

FORM THREE CHAMPIONS APRIL EXAMS 2020

CHEMISTRY PAPER ONE

233/1

CHEMISTRY

PAPER 1

TIME:2HOURS

FORM THREE APRIL 2020

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

INSTRUCTIONS TO CANDIDATES:

Write your **name school** 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

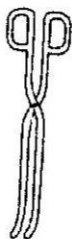
All working **MUST** be clearly shown where necessary.

For Examiner's Use Only

Question	Maximum score	Candidate's score
1-28	80	

This paper consists of 11 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

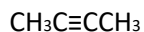
1. Identify and state the use of the apparatus represented below. (2 marks)



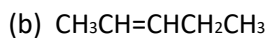
Name.....

Use.....

Give the systematic name of each of the compounds represented by the formulae below. (3 marks)



.....



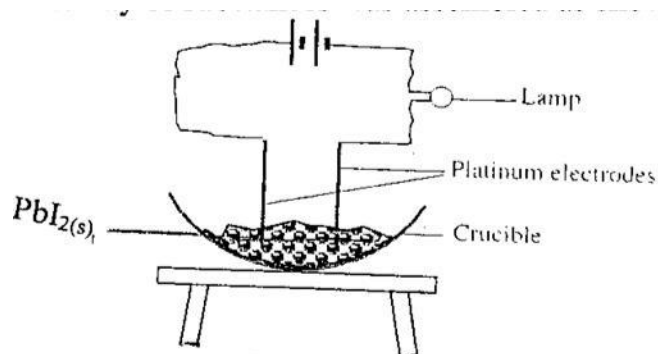
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3. A fixed mass of a gas occupies 105cm^3 at -14°C and 650mmHg . At what temperature will it have a volume of 15cm^3 if pressure is adjusted to 690mmHg ? (3marks)

4. a) Using dots (.) and crosses (x) to represent electrons, show the bonding in the compounds formed between magnesium and fluorine. (Atomic numbers; Mg= 12, F=9) (1 mark)

b) State one likely physical property of the compound formed between magnesium and fluorine in (a) above. (1 mark)

5. A set-up to investigate electrical conductivity of substances was assembled as shown below.



The bulb did not light.

(a) What was missing in the set-up? (1 mark)

.....

(b) The bulb lit when the omission was corrected. Explain. (2 marks)

.....

.....

An oxide of copper in a porcelain boat was reduced by a stream of hydrogen. The results obtained were as follows;

Mass of porcelain boat = 4.5g

Mass of boat + Oxide = 6.40g

Mass of boat + Copper = 6.02 g

i) Determine the empirical formula of the oxide. (3 marks)

ii) If the relative formula mass of the oxide is 80, determine its chemical formula.

(Cu = 64, O = 16)

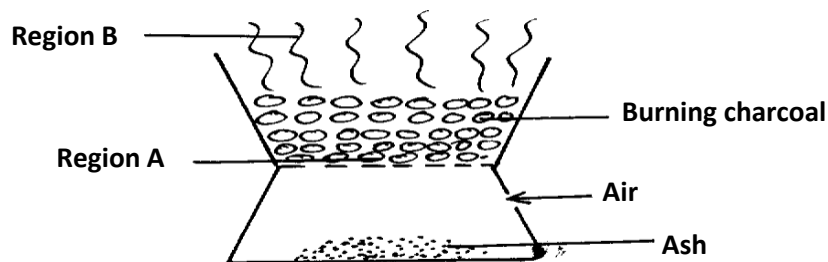
(1 mark)

7. Starting with copper metal, describe how to prepare solid copper (II) carbonate. (3 marks)

.....

.....

