Name:……. **Index no ……..….....**

Candidate's sign ……....

Date**: ……**

233/1

CHEMISTRY

PAPER 1

THEORY

MAY 2015

TIME: 2 HOURS

TIGANIA SOUTH PRE-MOCKS 2015

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

233/1

CHEMISTRY

PAPER 1

INSTRUCTIONS TO CANDIDATES:

- *Write you **name** and **index number** in the spaces provided above.*
- *Sign and write the date of examination in the spaces provided above.*
- *Answer **All**the questions in the spaces provided below each question.*
- *Mathematical tables and electronic calculators may be used.*
- *All working **MUST** be clearly shown where necessary.*

For Examiner's Use Only

Question	Maximum score	Candidate's score
1-28	80	

1. (a) What is chromatography? (1mk)

……

……

(b) Give **two** applications of chromatography (2mks)

……

……

2. Concentrated sulphuric (vi) acid is used to drysulphuric(vi) oxide gas

(a)Explain why concentrated sulphuric(vi) acid is not used to dry hydrogen sulphide (1mk)

……

……

(b) Name one drying agent that can be used to dry hydrogen sulphide (1mk)

……

3. Lead (ii) oxide reacts with acids and alkalis

(a) Write the equation for the reaction between lead (ii) oxide and

(i)Dilute nitric (v) acid (1mk)

(ii) Sodium hydroxide solution (1mk)

(b) What property of lead (ii) oxide is shown by the reactions in (a) above (1mk)

……

4. (a)Galvanized iron does not rust when scratched. In contrast when tin can is scratched then exposed iron underneath corrodes rapidly. Explain (2mks)

……

……

(b) List two methods of preventing rusting (1mk)

……

5. The electron arrangement of the atoms of elements **P**,**QR** and **S**are shown below, the letters are not the actual symbols of the elements

ELEMENT	**Electron arrangement**
P	**2.8.7**
Q	**2.8.8.2**
R	**2.8.5**
S	**2.8.6**

(a) Which two elements could react to form a compound soluble in water and a strong electrolyte

……(1mk)

(b) Using dot(.) and cross(x) diagrams show how the molecule between **P** and **S** is formed (1mk)

(c) Name the type of bond formed in (b) above (1mk)

……

6. Distinguish the following terms as used in the study of chemistry (3mks)

(a) Isotopes

(b) Allotropes

c) Isomers

7. Below is a list of major constituents of crude oil and their boiling points

CONSTITUENTS	**BOILING POINTS ^{0}C**
Diesel oil	250-350
Petrol	40-175
Lubricating oil	350-400
Kerosene	175-250

(a) Name the process by which the above constituents can be separated (1mk)

(b) List down the order by which the constituents would be obtained from the mixture (1mk)

……

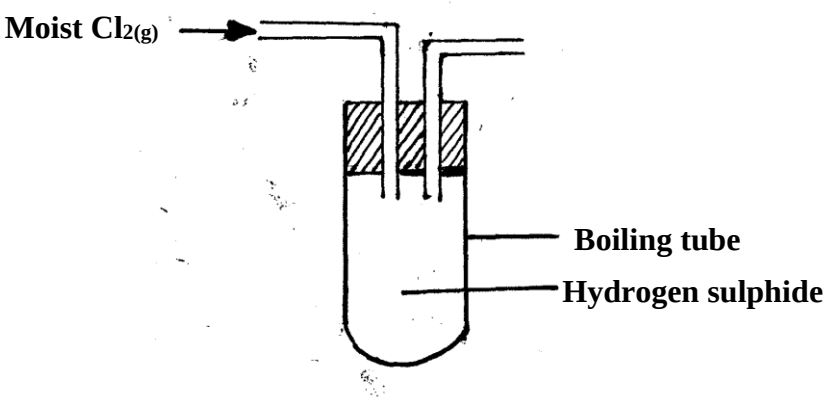
(c) When the above constituents are burned in air and the products passed through distilled water, the pH of the water decreases. Explain (1mk)

8. Hydrogen chloride dissolves in both methylbenzene and water. What happens when sodium carbonate is added to a test tube containing a solution of hydrogen chloride in methylbenzene? Explain (2mks)

