NAME: ……..….. INDEX NO:…….

CANDIDATES SIGN: …… DATE: ……..

233/1
CHEMISTRY
Paper 1
Mock Exams
March/April, 2015
2 hours

MOKASA JOINT EVALUATION EXAMINATION

Kenya Certificate of Secondary Education
Mock Examination – March/April 2015
Form 4
Chemistry Paper 1
Time: 2 Hours

INSTRUCTION TO CANDIDATES:

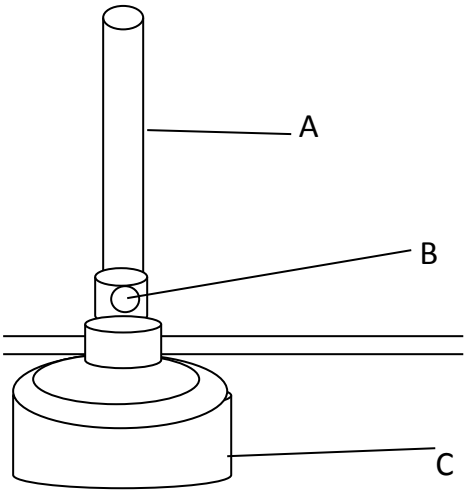
1. Answer ALL the questions in the spaces provided.
2. Mathematical tables and silent electronic calculators may be used.
3. All working must be clearly shown where necessary.

For Examiner's Use Only.

Question	Maximum Score	Candidate's Score
1-27	80	

This paper consist of 15 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

1. The diagram below shows parts of a Bunsen burner.



a) Name the parts labelled (½ mark)

A .....

B .....

b) Give one use of the part labelled B (1 mark)

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2. Hydrated copper (II) sulphate exists as blue crystals while anhydrous copper (II) sulphate is a white powder. Describe a laboratory experiment that can be used to show that the action of heat on hydrated copper (II) sulphate is a reversible reaction (2 marks)

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3. A piece of burning magnesium ribbon was placed in a gaSs jar full of Nitrogen gas. The product Q formed was then reacted with water.

a) Write the chemical formula for the product Q (1 mark)

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b) Write the equation for the reaction between product Q and water (1 mark)

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c) Using dot (•) and cross (x) diagrams to represent electrons, draw the structure to show bonding in nitrogen molecule (1 mark)

4. (i) What are isotopes (1 mark)

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(ii) Element Y (not the actual symbol of the element) has two isotopes with mass number 6 and 7. If the relative atomic mass of Y is 6.94, determine the percentage abundance of each isotope (2 marks)

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5. Given zinc oxide, dilute nitric (V) acid and sodium carbonate solution. Briefly describe how you can prepare zinc carbonate (3 marks)

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6. The elements shown in the table below (not actual symbols) belong to a certain family of metals in the periodic table. Study the information and answer the questions that follow.

Element	Atomic size (nm)
S	0.160
T	0.180
V	0.930

(i) Define the term ionization energy (1 mark)

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(ii) Which element is likely to have the highest ionization energy. Explain (2 marks)

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7. A certain mass of copper (II) carbonate was strongly heated.

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

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b) Given that 300cm^3 of carbon(IV) oxide gas was collected at s.t.p. and this represents 83% yield, determine the mass of copper (II) carbonate heated. (molar gas volume = 22.4dm^3, Cu=64, 0=16, C=12) (3 marks)

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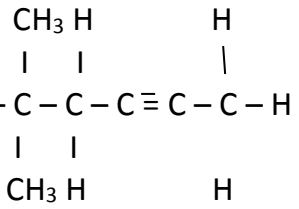
8. (i) Give the IUPAC names for the following organic compounds

a)  (1 mark)

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b)  (1 mark)

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c)  (1 mark)

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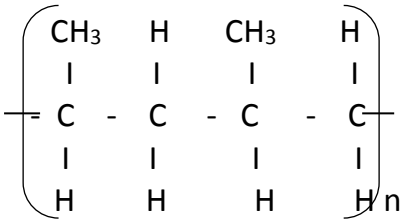
(ii) A polymer has the following structure



A sample of this polymer is found to have a molecular mass of 2184. Determine the number of monomers of the polymer. (C = 12, H = 1) (3 marks)

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9. During an experiment, chlorine was bubbled into a solution of sodium bromide in a beaker

a) State and explain one observation made (2 marks)

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b) Write an ionic equation for the reaction that took place in the beaker (1 mark)

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10. Hardness of water may be removed by either boiling or addition of chemicals.
    a) Write down an equation to show how boiling removes hardness of water (1 mark)

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    .....

    b) Name two chemicals that are used to remove hardness of water (2 marks)

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11. i) Define solubility (1 mark)

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    ii) 115g of a saturated solution at 65°C is found to contain 65g of potassium nitrate. Calculate the solubility of potassium nitrate at 65°C. (2 marks)

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12. The equation for the reversible reaction of Bismuth (III) chloride in water is

    $BiCl_{3(s)} + H_2O_{(l)} \rightleftharpoons BiOCl_{(s)} + 2H^+_{(aq)} + 2Cl^-_{(aq)}$

    a) State Le chatelier's principle (1 mark)

    .....

    .....

    b) What would be the effect of adding NaOH pellets to the equilibrium mixture. Explain. (2 marks)

    .....

    .....

13. In the equation, below identify the reagent that acts as an acid in the forward reaction. Give a reason.

    $NH^+_{4(aq)} + H_2O_{(l)} \rightleftharpoons NH_{3(aq)} + H_3O^+_{(aq)}$ (2 marks)

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14. In preparation of oxygen gas, a student used hydrogen peroxide and added a black solid and collected the gas over water.
    a) What is the name of the black solid and what is its function (1 mark)

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    b) During collection of the gas, why should the first bubbles be allowed to escape (1 mark)

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c) Give one main advantage of collecting a gas over water. (1 mark)

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15. Explain the following observation, a one molar solution of nitric (III) acid (1M HNO_2) has a pH of 2 where as a one molar solution of chloric(I) acid (IM HOCl) pH of 4. (2 marks)

