$3B_{(S)} + Fe^{3+}_{(aq)} \rightarrow Fe_{(S)} + 3B^{+}_{(aq)}$ (1 mark)

_____

_____

_____

(b) Magnesium metal was connected to an underground pipe made of iron as shown below:



Explain why it is necessary to carry out the process shown above. (2 marks)

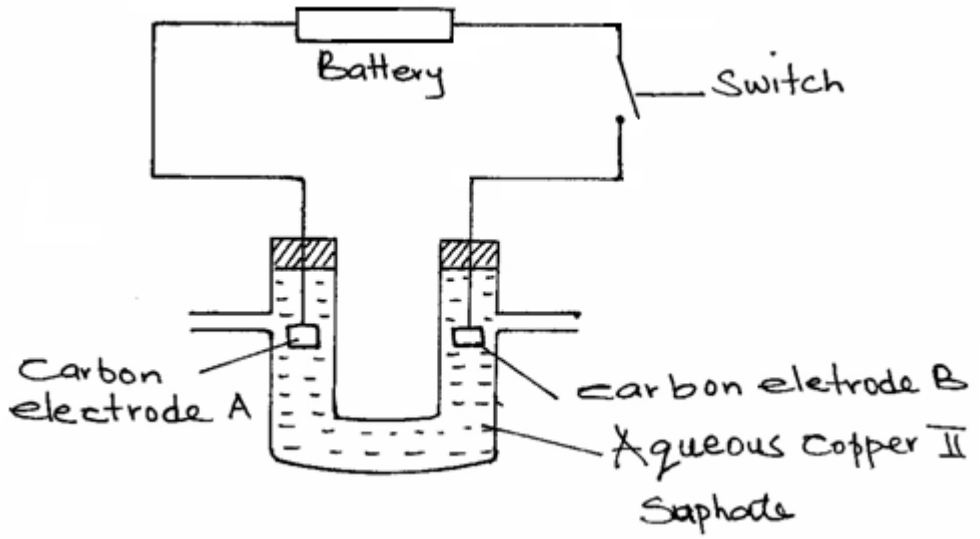
_____

_____

_____

_____

(c) Aqueous copper (II) sulphate was electrolysed using the set up shown below.



(i) When the switch was closed, a gas was produced at electrode **B**.
Which electrode is the anode?

_____

(ii) Write the half equation for the reaction at electrode **B**. (1 mark)

_____

_____

(iii) State and explain the observation that will be made at electrode **A**. (1 mark)

_____

_____

_____

(iv) What happens to the PH of the electrolyte above during electrolysis? Explain. (1 mark)

_____

_____

_____

(d) If carbon electrodes were replaced with copper electrodes in the reaction in (a) above, write the equations of the reactions that would occur at the:

(i) Anode. (1 mark)

_____

_____

(ii) Cathode. (1 mark)

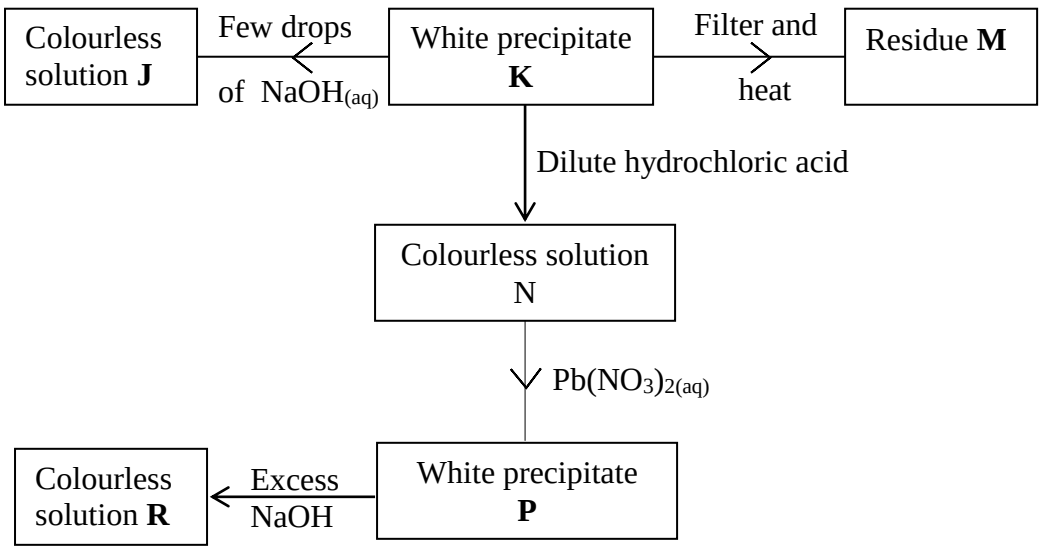
_____

_____

(v) Name **one** industrial application of the above electrolysis. (1 mark)

_____

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



Residue **M** was yellow when hot and white when cold.