9. (a)State Charles law (1mk)

(b) A gas at 17^0C occupies a volume of 510cm^3. Calculate the temperature at which its volume would be 420cm^3 (2mks)

10. Moist chlorine was passed into hydrogen sulphide as shown below



(a) What observation was made in the boiling tube? (1mk)

……

(b) Write the equation for the reaction taking place in the boiling tube (1mk)

……

(c) State the precautions that should be taken in carrying out this experiment (1mk)

……

11. Describe how a mixture of common salt, ammonium chloride and iron fillings would be separated into their individual solids (3mks)

……

……

12. Describe how you would prepare a dry sample of zinc carbonate in the laboratory starting with zinc chloride solid (3mks)

……

……

13. State and explain the observations that would be made if carbon (iv) oxide gas was bubbled through lime water for long time (3mks)

……

……

14. The solubility of salt **Y** at 60^0C is 40g/100g of water and 48g/100g of water at 100^0C

(i) How much salt of **Y** would saturate 190g of water at 100^0C (1 ½ mks)

……

……

(ii) 150g of saturated solution of **Y** at 100^0C is cooled to 60^0C. Calculate the mass of **Y** that crystallizes out (1 ½ mks)

……

……

15. Consider the reversible reaction below which is at equilibrium

$CaCO_{3(s)} \rightleftharpoons CaO(s) + CO_{2(g)}$ ΔH= +ve

State and explain what would happen to the equilibrium if;

(i) A few drops of sodium hydroxide were added to the above system (1 ½ mks)

……

……

(ii) The system was warmed (1 ½ mks)

……

……

16. Explain why hard water flowing in lead pipes may be safer for drinking than soft water flowing in the same pipes (3mks)

……

……

17. When sulphur is heated in a test tube, the yellow crystals melt to form a golden yellow liquid which changes at 180^0C into a dark brown very viscous liquid. On further heating to 400^0C, a brown less viscous liquid is formed

(i) What is the molecular mass of sulphur in the yellow crystals (S=32) (1mk)

……

(ii) If the brown liquid at 400^0C is cooled rapidly at room temperature, which form of sulphur is produced (1mk)

……

(iii) Explain why the molten sulphur becomes viscous (2mks)

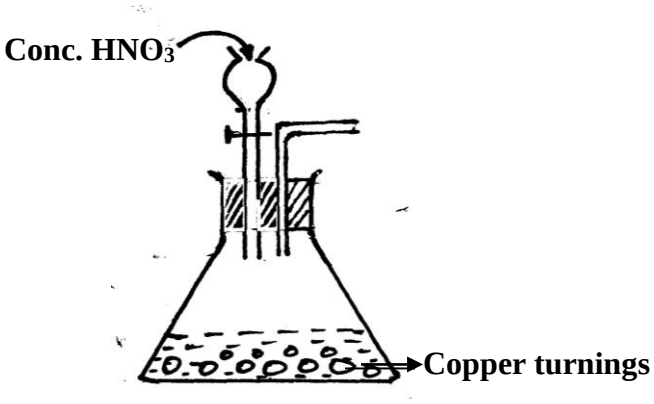
……

18. When a hydrocarbon is completely burnt in Oxygen, 11.0g of carbon (iv) oxide and 4.5g of water are formed. Determine the molecular formula of the hydrocarbon if its relative molecular mass is 84(C=12,O=16,H=1) (3mks)

……

……

19. Below is an incomplete set-up for preparing a gas



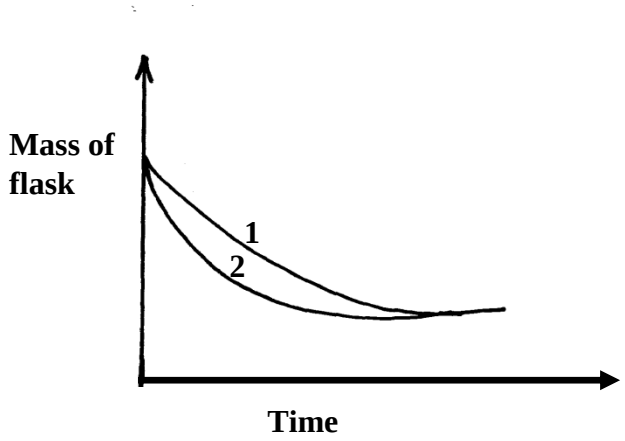
Complete the diagram to show how a dry sample of the gas can be collected (3mks)