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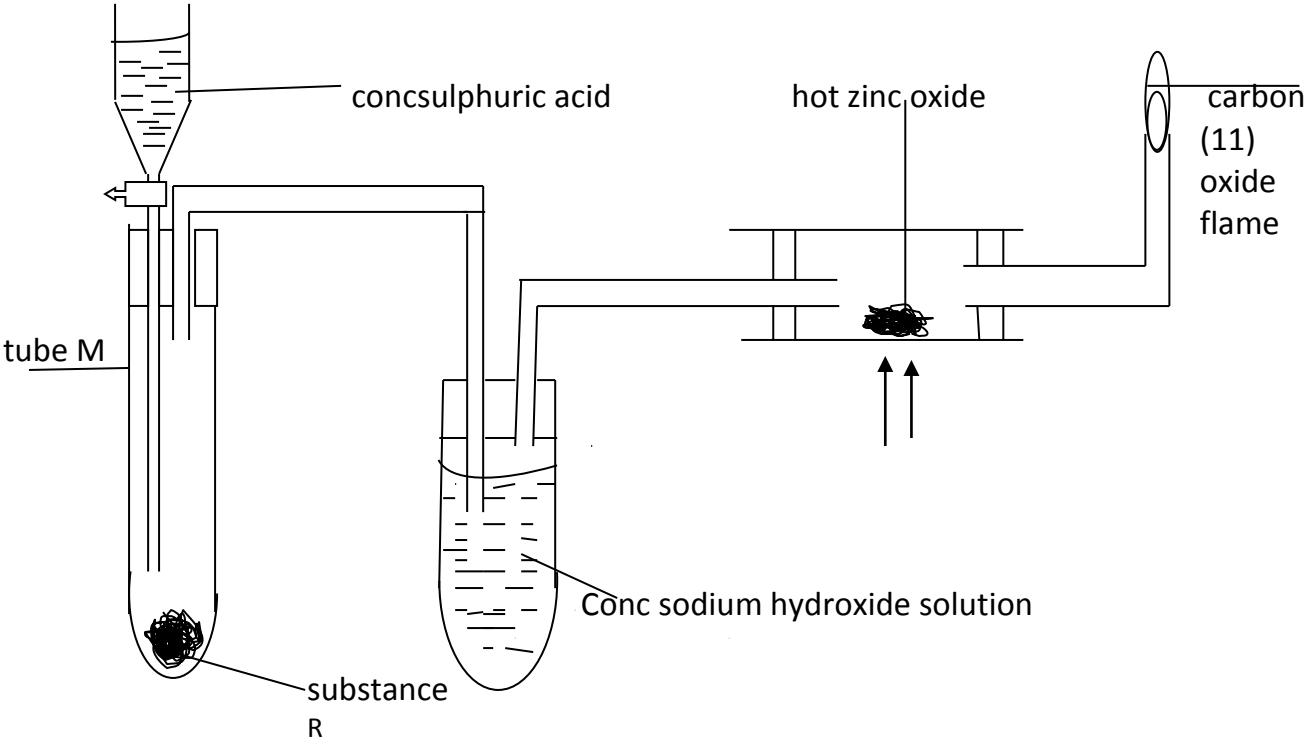
16. a) Study the set-up below and use it to answer the questions that follow.



a) Identify substance R (1 mark)

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.....

b) State the function of concentrated sodium hydroxide solution (1 mark)

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.....

c) State the property of carbon (II) oxide gas demonstrated in the above set-up (1 mark)

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.....

d) Write a balanced chemical equation for the reaction occurring in tube M. (1 mark)

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17. 200cm^3 of oxygen diffused through a porous plug in 60 seconds. How long will it take 300cm^3 of sulphur (IV) oxide to diffuse through the same plug? (S = 32, O = 16) (3 marks)

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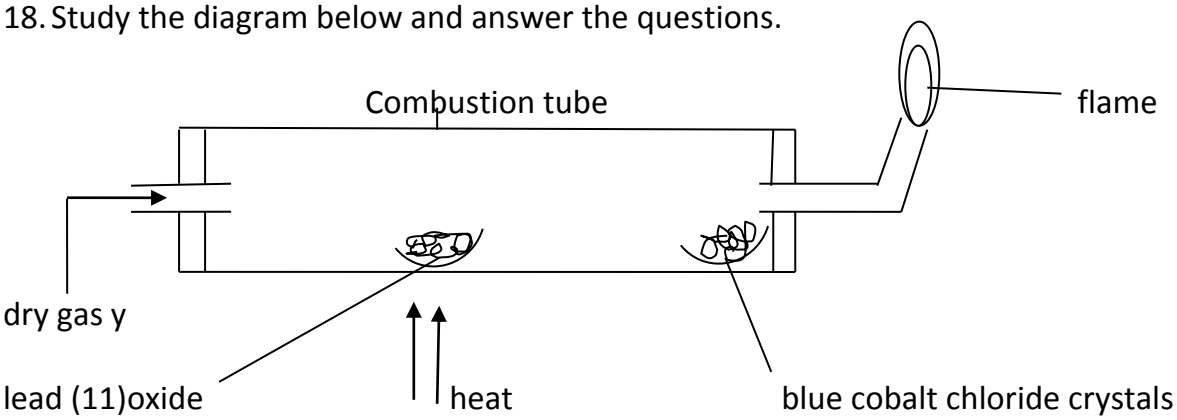
18. Study the diagram below and answer the questions.



(i) Identify gas Y (1 mark)

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.....

(ii) State and explain two observations made in the combustion tube. (2 mark)

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.....

(iii) Write a chemical equation for the reaction between lead (II) oxide and gas Y (1 mark)

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19. i) State Hess's law. (1 mark)

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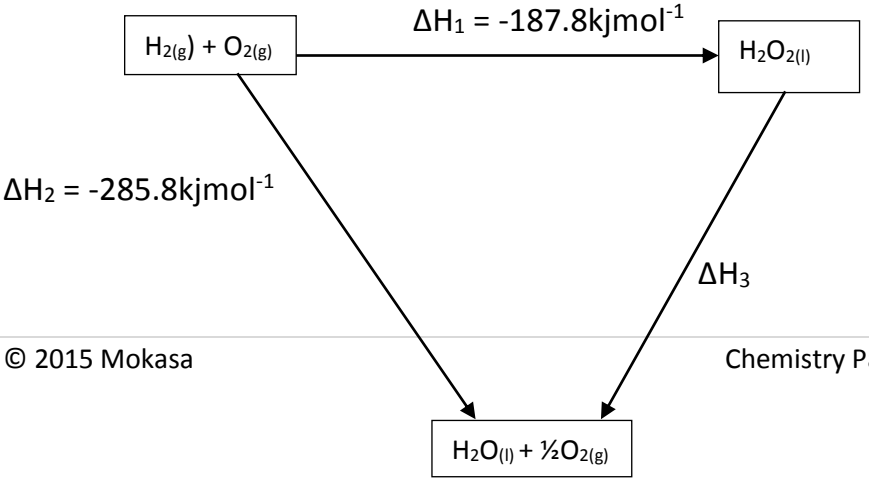
(ii) The figure below shows an energy cycle diagram.



a) Give the name of the enthalpy change ΔH_1 (1 mark)

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.....

b) Determine the value of ΔH_3 (1 mark)

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.....

