NYAMBARIA HIGH SCHOOL

END OF YEAR EXAMS

Paving Way For Kenya Certificate of Secondary Education Success

Name …….. Admission no…….
Candidate's Signature…… Date…….

FORM 3
CHEMISTRY
PAPER 1
TIME: 2Hours

INSTRUCTIONS TO CANDIDATES

- ✓ **Write your name and admission 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 above**
- ✓ **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
1-29	**80**	

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1. A certain indicator was added to a solution .The pH value on the scale that was used with this indicator was read as 6.5

a) Name the indicator **(1mk)**

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b) State the nature of the solution **(1mk)**

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c) Why is the above indicator a better indicator than other common indicators used in the laboratories?

(1mk)

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2. Study the information below and answer the questions that follow.

Ions	Electronic arrangement	Ionic radius
Na^+	2.8	0.095
K^+	2.8.8	0.133
Mg^{2+}	2.8	0.065

Explain why the ionic radius of:

a) K^+ is greater than that of N^+. **(1mk)**

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b) Mg^+ is smaller than that of Na^+ **(1mk)**

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3. A fixed mass of a gas occupies $200cm^3$ at a temperature of 296 k and 740mmHg pressure. Determine the volume this gas would occupy at S.T.P. **(2mks)**

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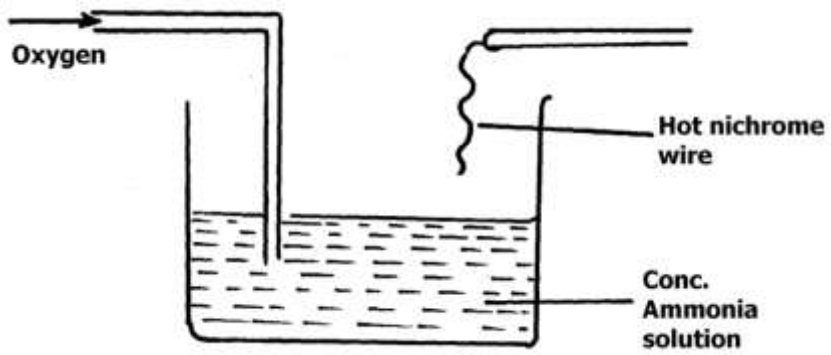
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4. The apparatus below was set – up to show the catalytic oxidation of ammonia. Study the diagram and answer the questions that follow.



a) State what would be observed in the experiment above. Explain. **(1mk)**

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b) Write the equation for the reaction that takes place during oxidation of ammonia. **(1mk)**

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5. A heavy metal **X** was dissolved in dilute nitric acid to form a solution of compound **X**$(NO_3)_2$. Portions of the resulting solution were treated as follows:

a. To the first portion a solution of dilute hydrochloric acid is added, where a white precipitate **(S)** is formed, which dissolves on warming.
b. The second portion is treated with two drops of 2M Sodium hydroxide solution where a white precipitate **T** is formed. The white precipitate dissolved in excess sodium hydroxide to form a colourless solution.
c. A solution of potassium iodide is added to the third portion where a yellow precipitate **(U)** is formed.
d. When the resulting solution is evaporated to dryness and heated strongly a yellow solid **(V)** is formed and a brown gas (**W)** and a colourless gas **(X)** are formed.

i. Identify the substances X, S, T, U, V, W **(3 marks)**

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ii. Write an ionic equation of the reaction that occurs in part (c) **(1 mark)**

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6a) Both sodium and aluminium are metals in period 3, yet sodium has a much lower melting point than aluminium. Explain **(2mks)**

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b) Explain why electrical conductivity of metals decrease with increase in temperature. **(2mks)**

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7). You are provided with water and the usual laboratory apparatus. Describe how you would fully separate solid lead (II) carbonate from a mixture of lead (II) Carbonate, iron fillings and sodium carbonate. **(3mks)**

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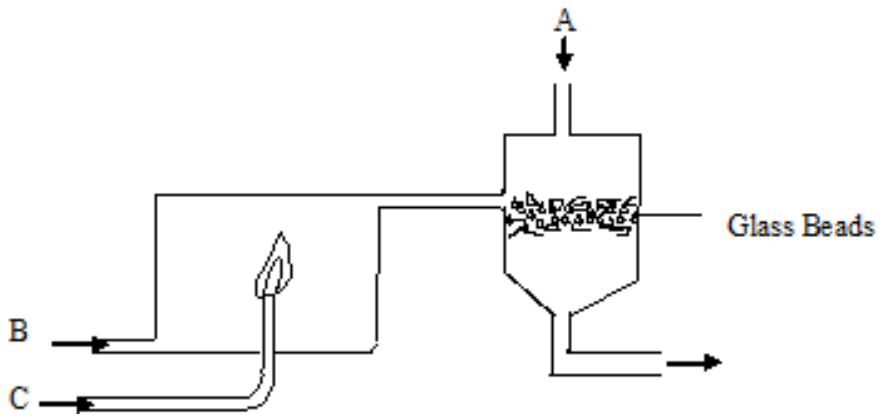
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8). The diagram below shows industrial manufacture of hydrochloric acid.



a) Name the substance: **(3mks)**

A.....