20. Strontium lies below calcium in the periodic table. How does the melting point of strontium compare with the melting point of calcium? Explain (3mks)

……

……

21. The curves below were obtained when equal volumes of hydrochloric acid of the same concentration were reacted with 25g of marble chips. In one case the acid was first warm



(a) Which curve represents the reaction involving cold acid (1mk)

……

(b) How does increasing temperature affect the rate of reaction (1mk)

……

……

(c) Why does the mass of the flask decrease with time (1mk)

……

……

22. $100cm^3$ of carbon (iv) oxide gas diffused through a porous partition in 30 seconds. How long would it take $150cm^3$ of Nitrogen (iv) oxide to diffuse through the same partition under the same conditions. *(C=12, N=14,O=16)* (3mks)

23. Identify the particles that facilitate the electric conductivity of the following substances (3mks)

(i) Sodium metal……

(ii) Sodium chloride solution…….

(iii) Molten lead bromide…….

24. An ion of oxygen is larger than oxygen atom. Explain (2mks)

……

……

25. Carbon and silicon belong to the same group of the periodic table, yet carbon (iv) oxide is a gas while silicon (iv) oxide is a solid with a high melting point. Explain this difference (2mks)

……

……

……

26. (a) Name the following compounds

(i) CH_2=CH CH_3

……

(ii) CH_2ClCH_2Cl

……

(b) Methane reacts with chlorine to form tetrachloromethane. What condition is required for the reaction to occur?

……

27. The first step in the industrial manufacture of Nitric (v) acid is the catalytic oxidation of ammonia gas

(a) What is the name of the catalyst used (1mk)

……

(b) Write the equation for the catalytic oxidation of ammonia gas (1mk)

……

……

(c) Nitric (V) acid is used to make ammonium nitrate. State one use of ammonium nitrate (1mk)

……

28. Study the reaction below and answer the questions that follow

$NH_{3(g)} + H_2O_{(l)} \rightleftharpoons NH^+_{4(aq)} + OH^-_{(aq)}$

(a) Define the term acid (½mk)

……

…… (b)

Identify an acid in the above reaction (½mk)

……

……

(c)Explain your answer in (b) above (1mk)

……

……

Name: …….. Class: …… Adm.No……..
School: …… Date: ……
Sign:……..

233/2
CHEMISTRY
Paper 2
MAY 2015
Time: 2 hours

TIGANIA SOUTH PRE-MOCKS 2015
Kenya Certificate to Secondary Education
CHEMISTRY PAPER 2
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