The diagram below shows a 'jiko' when in use. Study it and answer the questions that follow



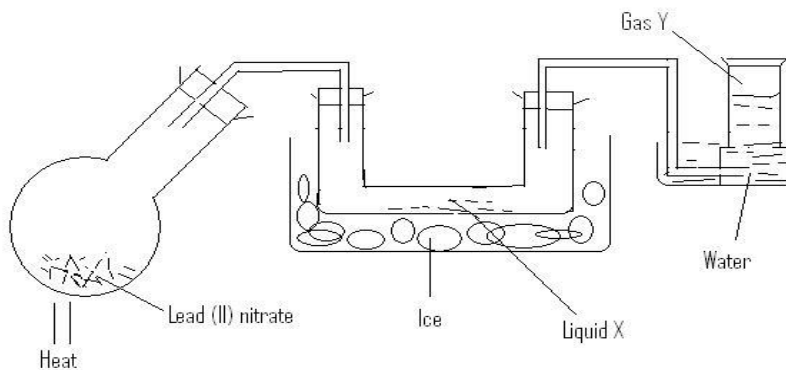
(a) Identify the gas formed at region B (1mk)

.....
.....

(b) State and explain the observation made at region B (2mks)

.....

9. A student set up the following experiment to study the effect of heat on lead (II) nitrate.



i) Identify liquid X (1 mark)

.....

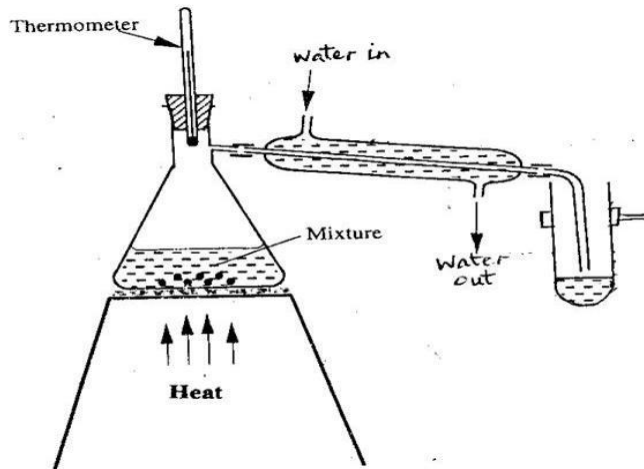
ii) Describe the test for gas Y. (1 mark)

.....

.....
iii) Write a balanced chemical equation for the reaction.

(1 mark)

10. The set-up represented below can be used to separate ethanol from its mixture with water.



(a) Identify an error in the set-up.

(1 mark)

.....
(b) Name this method of separation.

(1 mark)

.....
(c) What properties make it possible to separate ethanol from water by this method? (1 mark)

11. Describe how to distinguish between substances I and II .

(3 marks)

I. CH_3CH_3

II. HCCCH_3

.....
.....
.....

12. Element K has two isotopes ^{20}K and ^{22}K with relative abundance of 90% and 10% respectively.

a) What are isotopes? (1 mark)

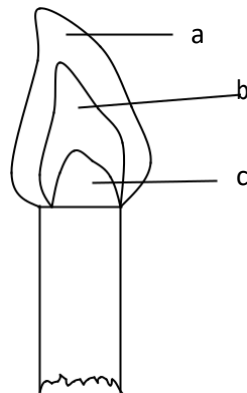
.....
.....

b) Determine the relative atomic mass of element K. (2 marks)

13. Give one application of calcium oxide. (1 mark)

.....
.....

14. Consider the diagram below.



Name the regions labeled a, b, c. (3 marks)

.....
.....
.....

15. State one use of:

a) Calcium nitrate

(1 mark)

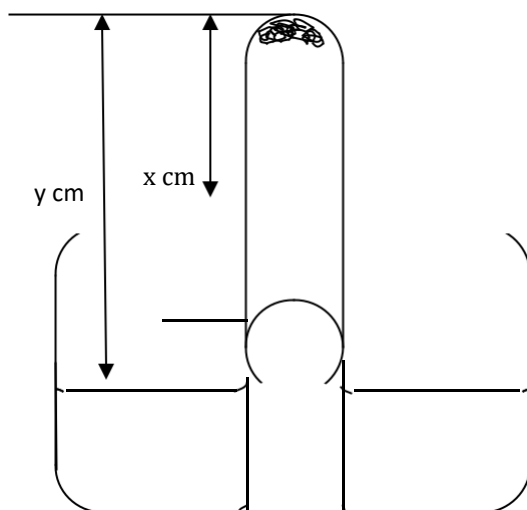
.....

b) Magnesium hydroxide

(1 mark)

.....