20. The table below shows the pH values of some solutions.

Solutions	A	B	C	D
pH values	13.0	7.0	2.0	6.5

a) Which solution reacts vigorously with magnesium metal? Explain. (1 mark)

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b) Which solution is likely to be that of lemon juice? (1 mark)

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c) Which solution is likely to produce green colour with the universal indicator. (1 mark)

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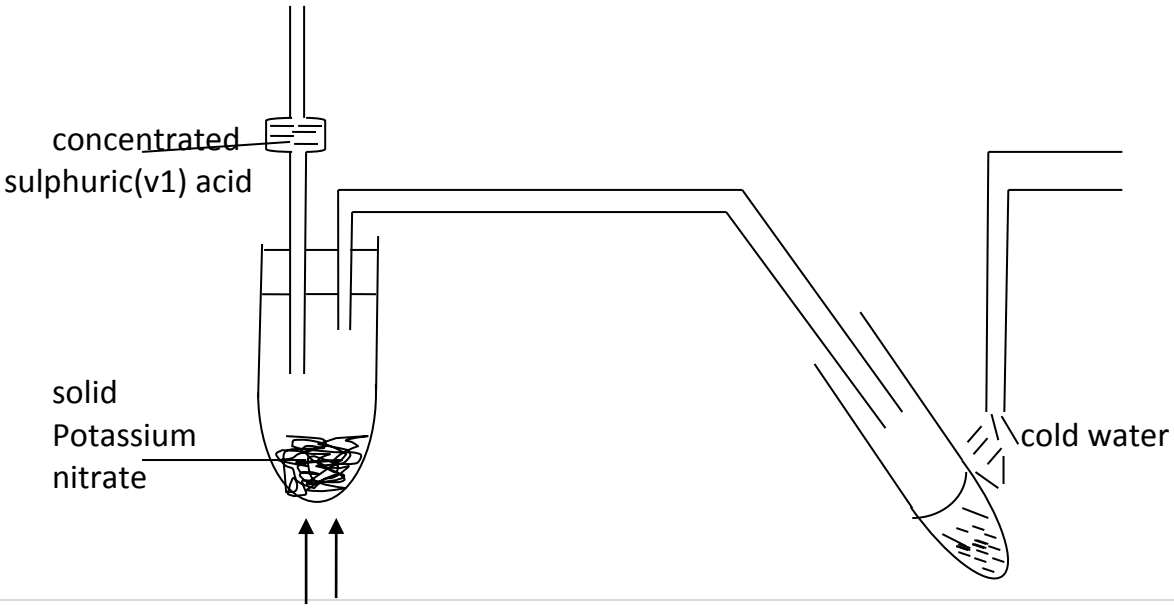
21. The diagram below shows a set-up that was used to prepare and collect a sample of nitric (V) acid in the laboratory.



heat

a) Give a reason why it is possible to separate nitric acid from the sulphuric (VI) acid in the set-up (1 mark)

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b) Name another substance that can be used instead of potassium nitrate (1 mark)

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c) Give one use of nitric (V) acid (1 mark)

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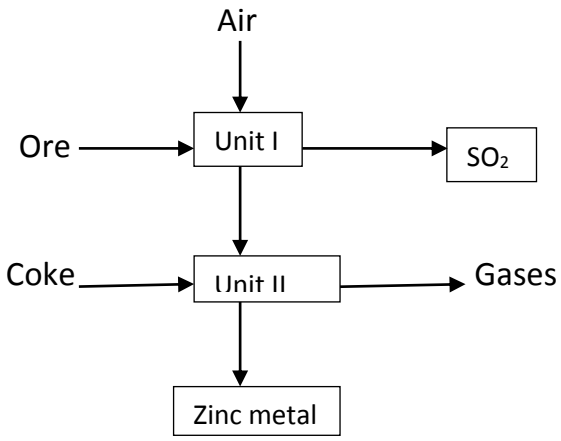
22. The flow chart below shows some processes involved in the industrial extraction of zinc metal.



a) Name one ore from which Zinc is extracted (1 mark)

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.....

b) Write the equation of the reaction taking place in unit II (1 mark)

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.....

c) Name two uses of Zinc metal (1 mark)

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23. Thorium $^{232}_{90}Th$ undergoes two consecutive alpha decays followed by two consecutive beta decays to form the nuclide $^{x}_{y}R$. Identify the values of $x$and y. (2 marks)

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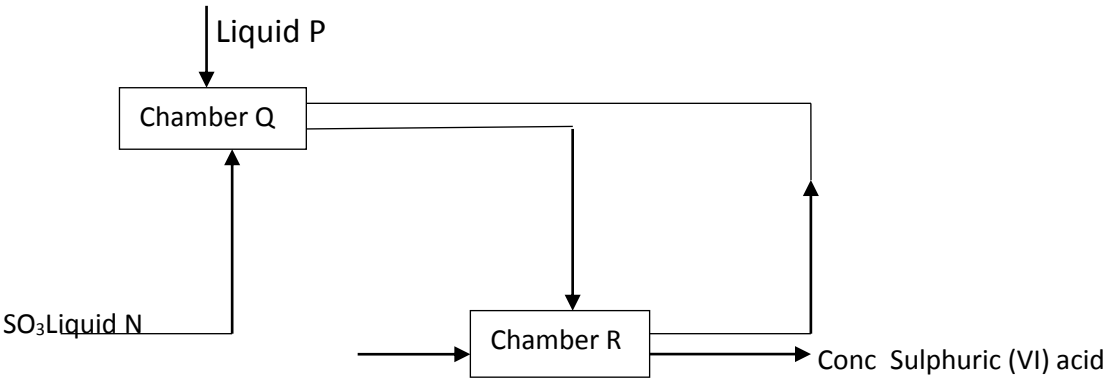
24. Below is part of the flow diagram of the contact process



a) Identify

(i) Liquid P (1 mark)

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(ii) Liquid N (1 mark)

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b) Write the equation for the reaction taking place in chamber R (1 mark)

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25. a) Define the term oxidation state (1 mark)

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b) Calculate the oxidation states of manganese and chromium in:

(i) MnO_2 (1 mark)

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(ii) CrO^{-}_{4} (1 mark)

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26. When hydrogen sulphide gas is bubbled through a solution of iron (III) chlorides, a green solution and a yellow solid are formed. Explain the observations (2 marks)

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27. During purification of copper by Electrolysis, 1.48g of copper were deposited when a current was passed through copper (II) sulphate solution for 2½ hours. Calculate the amount of current that was passed (3 marks)
(Cu = 63.5, IF = 96500C)

Name: …….. Class: ……. Adm.No……..

School: …… Date: ……

Sign:……..