C.....

B.....

b) State the function of the glass beads in the above process. **(1mk)**

……

……

9.(a) State Gay Lussac's Law **(1mk)**

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(b) An initial volume of 100cm^3 of a mixture of propane (C_3H_8) gas and excess oxygen was ignited in an experiment. The final volume was cooled to room temperature and bubbled through aqueous sodium hydroxide. The final volume was reduced by 45cm^3.

(i)Write the equation of the reaction taking place when propane is burnt in excess oxygen **(1mk)**

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(ii) Determine the composition of the initial mixture **(1^1/$_2$mk)**

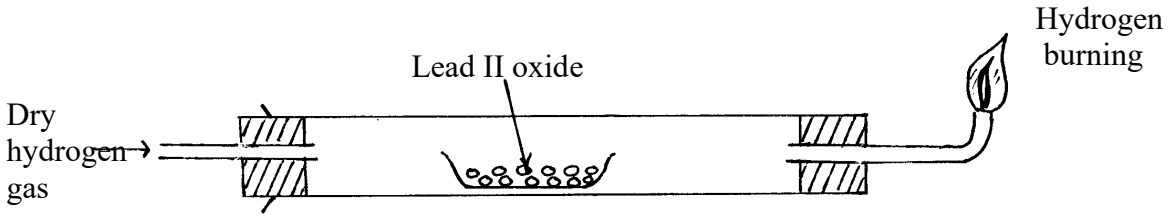
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(iii) Determine the volume of the residue gas **(1^1/$_2$mk)**

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10). Use the set-up below to answer the questions that follows.



a) Why is excess hydrogen burnt at the end of the tube. **(1mk)**

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b) What type of reaction is occurring in the combustion tube? **(1mk)**

……

c) State one use of hydrogen gas. **(1mk)**

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11). A green solid D was heated until there was no further change. The following observations were made.

(i) A colourless liquid condensed on the cooler parts of the test tube

(ii) A colourless gas which turns acidified potassium dichromate (VI) green was formed

(iii) Red-brown residue S was left

(a) Give the identity of solid D **(1mk)**

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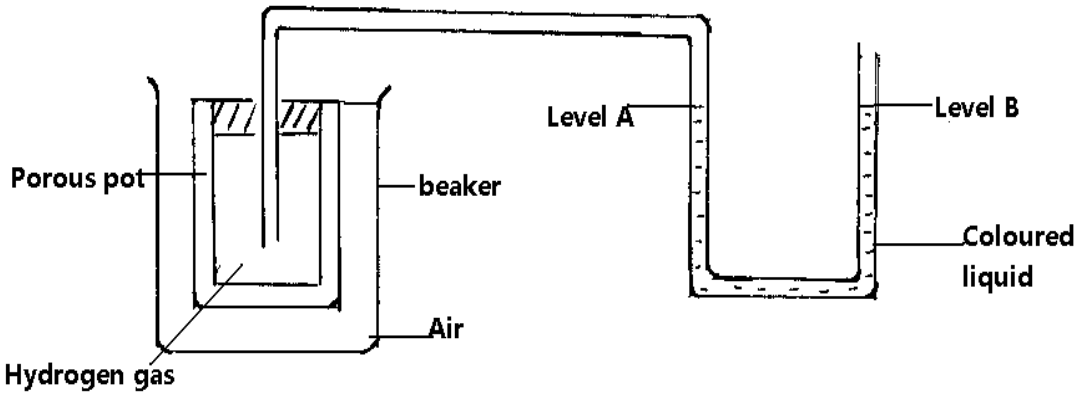
(b) How can you identify the colourless liquid **(1mk)**

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(c) Name the residue S **(1mk)**

……..

12).The set-up below was used to investigate the rate of diffusion of different gases.



(a) Explain why a coloured liquid is used in this experiment **(1mk)**

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(b) State and explain the observation made after 20 minutes **(2mks)**

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13). Element A has atomic mass 23 and element B has atomic mass 7 and also have 12 neutrons and 4 neutrons respectively.