16.. Some moist iron wool was placed in a test tube and the tube was inverted and set up as shown below.



The apparatus was left for one week. The water level rose and iron wool turned red-brown.

(i) Write the chemical equation to show the rusting of iron. (1 mark)

.....

(ii) Write the expression for an approximate percentage. (1 mark)

.....
.....

State two similarities between rusting and combustion.

.....(1 mark)

.....(1 mk)

17. Sulphur burns in air to form a gaseous product.

i) What is the colour of the flame of burning sulphur? (1 mark)

.....

ii) Give an equation for the reaction that takes place when the gaseous product is bubbled through water. (1 mark)

.....

iii) State one importance of the product formed in 17(ii) above. (1 mark)

.....

The pH values of some solutions labeled E to I are given in the table **below**. Use the information to answer the questions that follow.

pH	14.0	1.0	8.0	6.5	7.0
Solution	E	F	G	H	I

Identify the solution with the highest concentration of hydroxide ions. Give a reason for your answer. (2 marks)

Which solution can be used as a remedy for acid indigestion in the stomach?(1 mark)

Four metals are labeled P, Q, R and S (not actual symbols). Metal P displaces metal S from its oxide but cannot displace R from its oxide. Q when mixed with the oxide of R and heated, a reaction occurs.

Arrange the metals in order of reactivity, starting with the most reactive. (2 marks)

.....

A certain element Y has atomic number 15 and mass number of 31.

Calculate the number of neutrons in the element.

(1mk)

(b) Write the electron arrangement of the ion formed by element Y. (1mk)

How would the atomic size of the above element compare with another atom X whose atomic number is 11 and mass number 23? Explain. (1mk)

21. The table below shows the first ionisation energies of elements P and Q.

Element	1 st Ionisation energy kJ/mole
P	494
Q	418

a) What do these values suggest about the reactivity of P compared to that of Q? Explain. (2 marks)

.....
.....
.....

a) State two factors that influence ionization energy. (1 mark)

.....
.....

22. Steam is passed over heated iron filings in a combustion tube.

(a) Name the products of this reaction.

(2 mark)

.....
.....

(b) Write an equation for the reaction that occurs.

(1 mark)

..... Diamond and graphite are
allotropes of carbon.

(i) What are allotropes?

(1mk)

.....

.....In terms of structure and bonding
explain why diamond is used in drilling through hard rocks while graphite is a
lubricant (2mks)

.....
.....

24. 30cm^3 of 0.5M hydrochloric acid was used to neutralize 25cm^3 of sodium hydroxide solution.
Determine the concentration of sodium hydroxide in grams per litre. (3 marks)

(H=1, O=16, Na= 23)

The table below gives some information about the physical properties of four substances which are represented by letters. **L M N** and **K**.

Substance	Melting point	Heat of vaporization	Electrical Conductivity	
			Solid	molten

L	High	High	Poor	Poor
M	High	High	Good	Good
N	High	High	Poor	Good
K	Low	Low	Poor	Poor

Select with reasons an element which is likely to be:

(i) Copper metal (1mk)

.....

.....Silicon (iv) oxide

(1mk)

.....

.....Potassium iodide

(1mk)

.....

26. a) Write balanced chemical equations for reactions between chlorine and; (2 marks)

i) Concentrated sodium hydroxide

.....

ii) Dilute sodium hydroxide.

.....

b) State one observation made when a gas jar of moist hydrogen sulphide is inverted over a gas jar of dry chlorine gas. (1 mark)

.....