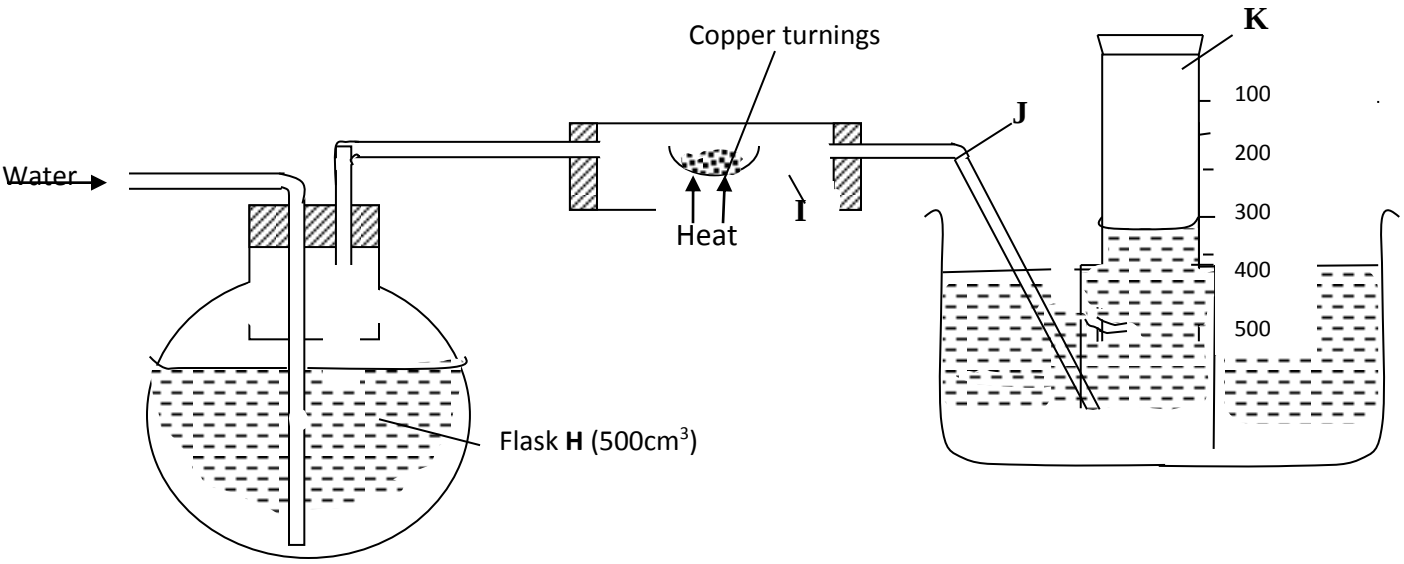
- *Write your name, admission number, date and school in the spaces provided.*
- *Answer **all** the questions in the spaces provided.*
- *All working must be clearly shown where necessary.*
- *Scientific calculators may be used.*

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)**

……

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

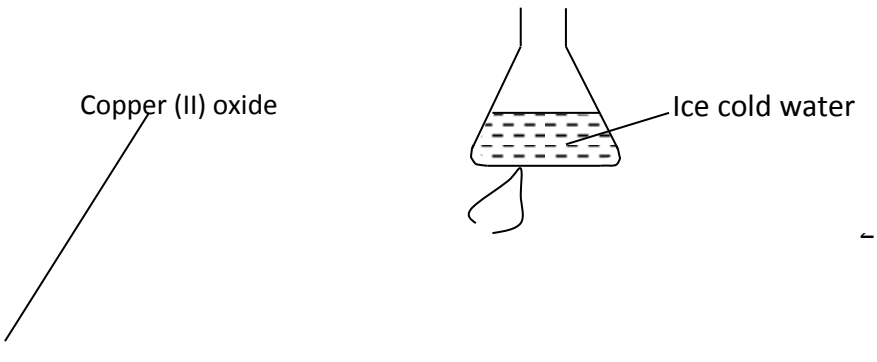
……

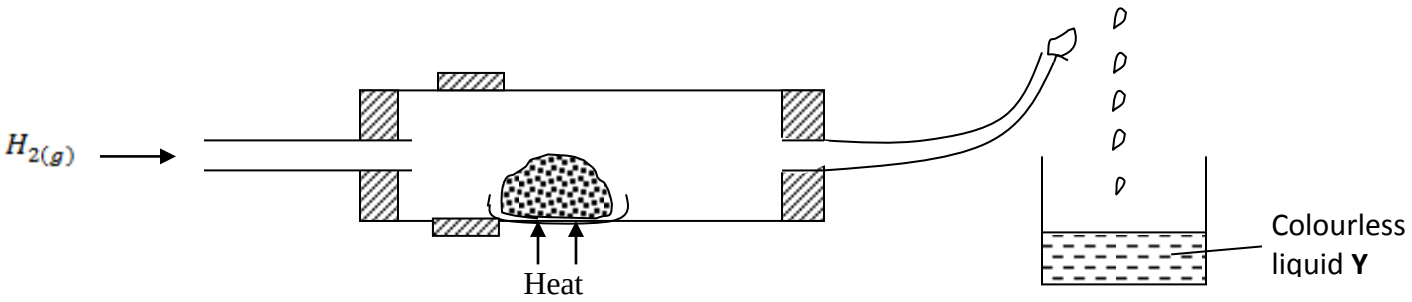
(iv) What was the volume of the gas collected in the measuring cylinder at the end of the experiment? **(1 mark)**