(a) Write the electron arrangement of A and B **(1mk)**

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(b)Which element has higher ionization energy? Explain **(2mks)**

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14) .Element X is found in period 3 and group (IV) of the periodic table. It consists of two isotopes ^{28}X and ^{Q}X. A sample of X was found to consist of 90% of ^{28}X. If the relative atomic mass of X is 28.3, work out the number of neutrons in ^{Q}X. **(3mks)**

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15). Starting with copper metal, describe how a solid sample of copper (II) carbonate can be prepared. **(3mks)**

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16). Both anhydrous calcium chloride and copper (II) sulphate are put on separate petri dishes in the laboratory and left over night. Calcium chloride formed a solution while copper (II) sulphate became wet and did not form a solution.

i) Name the change undergone by

Anhydrous calcium chloride **(1mk)**

……

Anhydrous copper (II) sulphate **(1mk)**

……

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Name two other compounds that would undergo the same change as anhydrous calcium chloride. **(1mk)**

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17). Write down the property of concentrated sulphuric (VI) acid shown in the following reactions. **(2mks)**

(a) $H_2C_2O_4.2H_2O_{(S)} \xrightarrow{H_2SO_{4(l)}} 2H_2O_{(l)} + CO_{2(g)} + CO_{(g)}$

Property …….

(b) $C_{(S)} + 2H_2SO_{4(l)} \rightarrow CO_{2(g)} + 2H_2O_{(l)} + 2SO_{2(g)}$

Property …….

18). When a hydrated sample of calcium sulphate $CaSO_4.\mathbf{x}H_2O$ was heated until all the water was lost, the following data was recorded.

Mass of crucible	=	30.296g
Mass of crucible + hydrated salt	=	33.111g
Mass of crucible + anhydrous salt	=	32.781g

Determine the empirical formula of the hydrated salt. **(3mks)**
(Ca = 40, S = 32, O = 16, H = 1)

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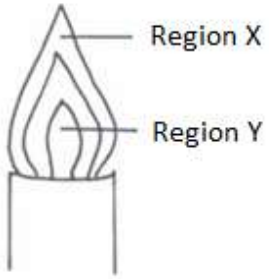
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19). The diagram below shows a non-luminous flame. Use it to answer the questions that follow:



Two wooden splints were placed across regions **X** and **Y** respectively. Draw labelled diagrams to show the effects observed on the wooden splint placed across each region.

(i) Region **X**. **(1½mks)**

(ii) Region **Y**. **(1½mks)**

20) Calculate the number of aluminium ions in a 400 cm^3 of 0.4M aluminium sulphate solution. ($L = 6.023 \times 10^{23}$) **(3mks)**

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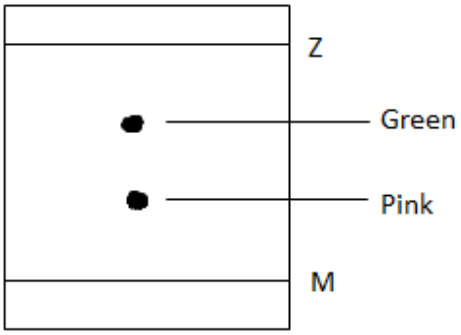
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21). The chromatogram below shows the constituents of a flower extract. Study it and answer the questions that follow.



a) Give a reason to explain the different positions of green and pink pigments. **(2mks)**

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b) What do the lines labeled Z and M represent? **(1mk)**

Z…… M……

22). Describe how you can distinguish a solution of sodium sulphite from a solution of sodium sulphate in the laboratory. **(2mks)**

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23). An aqueous ammonia was added to a solution of copper (II) sulphate dropwise until in excess. State the observations made when

(a) A few drops of aqueous ammonia were added. **(1mk)**

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(b) Excess aqueous ammonia was added. **(1mk)**

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(c) Write the formula of the substance formed in (b) above **(1mk)**

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24). During decomposition of hydrogen peroxide to form oxygen gas in the laboratory a catalyst is found necessary