27.a) Hydrogen sulphide gas is bubbled through bromine water.

i) Give two observations made. (1 mark)

.....
.....

ii) Write an equation for the reaction that takes place. (1 mark)

.....

b) State the test for hydrogen sulphide gas. (1 mark)

.....
.....

28.(a) State Gay-Lussac's law. (1 mark)

.....
.....

When 100cm^3 of a gaseous hydrocarbon (C_xH_y) burns in 300cm^3 of oxygen, 200cm^3 of carbon(IV)oxide and 200cm^3 of steam are formed.

Deduce the formula of the hydrocarbon. (2 marks)

FORM THREE CHAMPIONS APRIL EXAMS 2020

CHEMISTRY PAPER TWO

233/2

CHEMISTRY

PAPER 2

TIME:2HOURS

FORM THREE APRIL 2020

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

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.

All working **must** be clearly shown where necessary.

Mathematical tables and electronic calculators can be used.

For Examiners Use Only

Question	Maximum score	Candidate's score
1	13	
2	11	
3	12	
4	10	

5	11	
6	11	
7	12	
Total	80	

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The table below shows the elements in the third period, the oxides of the third period and their properties. The letters are not the actual symbols of the elements. Study the information and answer

the questions that follow:

Element	Atomic number	Atomic radius(nm)	Oxide	State at RT	oxide melting point °C
M	11	0.191	M ₂ O	Solid	1132
N	.....	0.160	NO	Solid	2852
P	13	0.130	.....	Solid	2072
Q	14	0.118	QO ₂	.....	1610
R	.....	0.110	.....	Solid	580
S	16	0.102	SO ₂	.....	-75
T	17	0.099	TO ₂	Gas	-60
V	18	0.095	X	X	X

(a) (i) Complete the table above
(3mks)

(ii) Explain the trend in the atomic radius across the period

(2mks)

.....
.....

(iii) Explain why the oxide of element **V** does not exist

(1mk)

.....
.....

(b) Name the type of structure and bond in the following oxide

(2mks)

Oxide	Structure	Bond type
NO		
TO ₂		

ii) Using dots and crosses to represent electrons. Show the bonding in the oxide, **QO₂** (2mks)

(c) (i) Explain why elements **P** conducts electricity but **T** does not

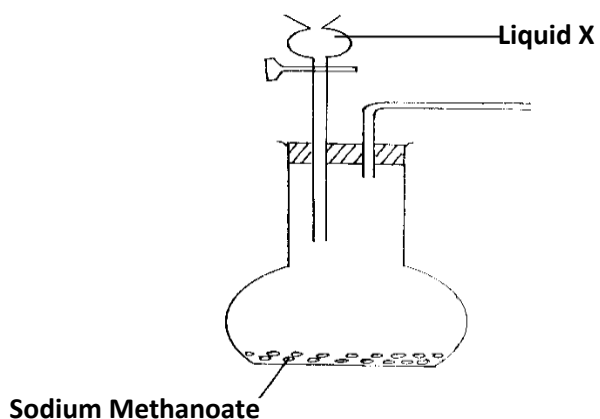
(1mk)

.....
.....

(ii) The oxide of **P** reacts both acids and alkalis. Give the name of this kind of oxide (1mk)

.....

The set up below was to be used to prepare carbon (II) oxide in the laboratory. Use it to answer the questions that follow.



(a) Complete it in order to collect the gas.

(3mks)

.....

.....

Which is the appropriate identity of the liquid **X**?

(1mk)

.....

.....

(c) Explain how you can chemically distinguish unlabelled gases of carbon (II) oxide and carbon (IV)

Oxide respectively.