……

(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)**

(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)**

……

……

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 mark**

(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)**

……

……

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

……
……

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

……
……

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

……

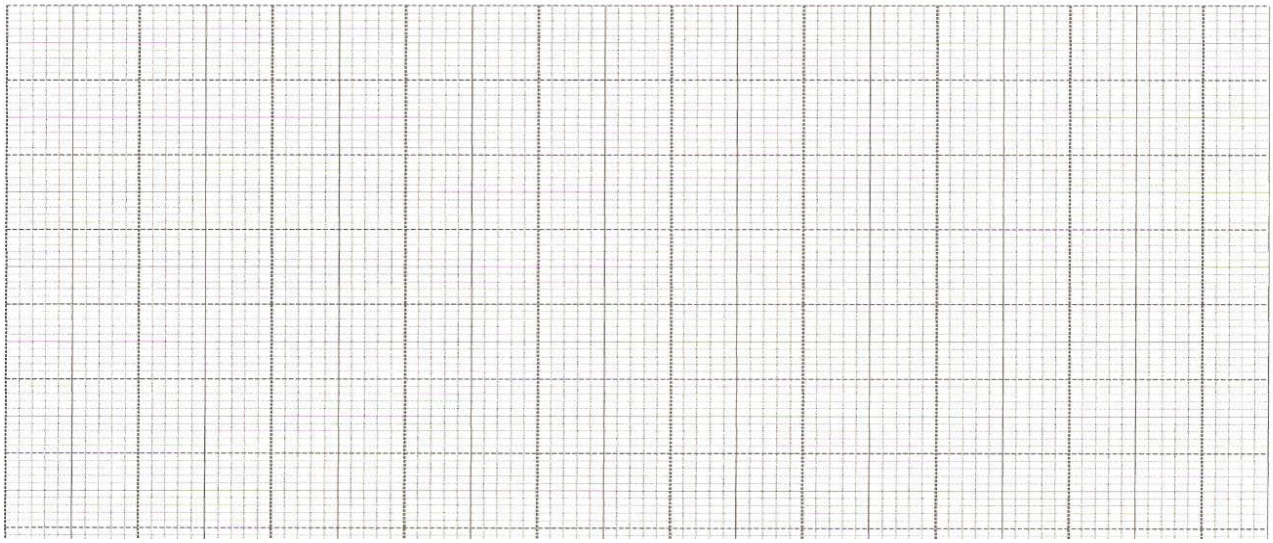
(ii) Why is there no ionic radius for **W** reported in the table? **(1 mark)**

……

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
	KBr	50	55	60	65	70	77	85	90	95

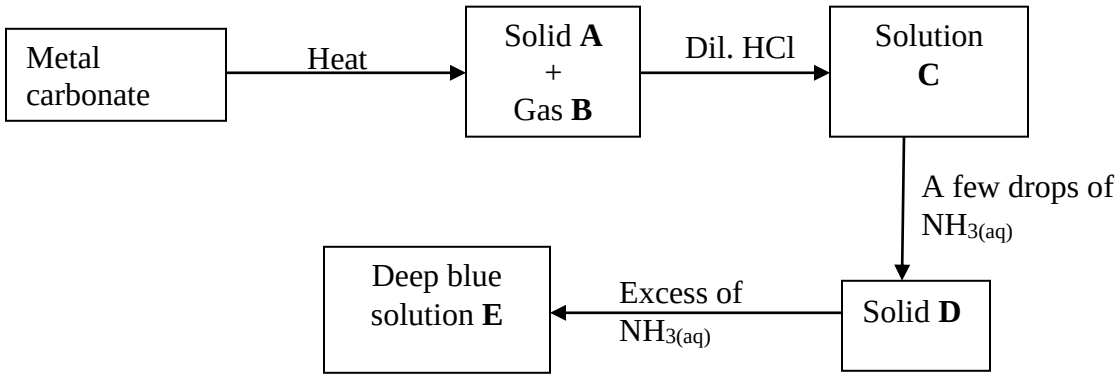
(i) Draw solubility curves for both salts on the same axis. **(3 marks)**