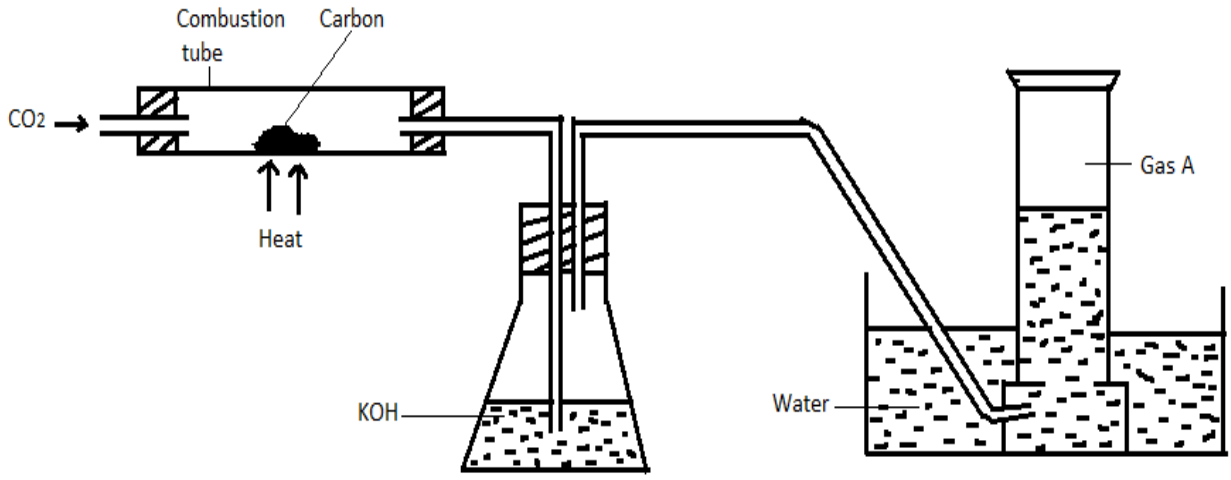
(i) Name the catalyst used **(1mk)**

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(ii) Write a balanced chemical equation for the changes that takes place **(1mk)**

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25). Carbon (IV) oxide was passed over heated charcoal and the resultant gas collected as in the Above



a) Name gas A **(1mk)**

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b) Write an equation for the reaction taking place in the combustion tube **(1mk)**

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c) What is the purpose of potassium hydroxide solution **(1mk)**

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26). When a piece of sodium metal is added to water a vigorous reaction takes place and a colourless gas is given off

a) Name the colourless gas **(1mk)**

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b) State and explain the observations made when both red and blue litmus papers are dropped into the water after the reaction **(2mks)**

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27). Apiece of burning magnesium was inserted in a gas jar of carbon (IV) oxide

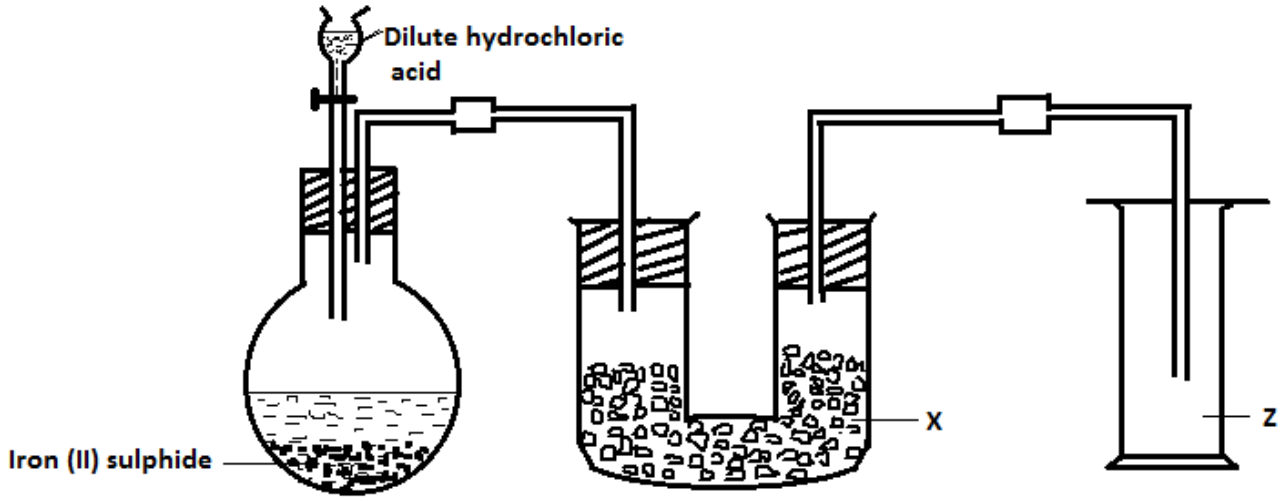
(a) State the observations made **(1mk)**

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(b) Write an equation for the reaction in (a) above **(1mk)**

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28. The diagram below shows a set up used for the preparation of gas Z.



(a) Write an equation for the reaction between iron (II) sulphide and dilute hydrochloric acid. **(1mk)**

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(b) What is the purpose of substance X **(1mk)**

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(c) Explain the method used to collect gas Z **(1mk)**