(2mks)

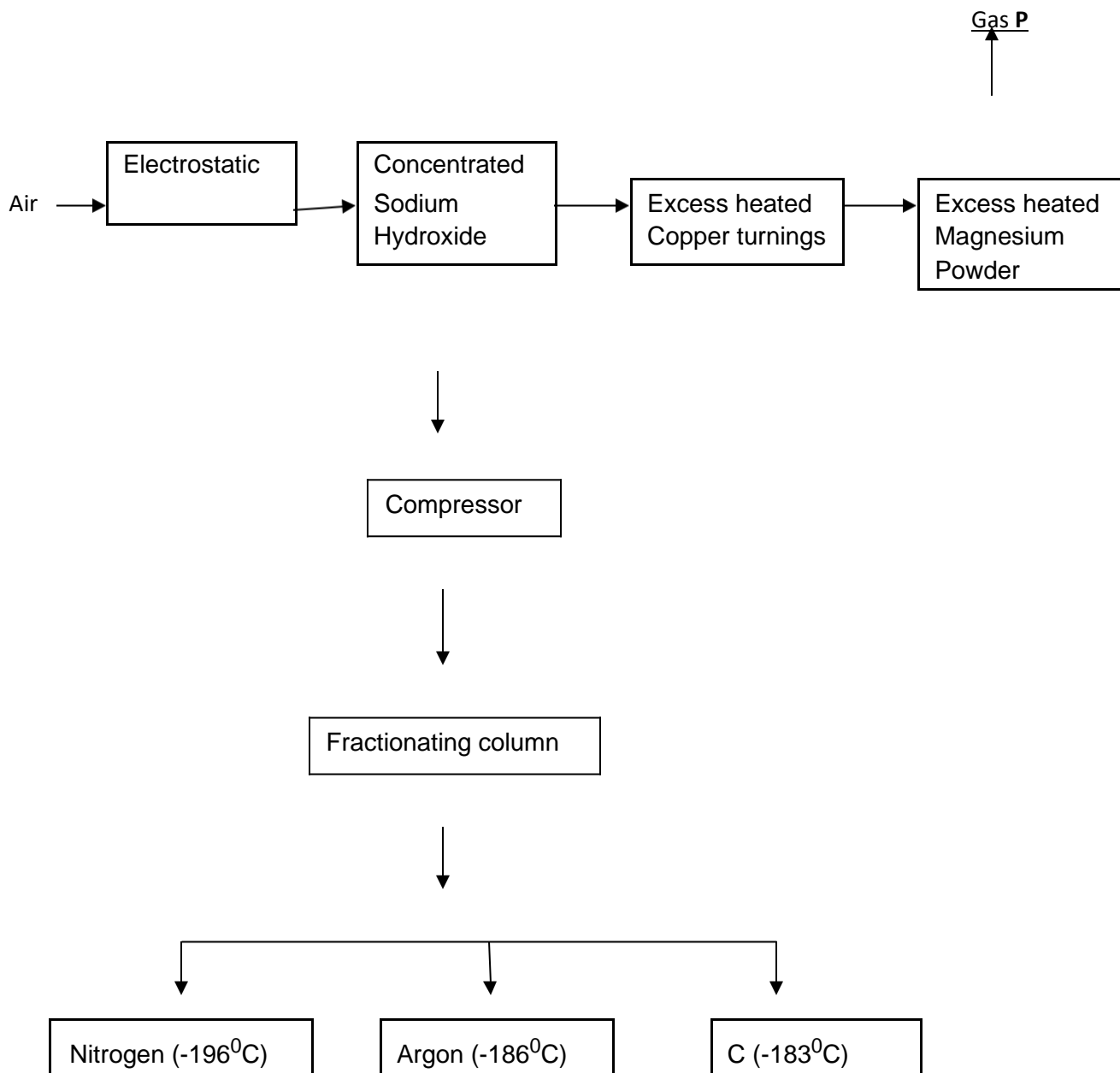
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Using dot (●) and crosses (×) draw the structure of Carbon (IV) oxide.

(2mks)

Calculate the volume of oxygen that will be required for complete combustion of 100cm³ of carbon (II) oxide.