(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)**

……

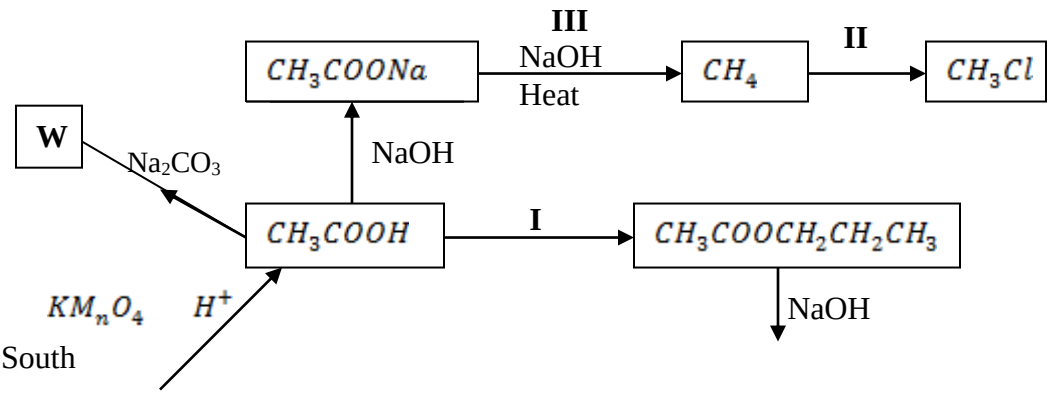
(ii) Name;