(a) (i) Identify.

I White precipitate **K** _____ (1 mark)

II Solution **N** _____ (1 mark)

III Residue **M** _____ (1 mark)

(ii) Write an ionic equation for the reaction of solution N with $Pb(NO_3)_{2(aq)}$. (1 mark)

_____

_____

(iii) Write observations that would be made when ammonia solution is added dropwise till in excess to the colourless solution **N**. (1 mark)

_____

(b) Ammonia gas bubbled into water forms a solution which conducts electricity whereas the solution formed when it is bubbled through methylbenzene does not. Explain. (2 marks)

_____

_____

_____

_____

(c) Boilers used for boiling hard water are normally covered with boilers scale after sometime.

(i) What is the chemical name for boilers scales? (1 mark)

_____

(ii) How is the boiler scale removed? (1 mark)

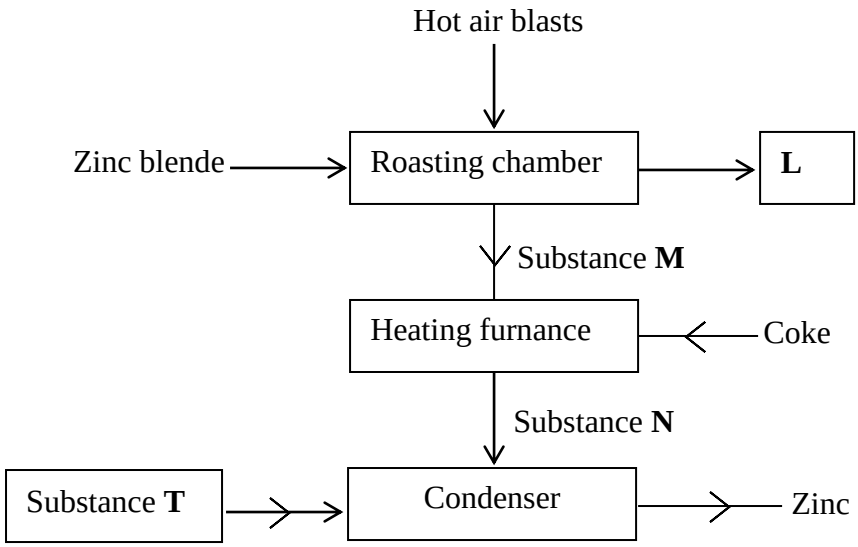
_____

_____

(d) Write the formula of the anion in solution **J**. (1 mark)

_____

7. The flow chart below illustrates extraction of zinc from zinc blende. Study it and answer the questions that follow.



(a) Give an equation for the reaction in the roasting furnace. (1 mark)

_____

_____

(b) Name each of the substances marked **L**, **T**, **N** and **M**. (2 marks)

L _____

T _____

N _____

M _____

(c) Why is it necessary to condense substance **N**? (1 mark)

_____

_____

(d) Which other factory can be set up near the zinc extraction plant? Explain. (2 marks)

_____

_____

_____

_____

(e) Give **one** use of zinc metal. (1 mark)

_____

_____

(f) (i) Zinc sulphide and sulphuric acid react according to the following equation:

$ZnS_{(S)} + H_2SO_{4(aq)} \rightarrow ZnSO_{4(aq)} + H_2S_{(g)}$

2.91g of zinc sulphide reacted with 100cm³ of 0.2M sulphuric acid. Determine the reagent that was in excess. (Zn = 65.0, S = 32.0). (2 marks)

_____

_____

_____

_____

_____

_____

(ii) Calculate the volume of hydrogen sulphide H_2S) gas produced in the reaction above at r.t.p. (Molar gas volume 24dm³). (2 marks)

_____

_____

NAME…….. INDEX NO…….....

233/3 **CANDIDATE'S SIGN……..…..**
CHEMISTRY
PAPER 3 **DATE……..…….**
(PRACTICAL)
JULY/AUGUST, 2015
TIME: 2¼ HOURS

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 3
(PRACTICAL)
TIME: 2¼ HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer **ALL** questions in the spaces provided for each question.
2. You are required to spend the first 15 minutes of the 2¼ hours allowed for this paper reading the whole paper carefully before commencing your work.
3. All working must be clearly shown where necessary.
4. Mathematical tables and silent electronic calculators may be used.
5. This paper consists of **6** printed pages. Ensure that the question paper has all the pages and no questions are missing.

