NAME…… INDEX NO……. ……...…

SCHOOL……...……. CANDIDATE'S SIGNATURE…….

DATE……..

233/1
CHEMISTRY
PAPER 1
(THEORY)
MARCH/APRIL 2015
TIME: 2 HOURS

KABONDO DIVISION JOINT EVALUATION TEST

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

233/1
CHEMISTRY
PAPER 1
(THEORY)
MARCH/APRIL 2015
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- Write your 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
- Mathematics tables and electronic calculators may be used.
- All working must be clearly shown where necessary.

FOR EXAMINERS USE ONLY

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

1. (a) State one disadvantage of using flower extracts as acid – base indicators. (1mk)

……

……

(b) Name the indicator that can be used in the laboratory to tell the PH of lemon juice.(1mk)

……

(c) Differentiate between strong and weak acids. (1mk)

……

……

2. (a) What are isotopes? (1mk)

……

……

(b) Determine the number of neutrons in $^{18}_{8}O$ (1mk)

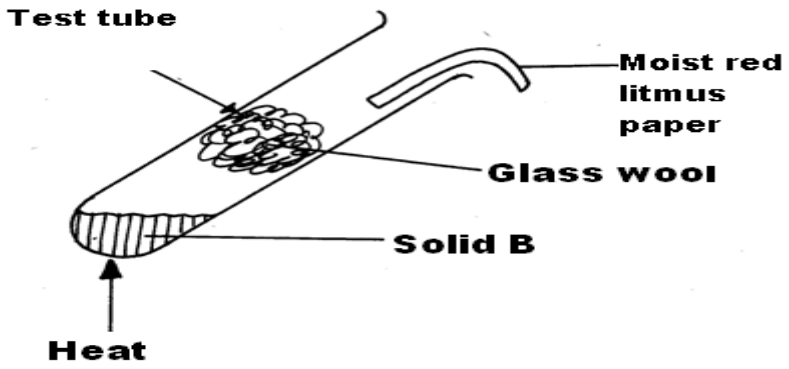
3. When magnesium is burnt in air it reacts with both oxygen and nitrogen gas giving a white ash. Write two equations for the reactions that take place. (1mk)

……

……

4. A solution contains 29.1g per litre of aluminium Sulphate. Calculate the number of Sulphate ions in $350cm^3$ of the solution.
(Al = 27, S = 32, O = 16) Avogadro's constant = 6.0×10^{23}. (2mks)

5. When a solid B was heated in a test-tube, it gave off two gases. The two gases were seperates by passing them through a plug of glass wool in a test-tube as shown below.



The first gas which evolved turned moist red litmus paper to blue. Later the other gas involved turned the litmus back to red.

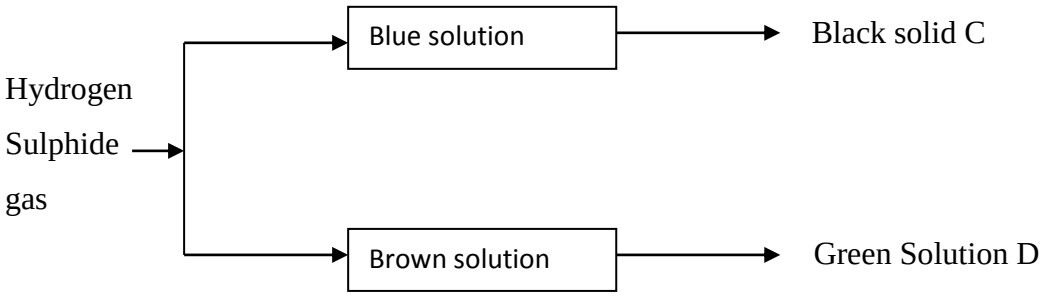
(a) Identify solid B (1mk)

……

(b) Write the equation for the reaction that take place in the test tube (1mk)

……

6. Hydrogen Sulphide gas was bubbled into two solutions of metallic nitrates as shown in the flow diagram below



(a) Identify the black solid C (1mk)

……

(b) Write an ionic equation for the formation of the green solution (1mk)

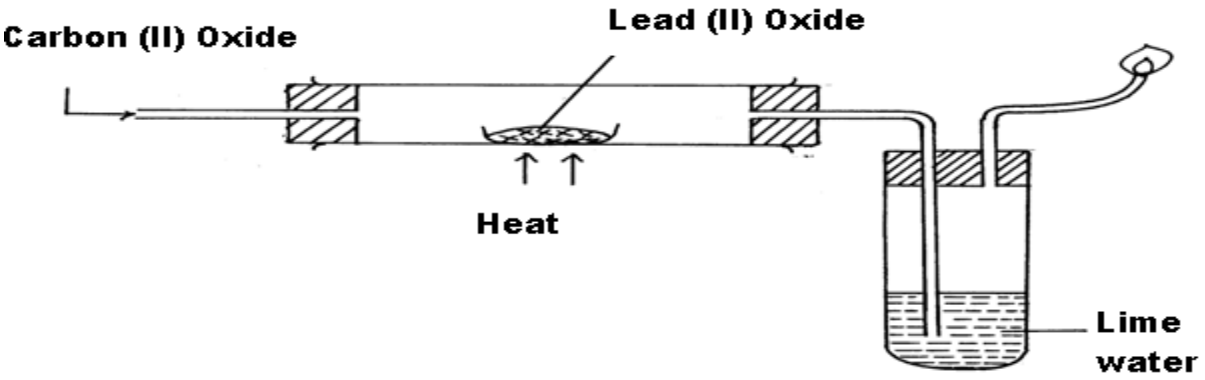
……

(c) State the property of Hydrogen Sulphide shown by the formation of solution D (1mk)

……

……

7. The apparatus shown below was used to investigate the effect of Carbon (II) Oxide on Lead (II) Oxide.



(a) State the observation made in the combustion tube during the experiment. (2mks)

……

……

……

(b) Write the equation for the reaction that take place in test-tube E. (1mk)

……

……

8. (a) Lime water is also used to soften hard water. Why is this method not preferred to soften hard water. (1mk)

……

……

(b) Name a compound that causes temporary hardness of water. (1mk)

……

……

(c) State one disadvantage of using hard water for domestic purpose. (1mk)

……

……

9. (a) Name the compound below

$CH_3CH_2CH = CH_2$

……

……

(b) Draw and name other isomers of the compound in (a) above. (2mks)

10. A white solid dissolve in water to form a colourless solution. The colourless solution forms a white precipitate with Ammonia solution but dissolve in excess alkali. The colourless solution forms a white precipitate with Lead (II) Nitrate solution. The white Precipitate dissolve on warming to form a colourless solution.