233/2
CHEMISTRY
Paper 2
MARCH/APRIL 2015
Time: 2 hours

M O K A S A J O I N T E X A M I N A T I O N - 2015

Kenya Certificate to Secondary Education

CHEMISTRY PAPER 2

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

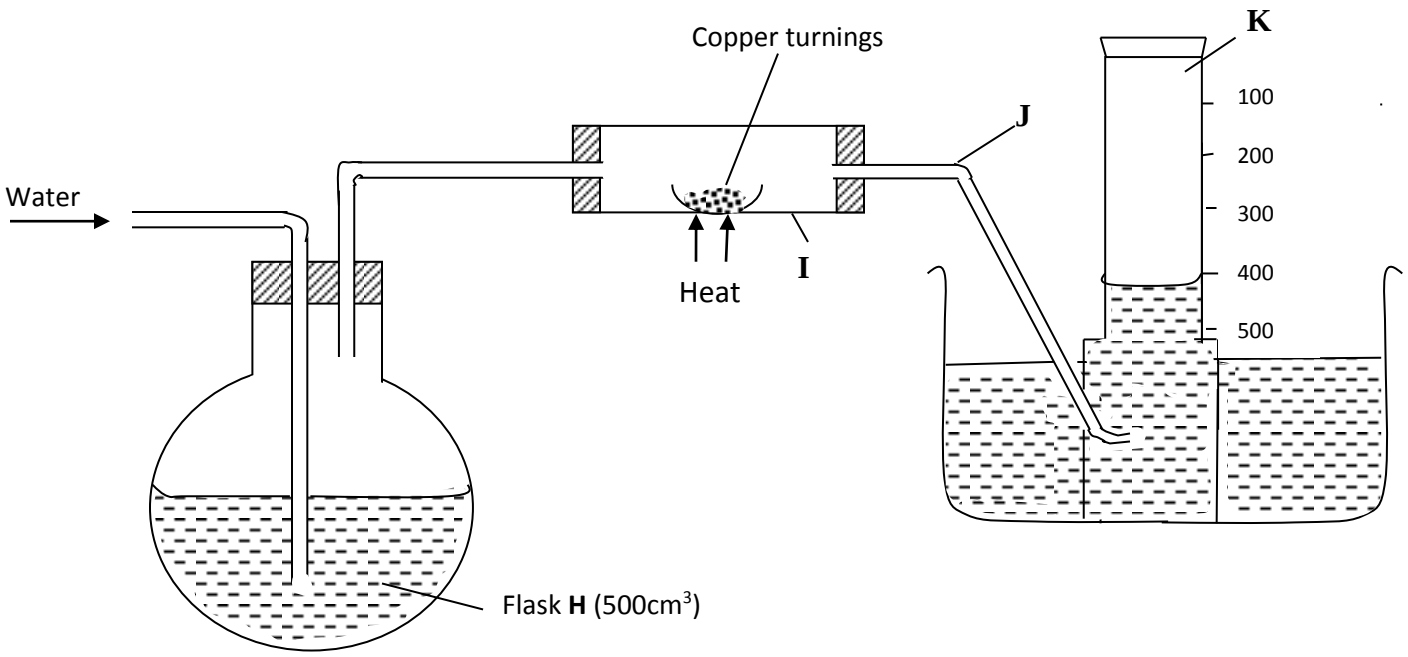
- *Write your name, admission number, date and school in the spaces provided.*
- *Answer **all** the questions in the spaces provided.*
- *All working must be clearly shown where necessary.*
- *Scientific calculators may be used.*

FOR EXAMINERS' USE ONLY

Questions	Maximum Score	Candidate's Score
1	10	
2	12	
3	10	
4	12	
5	13	
6	12	
7	11	
TOTAL	**80**	

This paper consists of **13** printed pages. Candidates are advised to check and to make sure all pages are as indicated and no question is missing.

1. A. In an experiment to determine the percentage of oxygen in air, the apparatus below were set up. Study the set up and the information provided to answer the questions that follow.



A 500cm^3 measuring cylinder **K** was filled with water and assembled for gas collection. Copper turnings were heated red hot and water was slowly passed into 500cm^3 flask **H** until it reached the 500cm^3 mark. A colourless gas was collected in **K**.

(i) What was the purpose of passing water into flask **H**? **(1 mark)**

……

(ii) What observations were made in the tube **I**? **(1 mark)**

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(iii) Name one of the gases that is likely to be found in **J**. **(1 mark)**

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(iv) What was the volume of the gas collected in the measuring cylinder at the end of the experiment? **(1 mark)**

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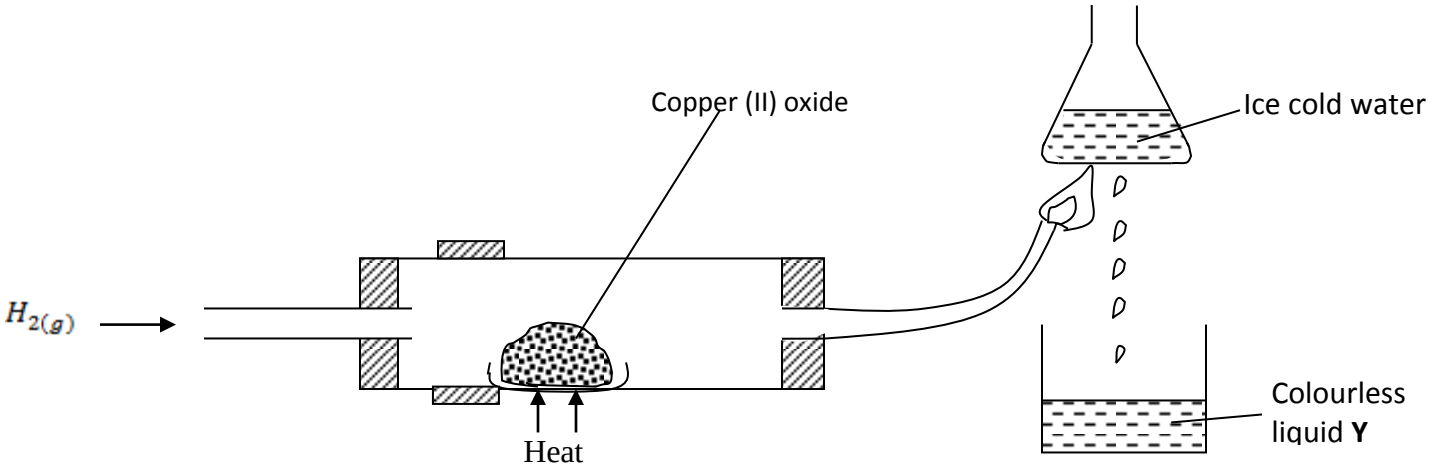
(v) Calculate the percentage of oxygen in air using the above results. **(2 marks)**

B. Study the diagram below and answer the questions that follow.



(a) Give ***one*** observation made in the combustion tube after some time. **(1 mark)**

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(b) Write an equation for the formation of the colourless liquid **Y**. **(1 mark)**

……

(c) What was the aim of the above experiment as demonstrated in the combustion tube? Explain. **(2 marks)**

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2. Use the information below to answer the questions that follow. The letters are not the actual symbols of the elements.

Element	**Atomic No.**	**M.P^{0}C**	**B.P^{0}C**	**Ionic radius (nm)**
P	11	98	890	0.095
Q	12	650	1110	0.065
R	13	660	2470	0.050
S	14	1410	2360	0.041
T	15	44.2 & 590	280	0.034
U	16	113 & 119	445	0.184
V	17	-101	-35	0.181
W	18	-189	-186	-

(a) (i) Write the electronic configuration of the atoms represented by letters **T** and **W**. **(1 mark)**

(ii) State the nature of the oxides of the elements represented by **Q** and **U**. **(2 marks)**

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(b) Why does the elements represented by the letters **T** and **U** have two values of melting points? **(1 mark)**

……

(c) Explain the following observations in terms of structure and bonding.