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



Name the major components of air.

(2mks)

.....
.....

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

Concentrated sodium hydroxide.

(1mk)

.....
.....

(ii) Excess heated copper turnings.

(1mk)

.....
.....

Excess heated magnesium powder.

(1mk)

.....
.....

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.

(1mk)

.....

Name substance C.

(1mk)

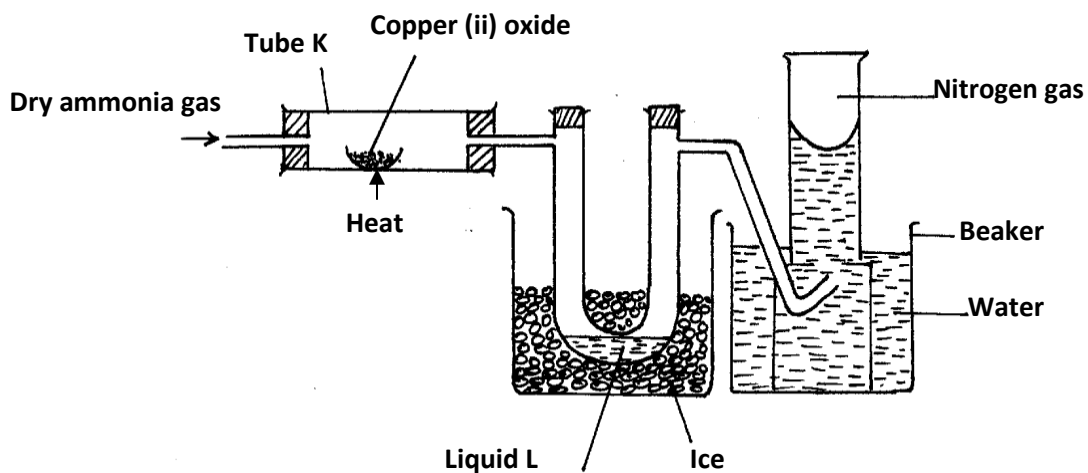
.....

State **two** uses of gas C.

(1mk)

.....

The diagram below shows the set up that can be used to obtain nitrogen gas in an experiment carried out by form 3 of Inaya Sec school.



(i) How is the ammonia gas from this process dried?

(1mk)

.....

(ii) Name liquid L?

(1mk)
.....

(iii) What observation would be made at tube K at the end of the experiment? (1mk)

.....
.....

(iv) Write an equation for the reaction that took place in the tube K. (1mk)

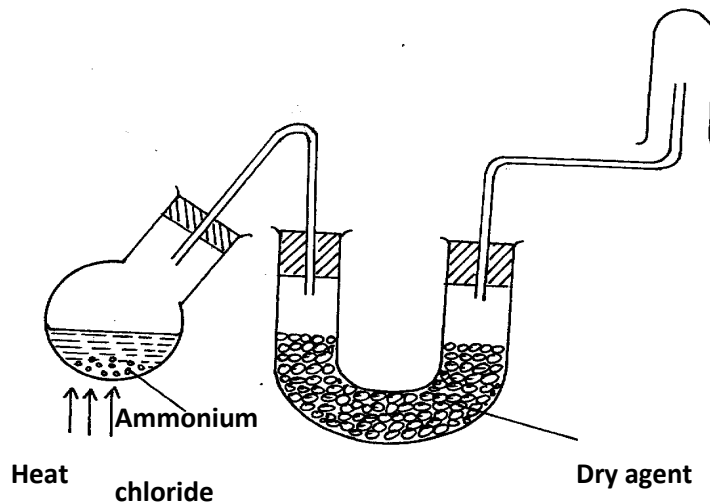
.....
.....

At the end of the experiment the pH of water in the beaker was found to be 10.0. Explain.

(1mk)

.....
.....

(b) A student set up the following apparatus for preparing jars of dry ammonia but found that no gas collected in the gas jars, although a reaction occurred in the flask.