(a) Write the chemical formulae for the ion formed when the colourless solution react with excess ammonia solution. (1mk)

……

……

(b) Write the name of the ion present in the white solid. (1mk)

……

……

(c) What is an alkali (1mk)

……

……

11. The solubility of Potassium Manganate (VII) at 20^0C is 13g per 100g of water and at 90^0C is 60g per 100g of water.

(a) Determine the mass of Pottassium (VII) Manganate present in 80g of saturated solution at 90^0C. (1mk)

……

……

(b) Calculate the mass of Pottassium (VII) Manganate that would crystallize out if the solution in (a) were cooled to 20^0C. (2mks)

……

……

12. (a) Explain why concentrated Sulphuric (VI) acid is a poor electrolyte and has no effect on blue litmus paper whereas 2M Sulphuric (VI) acid conducts electricity and changes blue litmus paper red. (1mk)

……

……

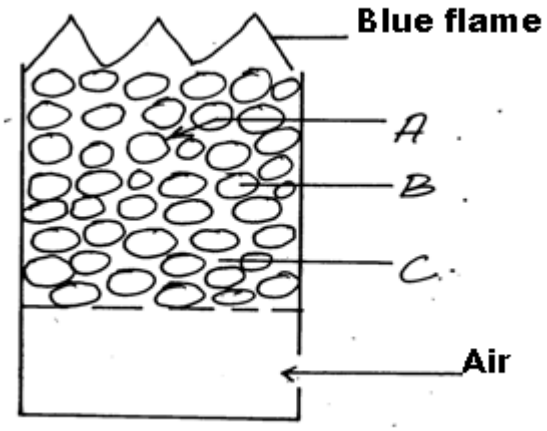
(b) What is a binary electrolyte. (1mk)

……

……

13. An element F has a relative atomic mass of 88. When a current of 0.5 amperes was persed through the fused chloride of F for 20 minutes and 20 seconds, 0.278g of F were deposited at the cathode. Determine the charge on ion of F (1Faraday = 96500C). (2mks)

14. Below is a cross- section of a charcoal burner



(a) Charcoal is a form of impure carbon. Name allotropes of carbon. (1mk)

……

……

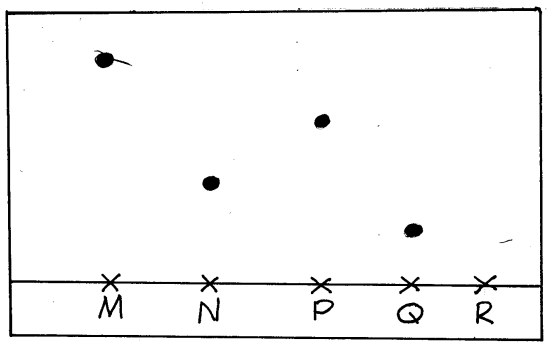
……

(b) Write an equation for the reaction taking place at the part marked B. (1mk)

……

……

15. The diagram below represents paper chromatogram of four types of sugar.



(a) Identify the most stable sugar. (1mk)

……

……

(b) On the diagram, show the chromatogram of R. (2mks)

……

……

……

……

16. The empirical formula of a hydrocarbon is C_2H_3. The hydrocarbon has a relative molecular Mass of 54. (H = 1, C = 12)

(a) Determine the molecular formula of the hydrocarbon. (1mk)

(b) Draw the structure formulae of the hydrocarbon in (a) (1mk)

(c) To which homologous series does the hydrocarbon in (b) above belong? (1mk)

17. State three factors that increase the rate of reaction for the following rection. (3mks)

$CaCO_{3(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(aq)}$

18. In terms of structure and bonding explain the following

(a) Melting point of Magnessium is higher than that of Sodium. (3mks)

……

……

……

……

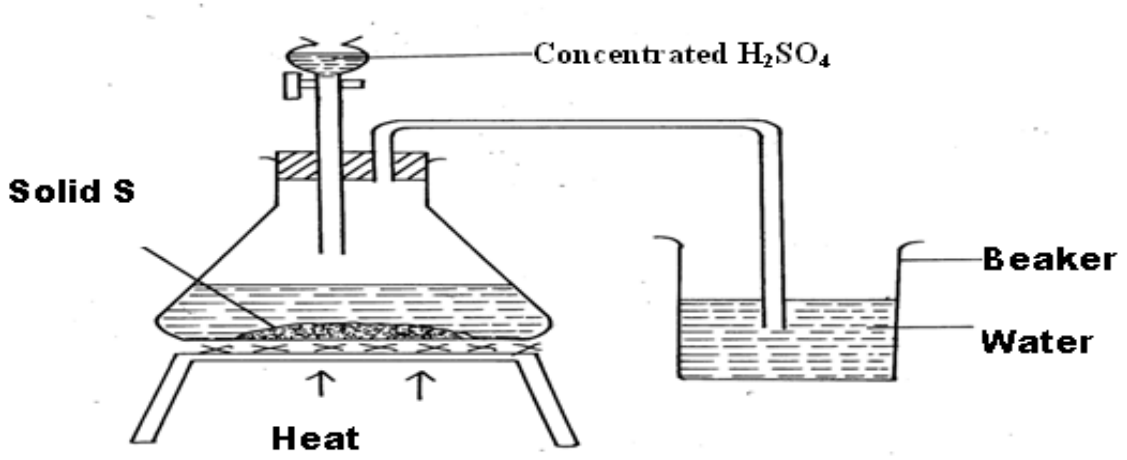
……

(b) Melting point of Chlorine is lower than that of Iodine. (1mk)