(i) There is an increase in boiling point from **P** to **R**. **(2 marks)**

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(ii) Element **S** has a high boiling point. **(2 marks)**

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(iii) There is a decrease in boiling points from **U** to **W**. **(2 marks)**

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(d) (i) Compare the atomic radius of **U** and **V**. **(1 mark)**

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(ii) Why is there no ionic radius for **W** reported in the table? **(1 mark)**

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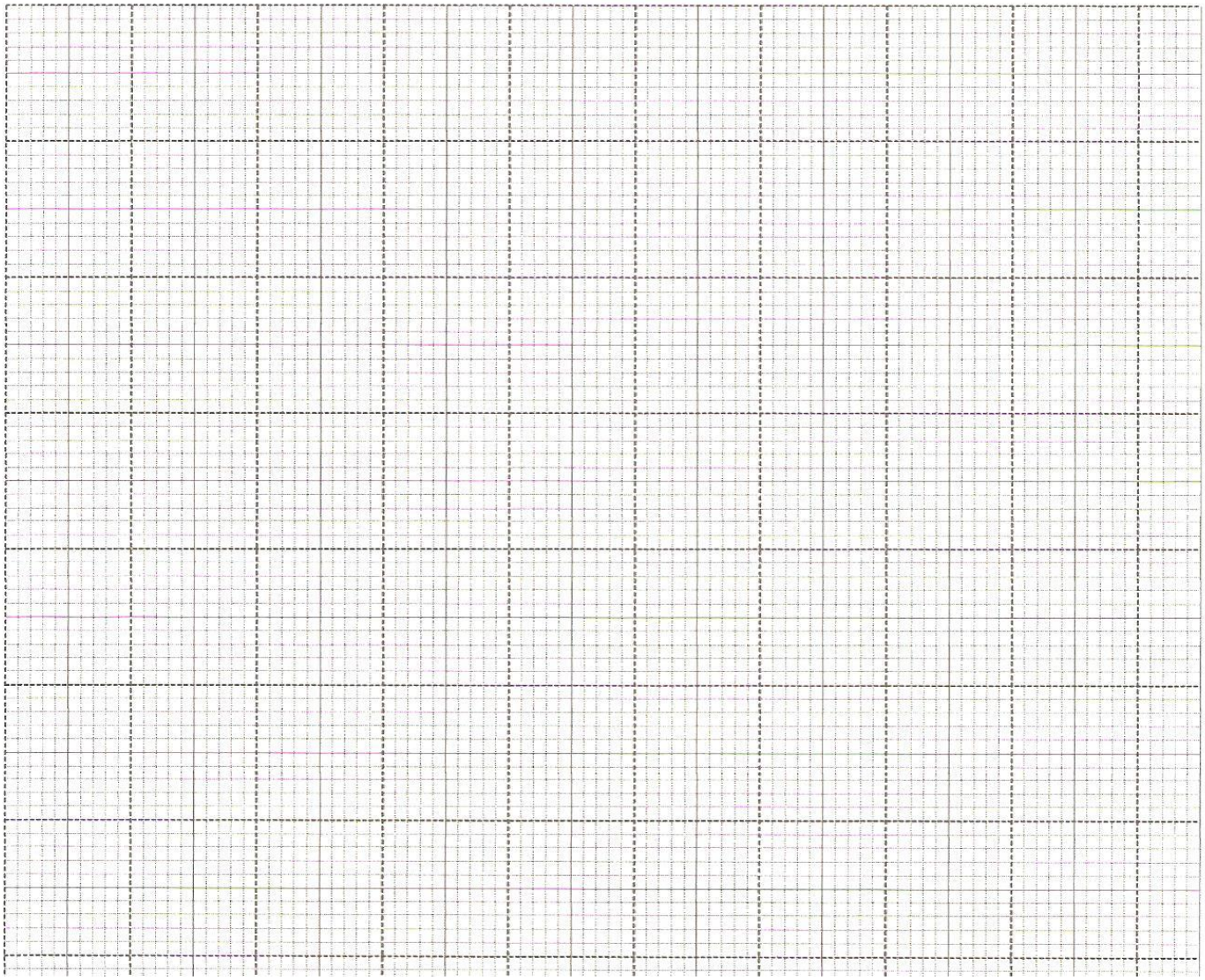
3. (a) The solubilities of potassium nitrate and potassium bromide at different temperatures was determined. The following data was obtained.

Temperature ^0C		0	10	20	30	40	50	60	70	80
Solubility g/100g H_2O	KNO_3	5	15	26	43	61	83	105	135	165
	KB_r	50	55	60	65	70	77	85	90	95

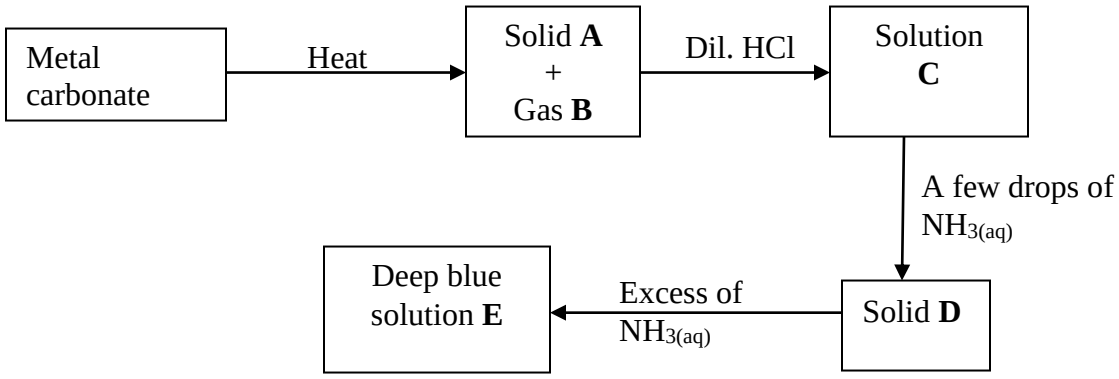
(i) Draw solubility curves for both salts on the same axis. **(3 marks)**



(ii) What was the solubility of each salt at 65^0C? **(1 mark)**

(iii) 100g of a saturated solution of potassium nitrate at 70^0C was cooled to 20^0C. What mass of the crystals will be crystallized? **(2 marks)**

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



(i) Write an equation for the formation of solid **A** and gas **B**. **(1 mark)**

……

(ii) Name;