FOR EXAMINER'S USE ONLY:

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	19	
2	14	
3	7	
TOTAL SCORE	40	

1. (a) You are provided with solution X and Y solution X is acidified potassium manganate (VII) solution. Solution Y was prepared by dissolving 5.88g of an iron (II) salt $(NH_4)_2\ Fe(SO_4)_2.\ 6H_2O$ in 250cm³ of solution.
You are required to standardize solution X using solution Y.

Procedure:

(i) Fill the burette with solution X.

(ii) Using a pipette and pipette filler, transfer 25.0cm³ of solution Y into a 250cm³ conical flask.

(iii) Titrate solution X against solution Y until a permanent pink colour just appears.

(iv) Record your results in the table below.

(v) Repeat the titration two more times to obtain two other titres and complete table I below.

Table I

Titration	1	2	3
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of solution X used (cm³)			

(3 marks)

(a) Calculate:

(i) Average volume of solution X used. (1 mark)

(ii) Molarity of solution Y. (2 marks)

(iii) Number of moles of solution Y in the average volume of solution X. (2 marks)

(b) Given that the equation for the reaction between X and Y is:

$$MnO^{-}_{4(aq)} + 5Fe^{2+}_{(aq)} + 8H^{+}_{(aq)} \rightarrow Mn^{2+}_{(aq)} + 5Fe^{3+}_{(aq)} + 4H_2O_{(l)}$$

Calculate:

(i) the number of mole of X in the average volume. (1 mark)

(ii) Concentration of solution Y in mole dm³. (2 marks)

1(b) You are provided with:

(i) 0.21M glucose solution V.

(ii) 0.02M potassium manganate (VII) solution W.

(iii) 1.0M acqueous sulphuric (VI) acid.

You are required to determine the rate of reaction between solution W and V at different temperature.

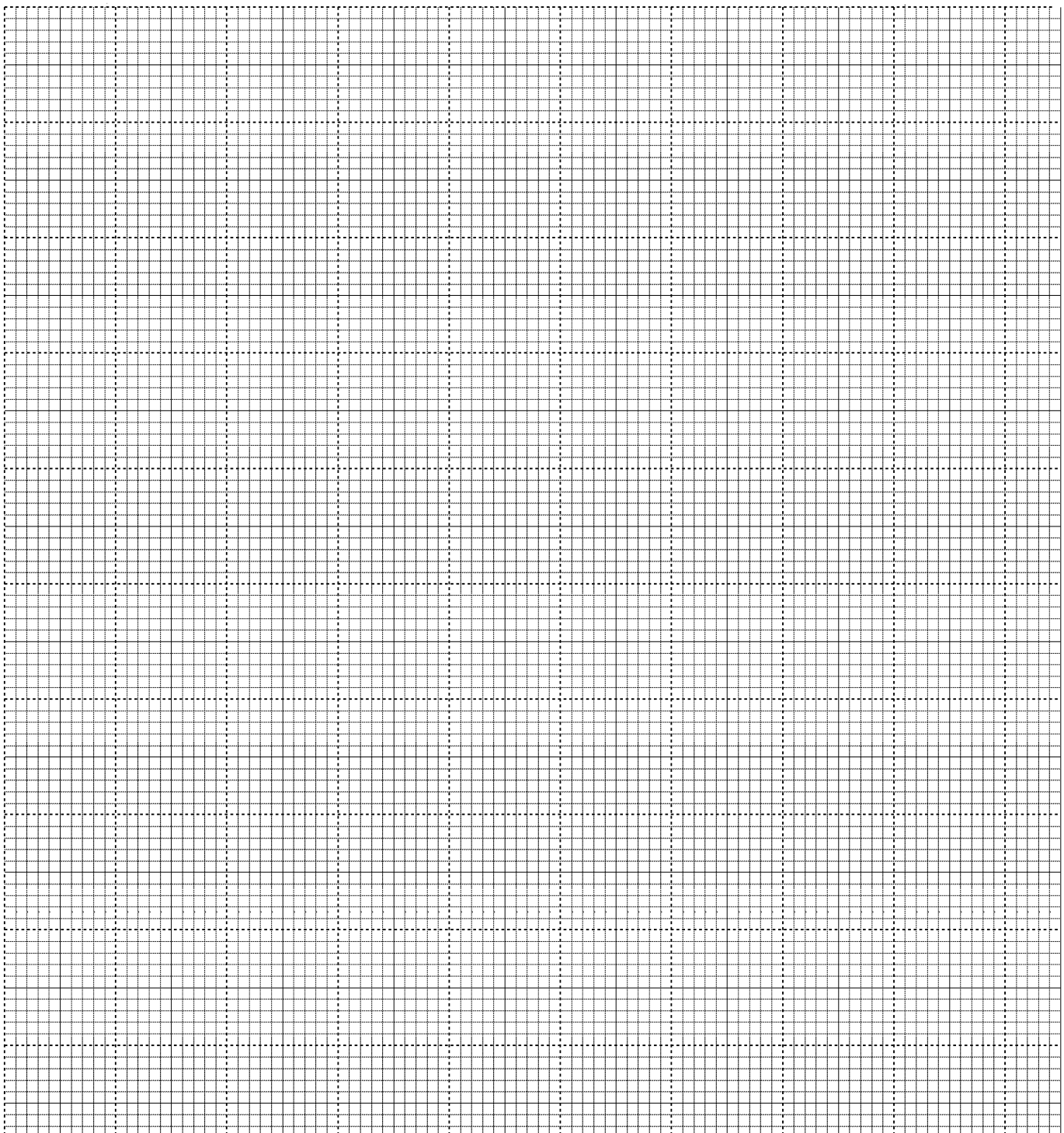
Procedure:

- Place 2cm³ of solution W into a 250ml beakers using 100ml measuring cylinder add 50cm³ of 1.0M sulphuric (VI) acid to the beaker containing solution W.
- Warm the mixture to about 65°C. Stop warming and allow the mixture to cool.
- When the temperature is exactly 60°C add 15cm³ of solution V and start the stopwatch immediately.
- Stir the mixture and measure the time taken for the colour of the mixture to change from purple to colourless.
- Record the time in the table below also record the temperature at which the mixture becomes colourless. Clean the beaker and repeat the procedure at temperature 55°C, 50°C and 45°C instead of 60°C.

(i) Calculate $\frac{I}{t}$ and complete the table below. (2 marks)

Temp. before mixing (°C)	60	55	50	45
Temp. when solution becomes colourless (°C)				
Time in (seconds)				
$\frac{I}{t}\left(S^{-1}\right)$				

(a) Plot a graph of $\frac{I}{t}\left(S^{-1}\right)$ (y-axis) against temperature at the point when the solution becomes colourless. (3 marks)



(b) From your graph:-

(i) Determine the time that the reaction would take if the temperature at which the solution becomes colourless is 42.5°C. (2 marks)

(ii) Describe the slope of your graphs. (1 mark)

2. (a) You are provided with solid B. Carry out the tests below and record your observations and inferences in the space below. Test for any gas produced using blue and red litmus paper.

(i) Place half spatula endful of solid B in a test tube and heat gently then strongly.

Observation	Inference

(3mks)	(1½mks)

(ii) Place a spatula endful of solid B into a boiling tube, and add about 10cm³ of distilled water. Shake well and filter the residue retain the residue. Divide the filtrate into three portions.

Observation	Inference
(1mk)	(1mk)

(iii) To the 1st portion, add $NaOH_{(aq)}$ dropwise until in excess.

Observation	Inference
(1mk)	(½mk)

(iv) To the second portion add acqueous ammonia dropwise until in excess.

Observation	Inference
(1mk)	(½mk)

(v) To the 3rd portion add 3 drops of $HNO_{3(aq)}$ followed by 2-3, drops of lead (II) nitrate warm gently.

Observation	Inference
(½mk)	(½mk)

(vi) Place the residue obtained in (b) above into a boiling tube and add about 5cm³

of dilute hydrochloric acid and retain the resulting mixture.

Observation	Inference
(1mk)	(1mk)

(vii) To the resulting mixture in (vi) above, add aqueous ammonia dropwise until in excess.

Observation	Inference
(1mk)	(½mk)

3. You are provided with an organic solid Z. Use it to carry out the following tests.

(i) Heat a spatula end full of solid Z over a flame.

Observation	Inference
(1mk)	(1mk)

(ii) Put the remaining portion of Z in a boiling tube. Add 10cm³ of distilled water. Shake and divide into three portions 2cm³ each.

Observation	Inference
(½mk)	(½mk)

(iii) To portion one add four drops of potassium chromate (VI) warm.

Observation	Inference

(1mk)	(1mk)

(iv) To portion two add small quantity of sodium hydrogen carbonate.

Observation	Inference
(½mk)	(½mk)

(v) To portion three add few drops of universal indicator, determine PH of the solution.

Observation	Inference
(½mk)	(½mk)