……

……

19. The set-up below was used to prepare a solution of hydrogen chloride gas



(a) Identify solid S (1mk)

……

……

(b) Identify one mistake in the set up. (1mk)

……

……

(c) Write an equation for the reaction taking place in the flask. (1mk)

……

20. (a) State gay Lussac's law (1mk)

……

(b) $10cm^3$ of a gaseous hydrocarbon, CxHy required 30cm3 of oxygen for complete combustion. If steam and $20cm^3$ of Carbon (IV) oxide were produced, what is the value of x in CxHy. (2mks)

21. Starting with lead metal, describe how a dry sample of Lead(II) chloride can be prepared in the laboratory. (3mks)

……

……

……

……

……

……

22. An ion T^{2-} has an electronic arrangement of 2.8

(a) What is the atomic number of the element. (1mk)

……

……

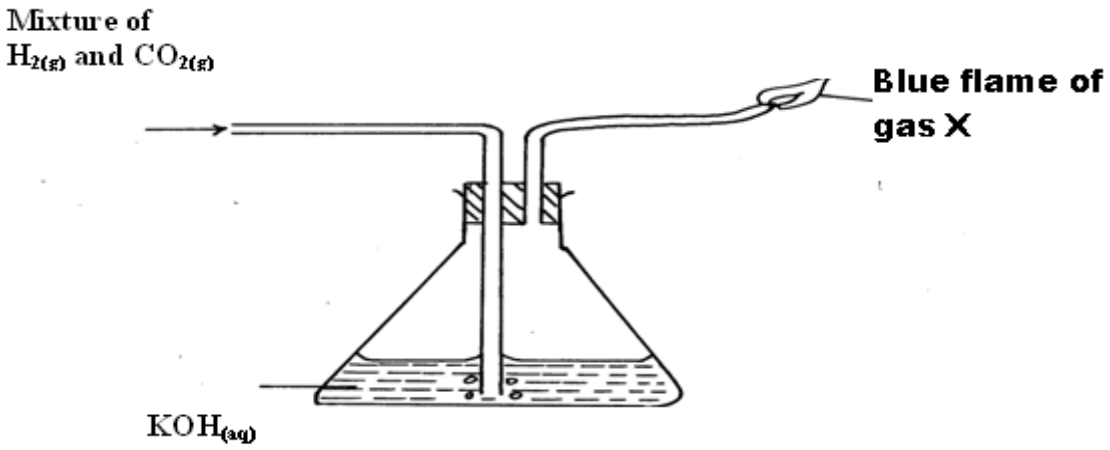
(b) To which group and period does the element belong to;

Group_____ (1mk)

Period_____ (1mk)

23. Using dot (.) and cross (x) diagram show the type of bond present in hydrogen ion, H_3O^+ (H = 1, O = 8) (2mks)

24. A mixture of Hydrogen gas and Carbon (IV) oxide are passed through Potassium hydroxide solution as shown below.



(a) State the observation made in the conical flask. (1mk)

……

……

(b) Write the equation for the reaction that takes place in:-

(i) the conical flask (1mk)

……

……

(ii) the burning of gas x (1mk)

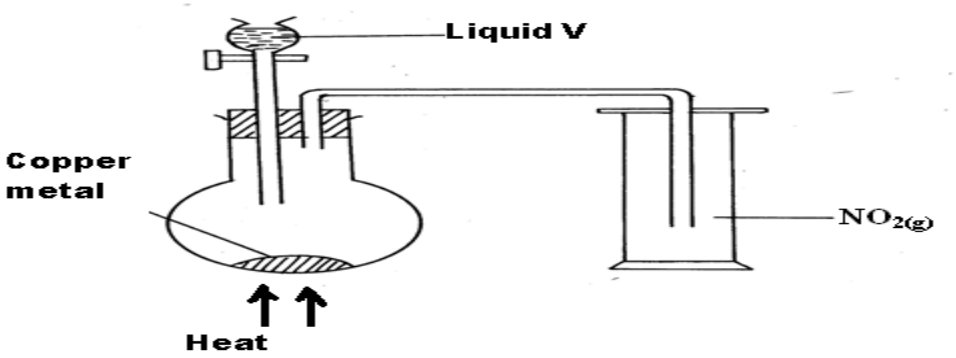
……

……

25. $20cm^3$ of a solution containing 4g per litre of Sdium hydroxide was neutralized by 8cm3 of dilute Sulphuric (VI) acid. Calculate the concentration of the acid im moles per litre.
(Na = 23, O = 16, H=1) (3mks)

26. Given that the hydration energies of $Ca^{2+}_{(g)}$ and $Cl^{-}_{(g)}$ are -1562KJ/Mole and -364KJ/Mole respectively. The heat of solution (ΔHsoln) for one Molw of $CaCl_2$ is -82.9 KJ/Mole. Determine the lattice energy for $CaCl_2$. (2mks)

27. The diagram below is used to prepare nitrogen (IV) oxide gas.



(a) Identify substance V (1mk)

……

(b) State and explain one precaution taken when carrying out the experiment. (2mks)

……

……

28. Electrode potentials for the half cells are shown below. Use the information to answer the questions that follow.

$Sn^{2+}_{(aq)} + 2e^- \longrightarrow Sn_{(s)}$; $E^\theta = -0.14V$

$Cu^{2+}_{(aq)} + 2e^- \longrightarrow Cu_{(s)}$; $E^\theta = -0.34V$

(a) Write the cell representation for the cell made up of two half cells. (1mk)

……

……

(b) Write the cell equation for the cell reaction. (1mk)

……

……

(c) Calculate the E^θ value for the cell. (1mk)

29. State the function of each of the following in the solvay process of production of Sodium Carbonate.

(a) Coke (1mk)

……

……

(b) Cold water on the carbonation. (1mk)

……

……

(c) Ammonia a generator. (1mk)

……

……

30. (a) A student in form three was given two gases C_2H_6 and C_2H_4. He added acidified Potassium Manganate (VII) to each solution. State the observations the student made. (2mks)

……

……

……

(b) State one use of C_2H_4. (1mk)

……

……

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233/2
CHEMISTRY
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233/2
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2	11	
3	13	
4	12	
5	11	
6	11	
7	10	
TOTAL SCORE	80	

1. (a) The table **below** shows the ions of elements **W, X,** Y, Z and their electron arrangement. The letters do not represent the actual symbols of the element.