(i) Explain why there was no gas collected?

(1mk)

.....

The following alterations were made

Using a mixture of ammonium chloride and an alkali, Ca(OH)_2 instead of NH_4Cl

The flask was made to slope with neck downward.

State the reason for each alteration above

(2mks)

.....

.....

.....

(iii) When ammonia gas is passed into a jar of hydrogen chloride gas, white fumes are formed.

Explain with an aid of equation of reaction.

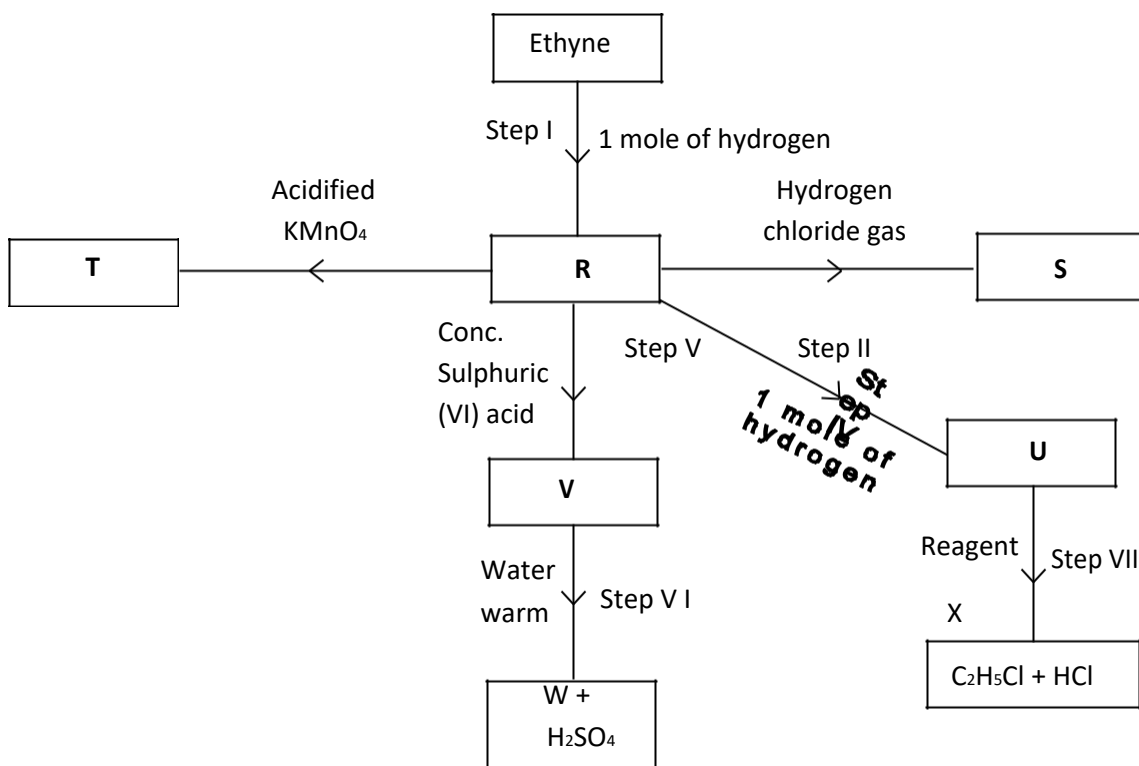
(2mks)

.....

Ammonia decomposes if sparked electrically, what would you expect to be the products of the decomposition?

(1mk)

Study the flow diagram **below** and answer the questions that follow.



Name substances. (3 marks)

.....

.....

.....

.....

.....

.....

Name reagent **X** and the condition required for the reaction in Step **VII** to occur. (2 marks)

.....

.....