Solution **C** - …….. **(1 mark)**

Solid **D** - …….. **(1 mark)**

(c) Write the formula of the complex ion in solution **E**. **(1 mark)**

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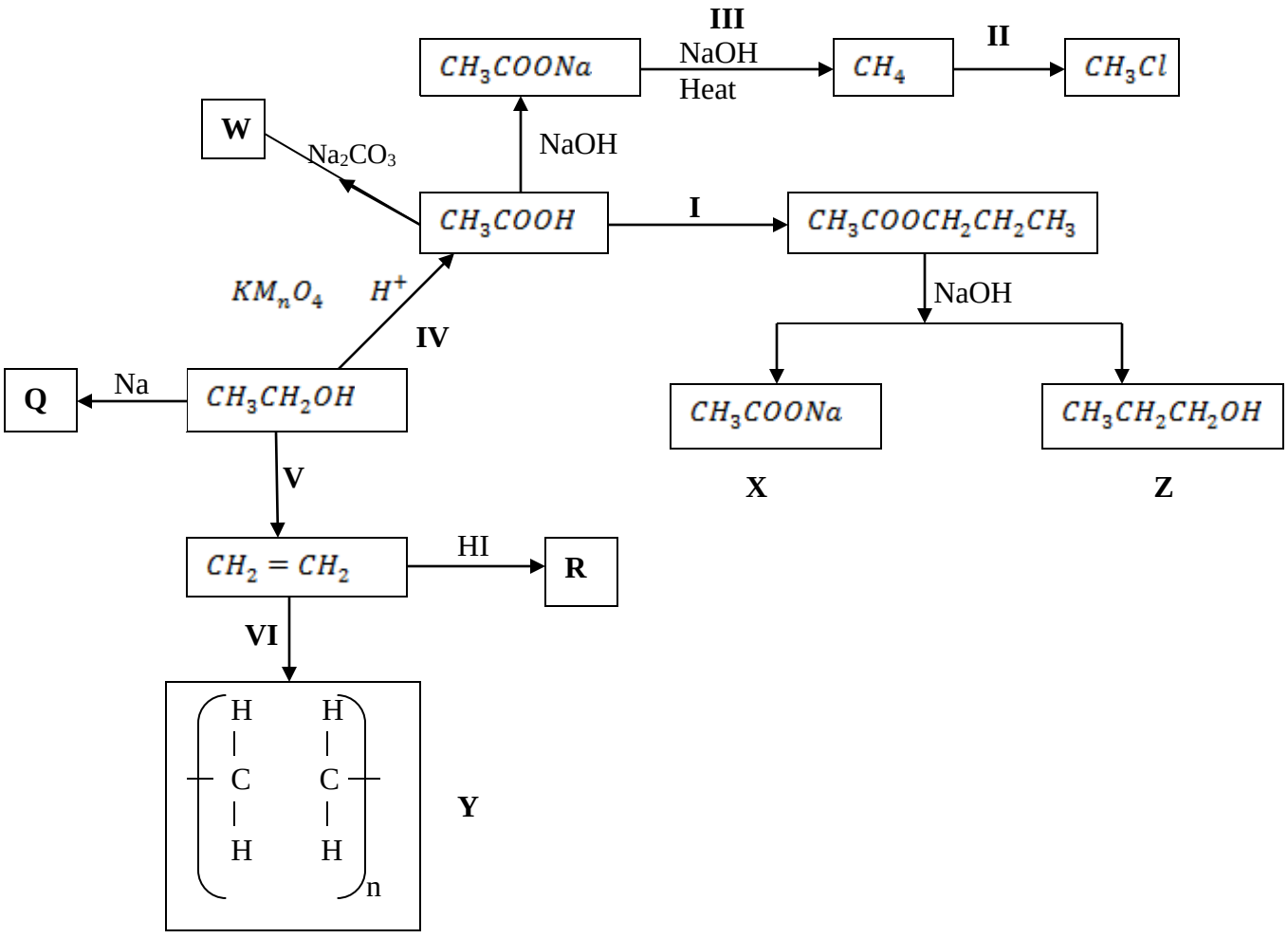
4. Study the flow chart below and answer the questions that follow.



(a) Name substance. **(3 marks)**

X - ……

Q - ……

R - ……

(b) Write down an equation for the reaction represented by step III. **(1 mark)**

……

(c) What are the conditions and reagent required for steps?

(i) **I** **(2 marks)**

Reagent - ……

Condition - ……

(ii) **IV** **(2 marks)**

Reagent - ……

Condition - ……

(b) Name the process represented by: **(4 marks)**

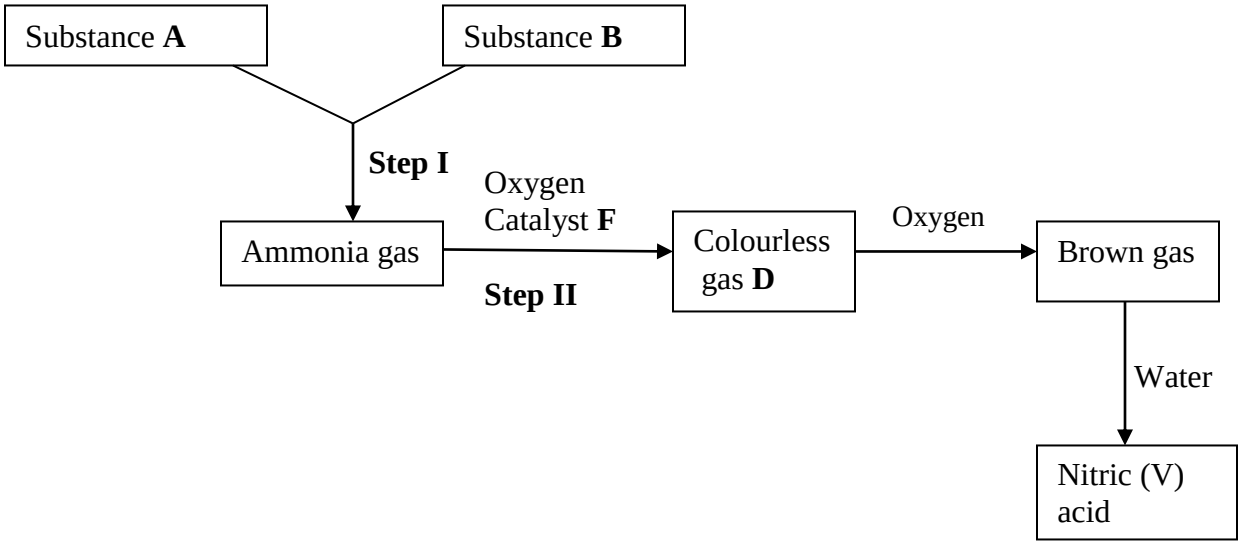
I - ……

II - ……

IV - ……

V - ……

5. **I.** Study the scheme below and answer the questions that follow.