Ion	Electron configuration
W^-	2,8,8
X^{2+}	**2,8,8**
Y^{3+}	**2,8**
Z^{2-}	2,8

(i) Which two elements belong to the same period? Give a reason. (2mks)

……

……

……

……

(ii) In which group of the periodic table does Y belong? (1mk)

……

……

(iii) Write the formula of the compound formed between W and X (1mk)

……

……

(iv) What type of bond is formed between W and X. Explain. (2mks)

……

……

……

……

(b) (i) What is a coordinate bond. (1mk)

……

……

(ii) Draw a dot (•) cross (X) diagram to show bonding in the Ammonium ion. NH_4^+ ion (N = 7, H = 1) (2mks)

c) Aluminum chloride and sodium chloride are both chlorides of period 3 elements.

Use this information to explain the following observations.

I A solution of $A1CI_3$ in water turns blue litmus paper red while that of sodium chloride does hot. (1 ½ mks)

……

……

II The melting point of sodium chloride (801°C) is higher than that of A1C13 (180°C). (1 ½ mks)

……

……

2. (a) Give the names of the following compounds.

(i) $CH_3CH_2CH_2CH_3$ (1 mk)

……

……

(ii) $CH_3CHCHCH_2CH_3$ (1 mk)

……

……

(b) Study the information in the table below ad answer the questions that follow.

No. of carbon atoms per molecule	**Relative molecular mass of hydrogen**
2	28
3	42
4	56

(i) Write the general formula of the hydrocarbons in the table. (1 mk)

……

……

(ii) Predict the relative molecular mass of the hydrocarbon with *5* carbon atoms. (1mk)

……

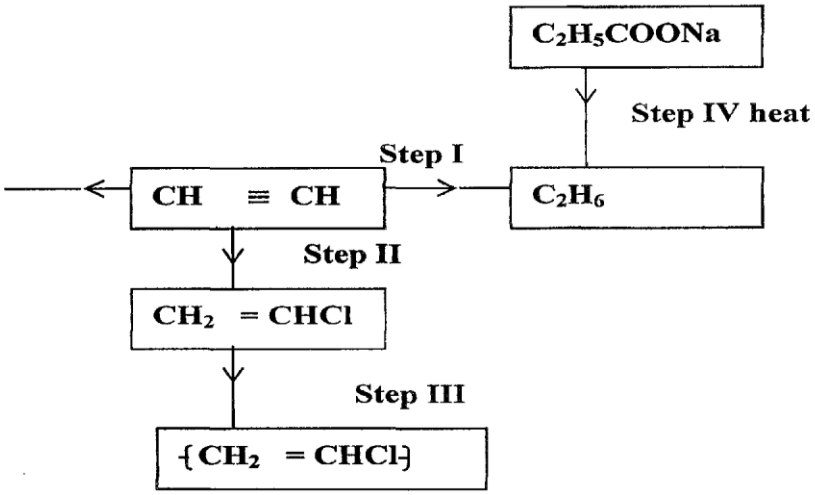
……

(iii) Determine the molecular formula of the hydrocarbon in (ii) and draw its structural formula. (2 mks)

……

……

(c) Study the scheme given below and answer questions that follow.



(i) Name the reagent used in

Step I (1 mk)

……

Step II (1 mk)

……

Step III (1 mk)

……

(ii) Write an equation for complete combustion of $CH \equiv CH$ (1 mk)

……

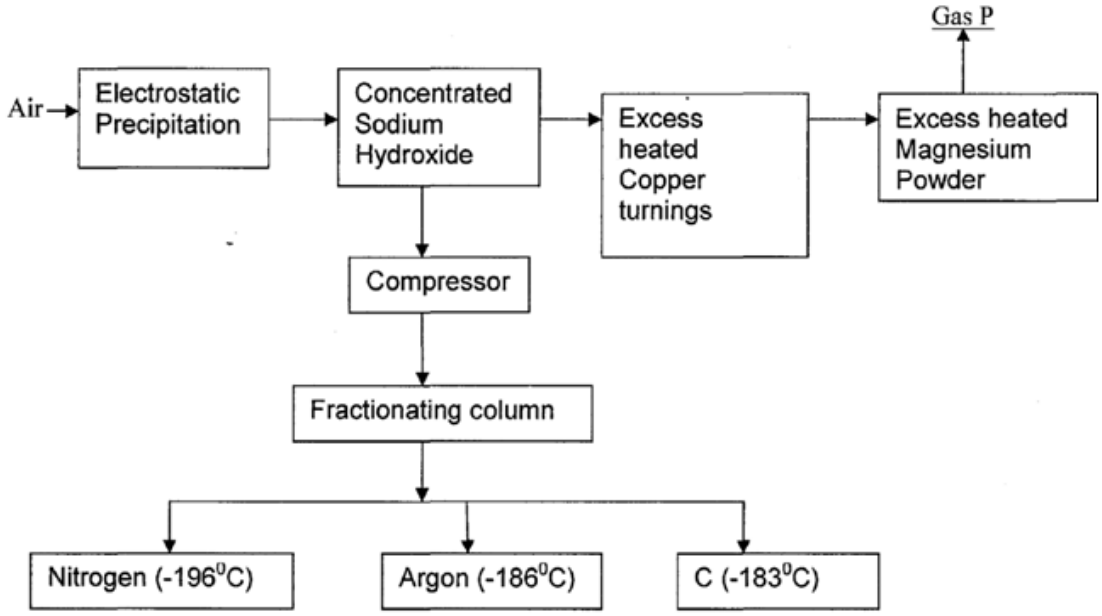
……

(iii) Explain **one** disadvantage of the continued use of items in step III. (1 mk)