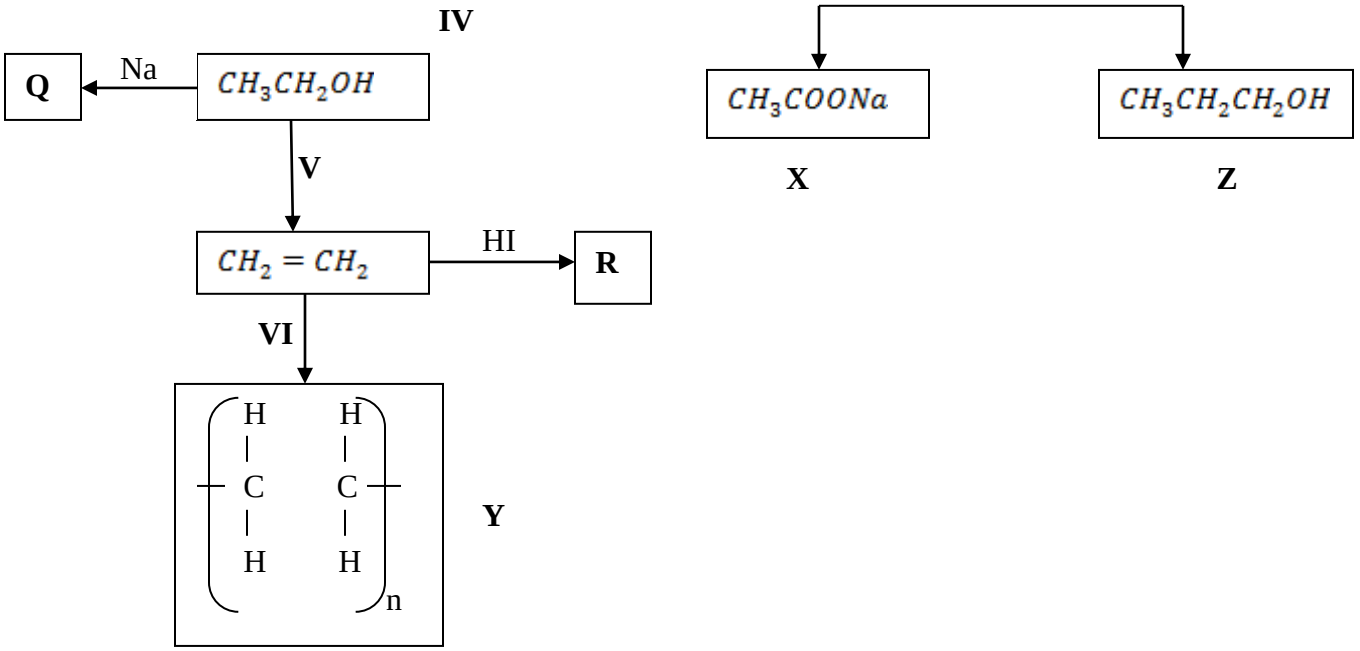
Solution **C** - …….. **(1 mark)**

Solid **D** - …….. **(1 mark)**

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

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)**

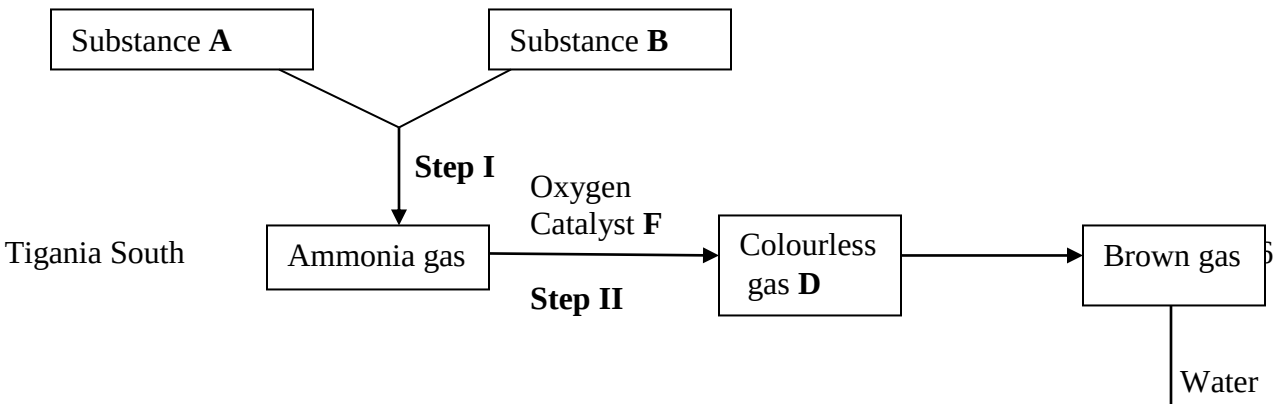
I - ……

II - ……

IV - ……

V - ……

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



Oxygen

(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;

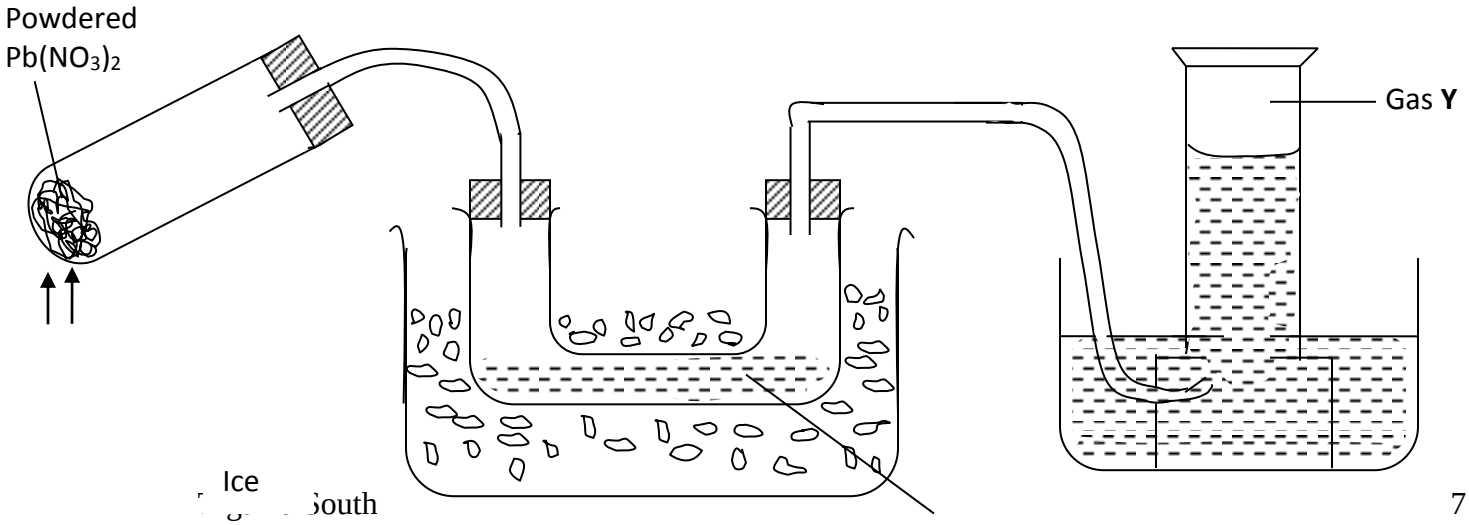
(i) Hot and concentrated sodium hydroxide. **(1 mark)**