(a) Identify substances. **(3 marks)**

A - ……

B - ……

D - ……

(b) State the catalyst necessary for; **(2 marks)**

Step **I** - ……

Step **II** - ……

(c) Write an equation for the reaction taking place in step **II**. **(1 mark)**

……

(d) Write two balanced chemical equations for the reaction between chlorine gas and;

(i) Hot and concentrated sodium hydroxide. **(1 mark)**

……

(ii) Dilute and cold sodium hydroxide. **(1 mark)**

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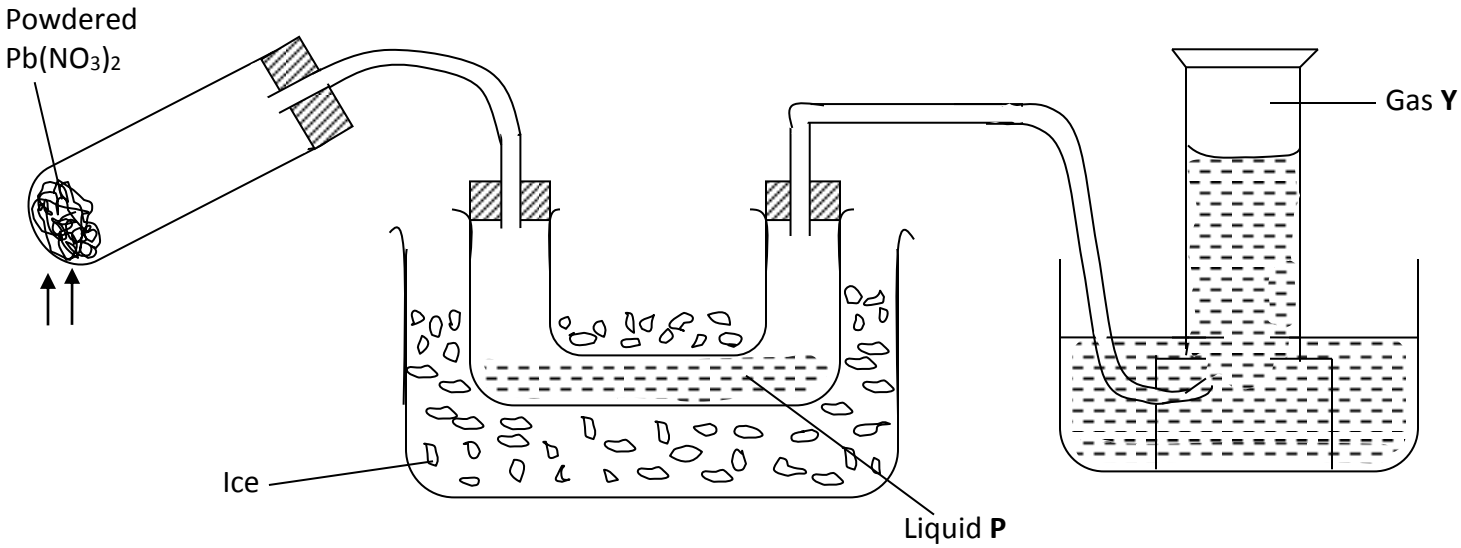
II. The diagram below shows an experiment in which the Lead (II) nitrate crystals are heated.



(a) Name; **(2 marks)**

(i) Liquid **P** - ……

(ii) Gas **Y** - ……

(b) Write a balanced chemical equation for the decomposition of Lead (II) nitrate. **(1 mark)**

……

(c) Explain how you can distinguish between nitrogen (II) oxide and nitrogen (I) oxide. **(2 marks)**

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6. **I.** Study the standard electrode potentials given below and answer the questions that follow.

$D^{2+}_{(aq)} + 2e^- \rightleftharpoons D_{(s)} \quad E^\theta = -2.92V$

$G^{2+}_{(aq)} + 2e^- \rightleftharpoons G_{(s)} \quad E^\theta = -2.36V$

$\frac{1}{2}J^{2+}_{(g)} + e^- \rightleftharpoons J_{(s)} \quad E^\theta = 0.00V$

$M^{2+}_{(aq)} + 2e^- \rightleftharpoons M_{(s)} \quad E^\theta = +0.34V$

$\frac{1}{2}R^{2+}_{(aq)} + e^- \rightleftharpoons R_{(s)} \quad E^\theta = 2.87V$

(a) Identify the strongest:

(i) Reducing agent ..... **(1 mark)**

(ii) Oxidizing agent ..... **(1 mark)**

(b) Calculate the e.m.f of a cell made of G and M. **(2 marks)**

(c) Write the cell representation for the above cell in (b). **(1 mark)**

(d) Draw a cell diagram for the cell in (b) above. **(2 marks)**

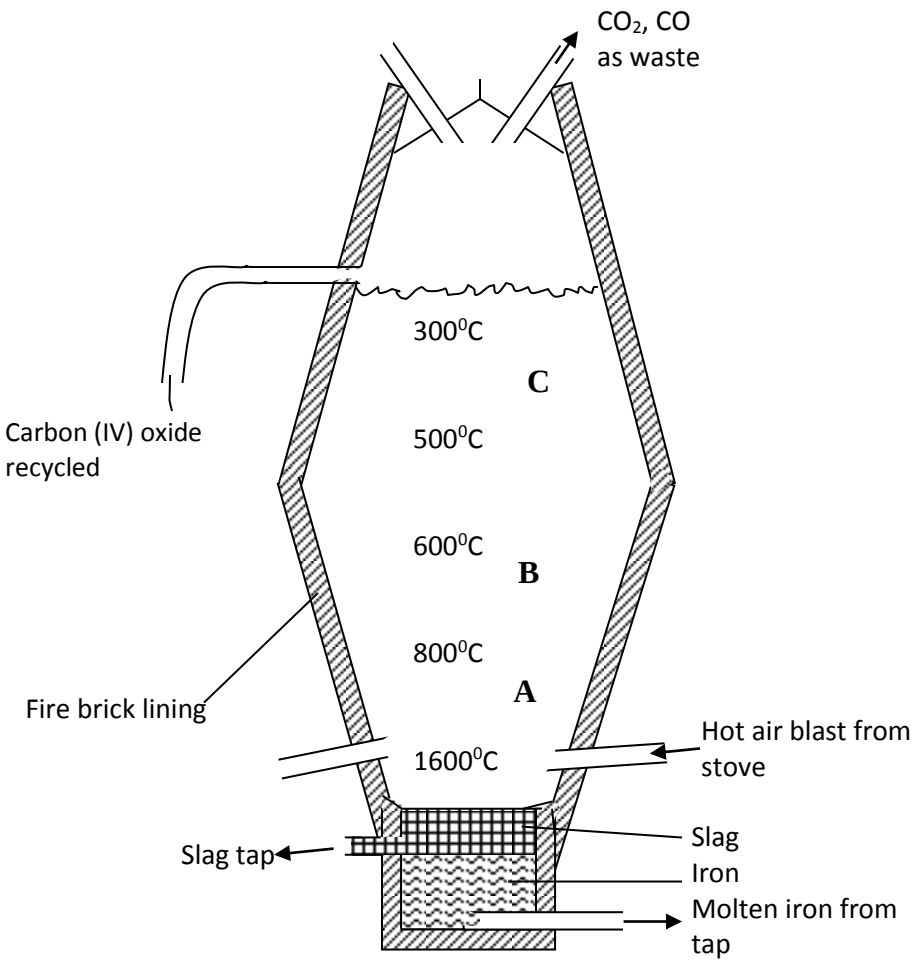
(e) Write the cell reaction for the drawn cell diagram in (d) above. **(1 mark)**

II. Electrolysis of aqueous solution of metal M resulted in the deposition of 1.07g of metal upon passage of a current of 1.32 amperes for 75 minutes.
(M = 52, 1F = 96500C)

(i) Calculate the quantity of electricity passed through the cell. **(1 mark)**

(ii) Calculate the charge on the metal ion. **(3 marks)**

7. Extraction of iron involves two main processes, smelting and refining. Below is the blast furnace which is used to smelt iron from its ore.