……

……

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



(a) Name the major components of air. (2mks)

……

……

(b) Write an equation for the reaction which takes place in the chamber with:

(i) Concentrated sodium hydroxide. (1mk)

(ii) Excess heated copper turnings. (1mk)

(iii) Excess heated magnesium powder. (1mk)

(c) Name **one** gas which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2mks)

……

……

……

(d) Name the substance that was eliminated by electrostatic precipitation. (1mk)

……

……

(e) Name a reagent that can be used in place of concentrated sodium hydroxide. (1 mk)

……

……

(f) Name substance C. (lmk)

……

……

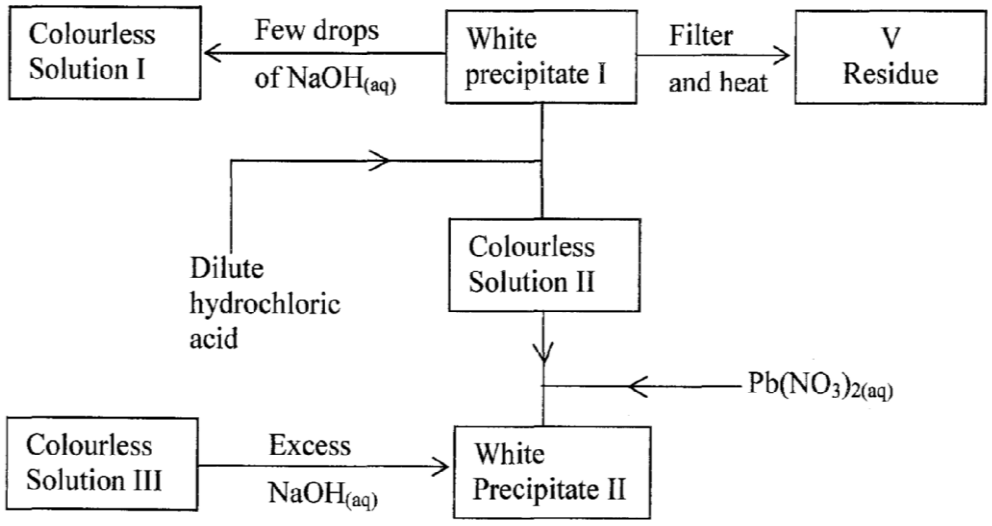
(g) State **three** uses of gas C. (3mks)

……

……

……

4. (a) Study the flow chart **below** and answer the questions that follow.



Residue V was yellow when hot and white when cold.

(i) Identify

I White precipitate **I.** (1mk)

……

II Solution **II.** (1mk)

……

III Residue V. (1mk)

……

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

……

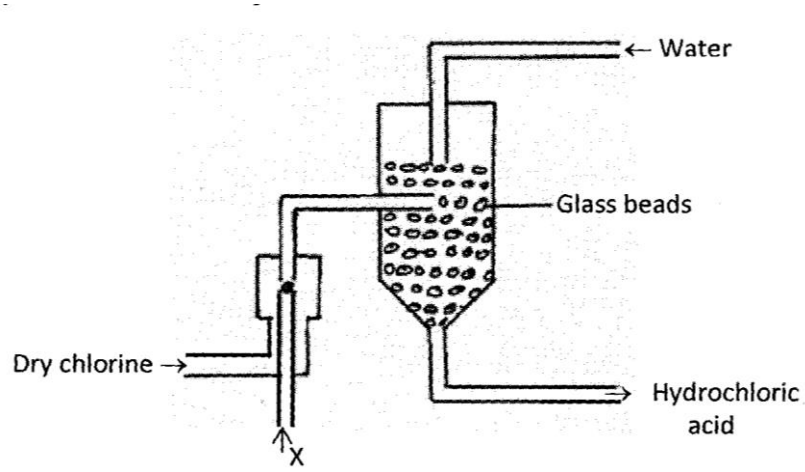
……

(iii) Write observations that would be made when ammonia solution is added drop wise till in excess to the colourless solution II (lmk)

……

……

(b) The diagram **below** represents a set-up for large scale manufacture of hydrochloric acid. Study it and answer the questions that follow:



(i) Name substance **X.** (1 mk)

……

……

(ii) What is the purpose of glass beads? (1 mk)

……

……

(iii) Give **one** source of substance X used in the above process. (lmk)

……

……

(iv) Give two use of hydrochloric acid. (2mks)

……

……

……

……

(c) The table below shows the ammeter readings obtained when two different electrolytes of the same concentration were tested.

Electrolyte	**Ammeter reading (Amps)**
Hydrochloric acid	4.0
Ethanoic acid	1.2

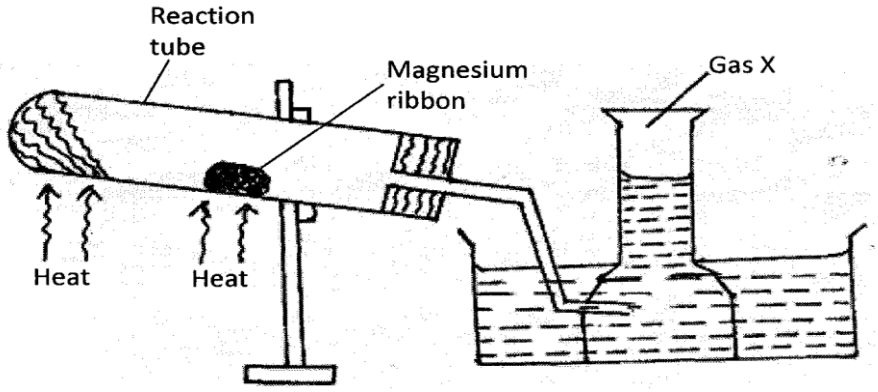
Why does Ethanoic acid give a lower ammeter reading? Explain your answer (2mks)

……

……

……

5. The set-up **below** was used to prepare and collect gas **X.** During the experiment cleaned magnesium ribbon was strongly heated before heating the wet glass wool.