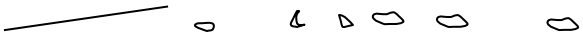
……

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

……

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





Liquid **P**

(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)**

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)**

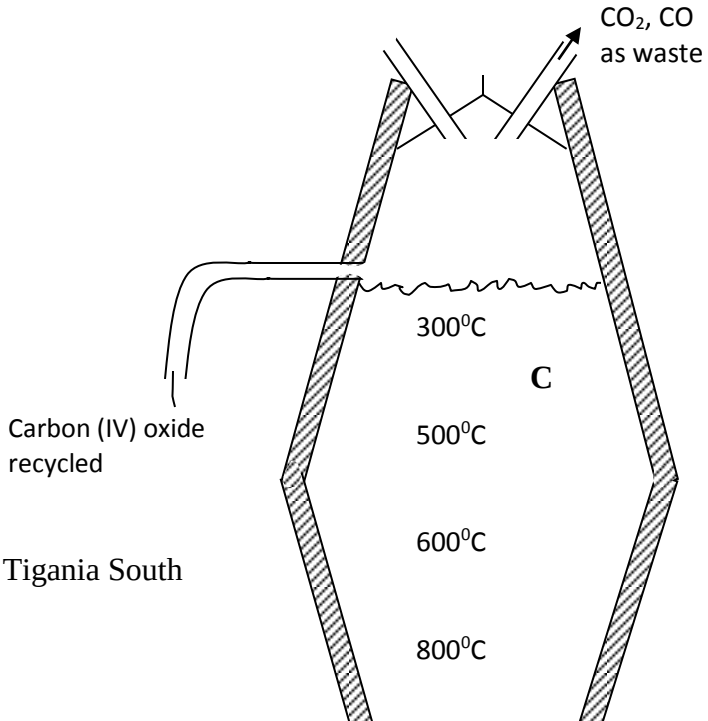
(e) Write the cell reaction for the drawn cell diagram in (d) above. **(1 mark)**

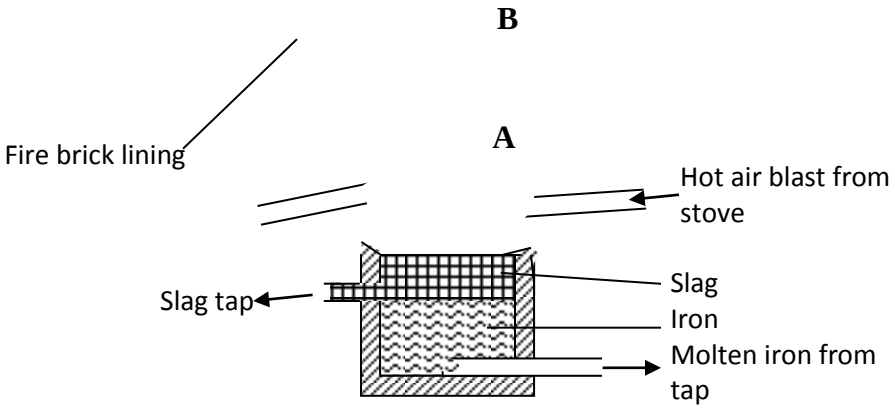
II. Electrolysis of aqueous solution of metal M resulted in the deposition of 1.07g of metal upon passage of a current of 1.32 amperes for 75 minutes.
(M = 52, 1F = 96500C)

(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. (3marks)

Name: …… **Index no ……**
School: …… **Candidate's sign ……**
Date: ……
233/3
CHEMISTRY

MAY 2015

TIME: 2 ¼ HOURS

TIGANIA SOUTH PRE-MOCKS 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)

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)

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

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)

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

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

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)