(a) (i) What does the word smelt mean? **(1 mark)**

……

……

(ii) Name the reducing agent in the process. **(1 mark)**

……

……

(iii) What is the role of the hot air blast in the process? **(2 marks)**

……

……

……

(b) Write equations for the reactions that take place at the region marked A, B and C.
(3 marks)

A - ……

B - ……

C - ……

(c) What is the purpose of limestone in the extraction process? **(1 mark)**

……

(f) Write equations to show how impurities are removed from the ore.
(3 marks)

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Name: …… **Index no ……..**

School: …….. **Candidate's sign ……..**

Date: ……

233/3

CHEMISTRY

MARCH/APRIL 2015

TIME: 2 ¼ HOURS

MOKASA JOINT EXAMINATION-2015

Kenya Certificate of Secondary Education (K.C.S.E.)

INSTRUCTIONS TO CANDIDATES:

(a) Write your name and index number in the spaces provided.
(b) Sign and write the date of examination in the spaces provided
(c) Answer ALL the questions in the spaces provided in the question paper
(d) You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ 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 you may need.
(e) All working MUST be clearly shown where necessary.
(f) Mathematical tables and electronic calculators may be used.
(g) Candidates should check the questions to ascertain that all pages are printed as indicated and that no questions are missing.

For Examiner's Use Only:

Question	Maximum score	Candidates score
1	22	
2	8	
3	10	
Total score	40	

1. You are provided with:

- A monobasic acid HA, solution J.
- Sodium carbonate solution, solution Q, containing 1.325g in 250cm^3 of solution.
- Solution R, containing 15.75g of $M(OH).8H_2O$ per litre.
- Screened methyl orange indicator.

You are required to:

- Standardize solution J.
- Determine the relative atomic mass of element M in $M(OH)_2.8H_2O$.

Procedure 1

Fill the burette with solution J. Pipette 25cm^3 of solution Q into a clean 250ml conical flask and add 2 – 3 drops of screened methyl orange indicator. Titrate this solution with the solution in the burette and record your results in table 1 below. Repeat this procedure and complete the table. **Retain solution J in the burette for use in procedure II**.

Table 1

Titre	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of J used (cm^3)			

(4 marks)

a) Calculate the average volume of solution J used. (1 mark)

……

……

b) Determine the concentration of solution Q in moles per litre (Na=23, C=12, O=16 (1 mark)

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……

c) (i) Determine the number of moles of the monobasic acid solution, HA, that are in the

averaged value calculated in (b) above. (1 mark)

……

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(ii) Determine the concentration of solution J in moles per litre. (1 mark)

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Procedure 2

- Using a 25cm^3 measuring cylinder, transfer 25cm^3 of solution R into a clean 250ml conical flask. Using a 100ml measuring cylinder, transfer 75cm^3 of solution Q into the flask with solution R. Boil the mixture for about 5 minutes. After cooling filter into a conical flask and transfer the filtrate into a clean 100ml measuring cylinder and add distilled water to make exactly 100cm^3 of solution. Label this solution as solution S.

Pipette 25cm^3 of solution S into a conical flask and titrate it with solution J using 2 drops of screened methyl orange indicator. Record your results in table 2 below. Repeat this to complete the table.

Table 2

Titre	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of **J** used (cm^3)			

(4 marks)

d) Calculate the average volume of solution J used. (1mark)

……

……..

e) Determine the number of moles of:

(i) The monobasic acid, HA, in the average volume. (1 mark)

……

……

……..

(ii) Sodium carbonate in 25cm^3 of solution S. (1 mark)

……

……

……..

(iii) Sodium carbonate in 75cm^3 of solution S. (1 mark)

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……

……..

iv) Sodium carbonate in the original $75cm^3$ of solution S. (1 mark)

……

……

……

v) Sodium carbonate that reacted with solution R. (1 mark)

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……

……

vi) M $(OH)_2$. $8H_2O$ in $25cm^3$ of solution R. (1 mark)

(1 mole of M $(OH)_2$. $8H_2O$ reacts with one mole of sodium carbonate)

……

……

……

f) Determine

(i) the concentration of solution R in moles per litre. (1mark)

……

……

……

……

(ii) the relative formula mass of $M(OH)_2.8H_2O$. (1 mark)

……

……

……

……

(iii) the relative atomic mass of M (O=16.0, H=1.0) (1mark)

……

……

……

2. You are provided with:
Solid P, 2.0 g of a dibasic acid H_2X.

You are required to determine the molar heat of solution of solid P.

PROCEDURE

Place $30cm^3$ of distilled water into a 100ml beaker. Measure the initial temperature of the water and record it in the table below. Add all the solid P at once and stir the mixture carefully with the thermometer until all the solid dissolves. Measure the final temperature reached and record it in table.

Final temperature (^oC)	
Initial temperature (^oC)	

(3 mks)

a) Determine the change in temperature, ΔT. (1 mk)

……

b) Calculate the:

i) heat change when H_2X dissolves in water. (Assume the heat capacity of the solution is 4.2 $Jg^{-1o}C^{-1}$ and density is $1g/cm^3$) (2 mks)

ii) number of moles of the acid that were used. (Relative formula mass of H_2X is 126) (1mk)

iii) molar heat of solution, ΔH, of the acid H_2X. (1mk)

3.You are provided with solid **G**.Place all solid **G** in a boiling tube.Add distilled water and shake.Divide the resulting solution into three portions.

Inferences	0bservations
(½ mk)	(½ mk)

i)To the first portion add drops of 2M sodium hydroxide.

Inferences	0bservations
(½ mk)	(½ mk)

ii)To the second portion dip a metallic spatula in the solution and burn it directly on a non-luminous flame.

Inferences	0bservations
(½ mk)	(½ mk)

iii)To the third portion add three drops of barium nitrate solution followed by 2cm^3 of 2M hydrochloric acid.

Inferences	0bservations
(½ mk)	(½ mk)

iv) To the fourth portion add three drops of acidified potassium dichromate (VI) solution.

Inferences	0bservations
(½ mk)	(½ mk)

b)You are provided with solid **F.** Carry out the tests below and record your observations and inferences in the spaces provided

(i) Using a metallic spatula, heat half of solid F in a non-luminous bunsen burner flame .

Inferences	0bservations
(½ mk)	(½ mk)

(ii) Put a half spatula endful of solid **F** into a boiling tube. Add about $10cm^3$ of distilled water and shake.

Inferences	0bservations
(½ mk)	(½ mk)

Divide the resulting solution from a(ii) above into two portions

(i) To the first portion,2 -3 drops of universal indicator and determine its pH.

Inferences	0bservations
(½ mk)	(½ mk)

(ii) To the second portion, add two drop of acidified potassium Manganate (VII) solution and shake.

Inferences	0bservations
(½ mk)	(½ mk)

(c) Put half spatula endful of solid **F** into a boiling tube and add 5 drops of ethanol followed by 2 drops of concentrated sulphuric (VI) acid.warm the mixture.

Inferences	0bservations
(½ mk)	(½ mk)