(a) Name gas **X ……** **(1mk)**

(b) Why is magnesium ribbon cleaned before it is used? (1mk)

……

……

(c) State one observation that would be noted in the reaction tube. (1mk)

……

(d) Write the equation for the reaction in the reaction tube. (1mk)

……

……

(e) State one industrial use of the solid product formed in the reaction tube. (1mk)

……

(f) What precaution should be taken at the end of experiment? Explain. (2mks)

……

……

……

(g) At the end of the experiment 96.0cm^3 of gas X were collected at 10^{0}C and 1 atmosphere pressure. Mg = 24, M.G.V = 22.4, T = O^{0}c AT STP, p = 1 atmospere at stp).

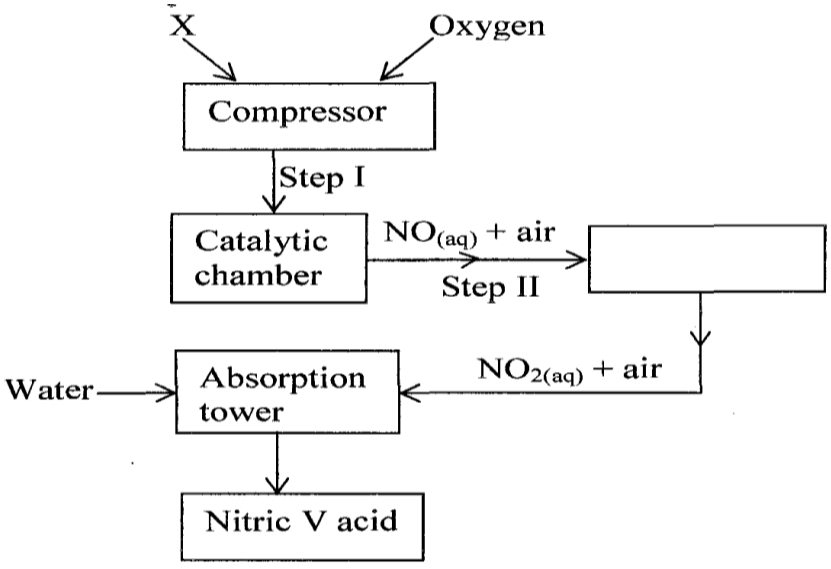
(i) Determine the volume gas X would occupy at s.t.p? (2mks)

……

……

(ii) Calculate the mass of magnesium ribbon used Mg = 24. (2 mks)

6. The flow chart **below** shows the large-scale manufacture of nitric (V) acid. Study it and answer the questions **below.**



(a) Name substance **X.** **(1mk)**

……

……

(b) Identify one source of **X** in this process. (1mk)

……

……

(c) Write a balanced equation for the reaction which take place.

(i) At Step II. (1mk)

……

……

(ii) In the absorption tower. (1mk)

……

……

(d) Name the catalyst used in this process. (1mk)

……

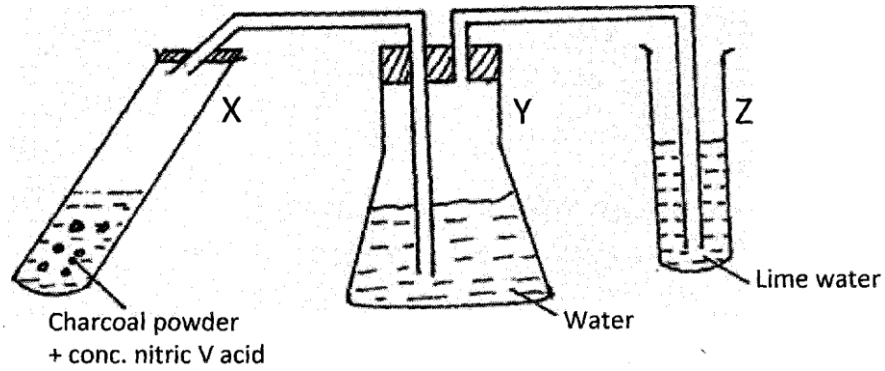
……

(e) Why is it not advisable to store nitric (V) acid in a transparent bottle? (1 mk)

……

……

(f) The apparatus **below** was arranged to investigate the properties of nitric (V) acid. Study the set-up and answer the questions that follow:



(i) Explain what would be observed when blue and red litmus paper is dropped into flask Y after the experiment. (2 marks)

……

……

(ii) Write an equation for the reaction in test tube **X** above. (1 mark)

……

……

(iii) What gaseous products would be expected if concentrated sulphuric (VI) acid was used in place of conc. nitric (V) acid? (1 mark)

……

……

7. (a) Explain the following observation, giving an equation where necessary. When a sample of tap water is boiled for some time, a white precipitate is formed. (lmk)

……

……

(b) A sample of hard water is *found* to contain 0.25g of calcium chloride and 0.24g of magnesium sulphate per litre.

(i) Describe how this sample of water is softened by using anhydrous sodium carbonate (2mks)

……

……

(ii) Calculate the mass of anhydrous sodium carbonate required to soften a litre of the water sample (Ca= 40, Mg = 24, Na = 23, 0 = 16, Cl = 35.5, S = 32 and C = 12) (3mks)

……

……

……

……

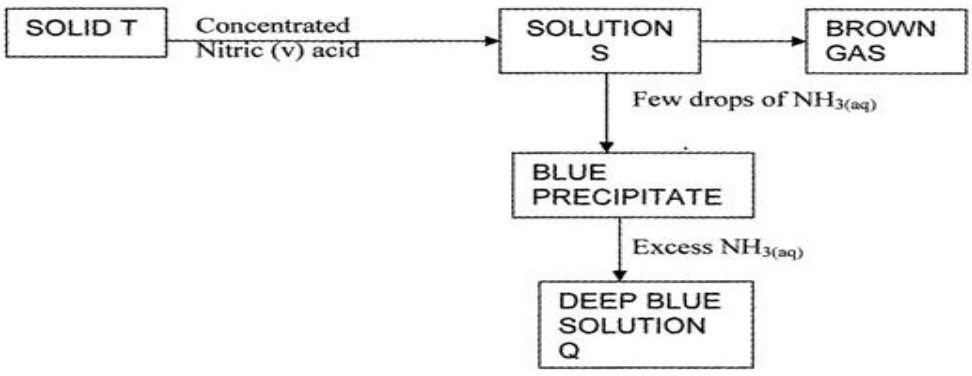
(iii) Give two reasons why it is necessary / important to soften tap water supplied for domestic . (2mks)

……

……

……

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



(i) Identify solid T (lmk)

……

……

(ii) Write an equation for the reaction between solid T and concentrated nitric (v) acid. (lmk)

……

……

(iii) Write an equation for the reaction that produces solution Q. (lmk)

……

……

NAME…… INDEX NO……. ……...…

SCHOOL……...……. CANDIDATE'S SIGNATURE…….

DATE……..

233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
MARCH/APRIL 2015
TIME: 2 ¼ HOURS

KABONDO DIVISION JOINT EVALUATION TEST

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

CHEMISTRY
PAPER 3
(PRACTICAL)

INSTRUCTIONS TO CANDIDATES

- Write **your name** and **Index number** in the spaces provided above.
- **Sign and** write the date of examination in the spaces provided.
- Answer **all** the questions in the spaces provided
- You are **not** allowed to start working with the apparatus for the first **15minutes** 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 that you may need
- All working **must** be clearly shown where necessary.
- Mathematical tables and silent non-programmable electronic calculators may be used.

FOR EXAMINERS USE ONLY

Question	Maximum Score	Candidate's Score
1	**16**	
2	**12**	
3	**12**	
TOTAL SCORE	**40**	

This paper consists of 8 printed pages .Candidates should check the questions to ensure that All the pages are printed as indicated and no questions are missing.

1. ***You are provided with:***

- 1 .5g of metal Carbonate A
- 75cm^3 of 1M hydrochloric acid labelled B
- *75cm^3* of 0.1M sodium hydroxide labelled C

You are required to determine the molar mass of the carbonate

Procedure I

Transfer carefully all solid **A** into **a** clean 250m1 volumetric flask. Add 50cm3 of the acid labelled **B** into the flask containing the carbonate. Wait until the reaction is complete (No more effervescence takes place)

Procedure II

When the reaction is complete, add 100cm^3 of distilled water to the contents of the flask and shake. Add more distilled water to top the solution to the mark. Label it as solution D. Pipette 25cm^3 of solution D into a 250cm^3 of conical flask and titrate with solution C using 1 to 2drops of phenolphthalein indicator. Record your results in table 1 below. Repeat this procedure to obtain accurate values:

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

Questions

(a) Find the moles of hydrochloric acid present in 50cm3 of solution B (lmk)

(b) Determine the average volume of solution **C** used (lmk)

(c) (i) Calculate the volume of sodium hydroxide that would react with 250cm^3 of the diluted acid (2mks)

(ii) Calculate the moles of sodium hydroxide solution **C** in the volume obtained in **c(i)** above. (1mk)

(d) Write down equation for the reaction between hydrochloric acid and sodium hydroxide (1mk)

(e) How many moles of hydrochloric acid are left after the reaction with the metal carbonate **A** (1mk)

(f) Calculate the moles of hydrochloric acid that reacted with l.5g of the metal Carbonate **A** (1mk)

(g) (i) Write down the ionic equation between carbonate and hydrochloric acid (1mk)

(ii) Calculate moles of carbonate **A** (1mk)

(iii) Calculate the molar mass of the carbonate **A** (1mk)

2. ***You are provided with:***

- 2.0M sulphuric (VI) acid solution, solution Z
- 0.42M glucose, solution ***X***

0.04M potassium manganate (VII) solution **Y**

You are required to determine the rate of reaction between aqueous glucose solution and acidified potassium manganate (VII) at different temperatures.

Procedure

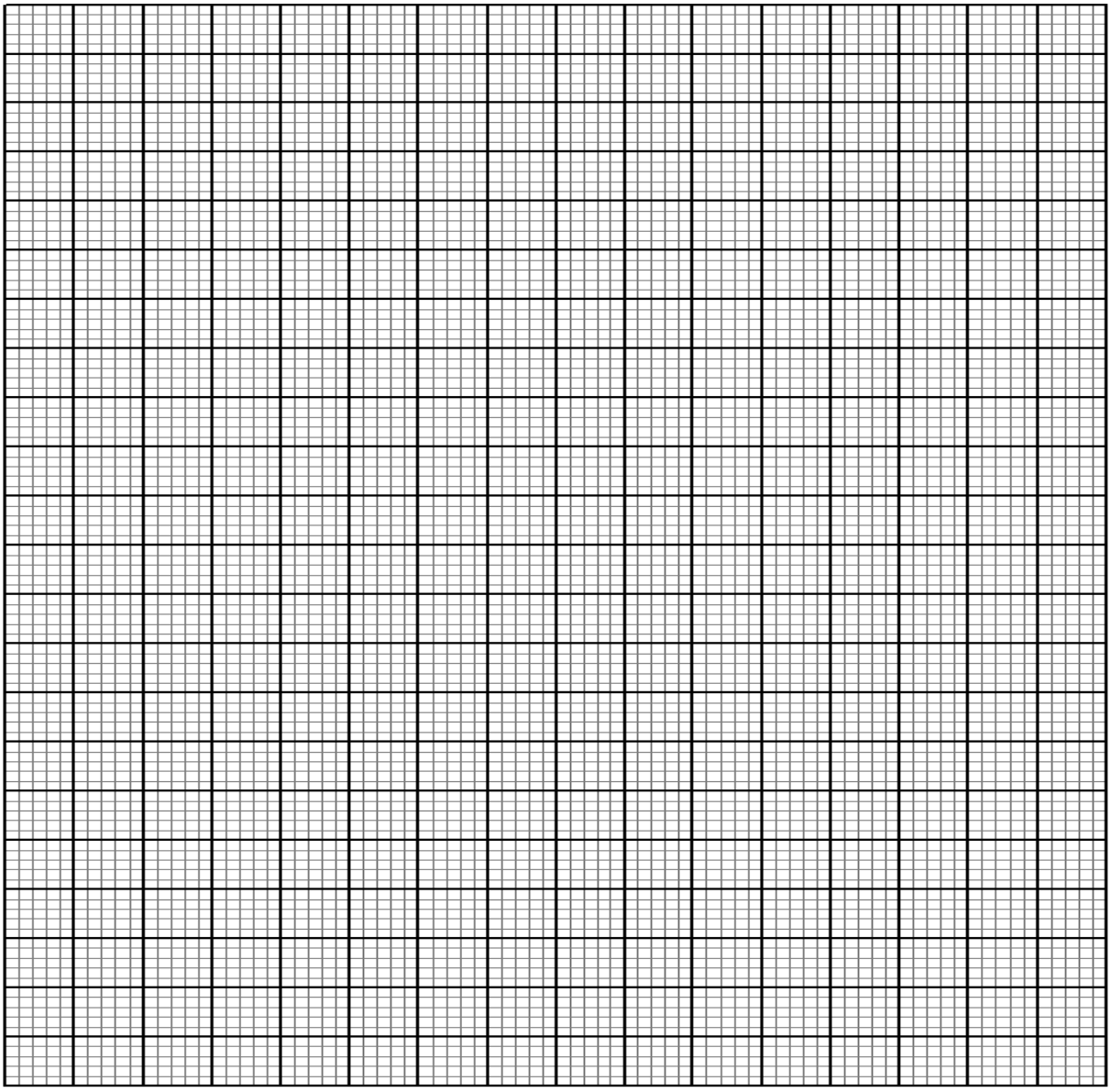
Place $1cm^3$ of solution **Y** into **a** conical flask. Using **a** $100cm^3$ measuring cylinder add $25cm^3$ of solution Z to the conical flask containing solution **Y.** Warm the mixture to about 70°C. Stop warming and allow the mixture to cool. When the temperature is exactly *65°C* add $7.5cm^3$ of solution ***X*** and start the stop watch immediately. Stir the mixture with a thermometer and measure the time taken for the colour of the mixture to change from purple to colourless. Record the time in table 2 below also record the temperature at which the mixture turn colourless. Clean the conical flask and repeat the procedure at temperature of 60°C, 55°C 50°C and 45°C instead of 65°C.

(a) Calculate $1/_{time}$ and complete the table

table 2 (6mks)

Temperature before mixing (°C)	65	60	55	50	45
Temperature when solution becomes colourless (°C)					
Time in seconds					
$1/_{time}(S^{-1})$					

(b) Plot a graph of $1/_{time}$ (y-axis) against the temperature at the point when the solution becomes colourless (3mks)



(c) From your graph, determine the time that the reaction would take if the temperature at which the solution becomes colourless is *52.5°C* (1mk)

(d) From your graph, determine the rate of reaction if the temperature at which the solution becomes colourless is 47°C (1mk)

(e) Explain the shape of your graph (1mk)

3. You are provided with mixture K. You are required to perform tests on the mixture in order to determine its composition. Record your observations and inferences in their spaces provided:

(a) Place a spatula of **K** on a white tile and observe its appearance: Observation

Observations	**Inferences**
(½ mk)	(½ mk)

(b) Place the remaining portion of K in a boiling tube and add 10cm3 of distilled water. Shake vigorously, filter and retain both the residue and filtrate

Observations	**Inferences**
(1mk)	(½ mk)

i) Divide the filtrate into 3 portions. To the first portion sodium hydroxide drop-wise until excess

Observations	**Inferences**
(½ mk)	(1mk)

(ii) Dip one end of a metallic spatula in 2M HC1 and heat it in a Bunsen burner flame for a few seconds and allow it to cool. Scoop a little of the solution from the second portion with the heated end of the spatula and place it as the hottest part of the non-luminous flame.

Observations	**Inferences**
(½ mk)	(½ mk)

(iii) To the third portion add *3-4* drops of dilute $HNO_{3\,(aq)}$ followed by 3-4 drops of $BaCl_{2\,(aq)}$

Observations	**Inferences**
(½ mk)	(½ mk)

(c) Scrap the residue from the filter paper and place a half of it in a clean dry test tube. Add about $3cm^3$ of 2M HNO_3. Test for any gas produced by use of calcium hydroxide solution on a glass rod. Preserve the solution for use in procedure (d) below: Observation

Observations	**Inferences**
(½ mk)	(½ mk)

(d) Add about $3cm^3$ of distilled water to the solution obtained in **(c)** above and shake to mix. Divide the solution into 3 portions

(i) To the first portion, add sodium hydroxide drop-wise until in excess

Observations	Inferences
(1mk)	(1mk)

(ii) To the second portion, add ammonia solution drop-wise until in excess

Observations	Inferences
(½ mk)	(½ mk)

(iii) To the third portion, add 2-3drops of potassium iodide solution

Observations	Inferences
(½ mk)	(½ mk)