Name the type of reaction that occurred in

Step I(1mrk)

Step VII(1mark)

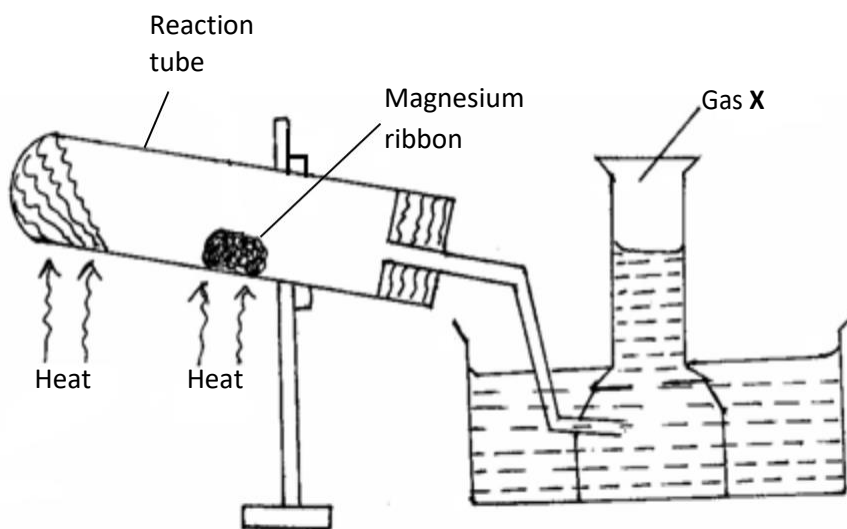
Name the reaction that occurred in

Step II (1 mark)

Step IV (1 mark)

Draw and name **two** structural isomers of C_4H_{10} .
(2 marks)

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.



Name gas X
(1mrk)

.....

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

.....

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

.....

.....

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

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

.....

.....

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

.....

.....

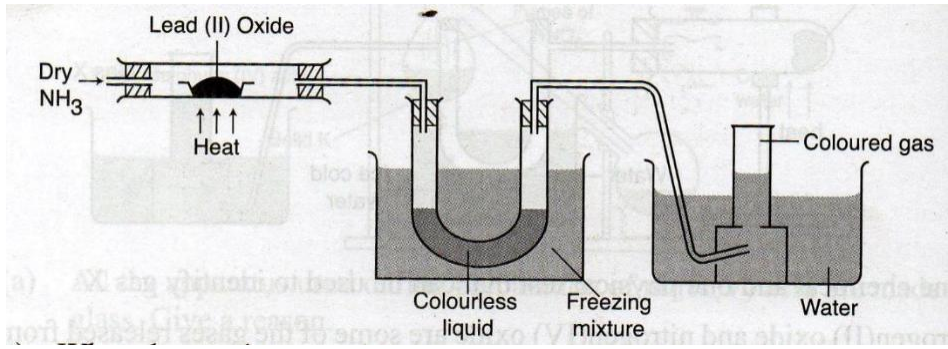
At the end of the experiment 96.0cm³ of gas X were collected at 10°C and 1 atmosphere pressure. (Mg = 24, M.G.V = 22.4, T = 0°C at stp, P = 1 atmosphere at stp).

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

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

.....
.....

(a) Dry ammonia gas is passed over heated lead (II) oxide in a combustion tube as shown in the diagram.



(i) What observation would be made in the combustion tube? Explain. (2mks)

.....
.....

(ii) Write the reaction taking place in the combustion tube. (2mks)

.....
.....

Outline a chemical test you would use to identify the colourless liquid collected in the u-tube. (2mks)

.....

(iv) Name the colourless gas. (1mk)

.....

(v) Name one industrial use of colourless gas. (1mk)

.....

(vi) State one industrial use of ammonia. (1mk)

.....

(b) When compound x is heated,a red-brown gas is evolved and a yellow residue is left on cooling.Name

(i) The red-brown gas (1mrk)

.....

(ii) Name the chemical test for gas (i) above (1mrk)

.....

(iii) The ions present in the residue. (1mrk)

.....

(iv) Compound X. (1mk)

FORM THREE CHAMPIONS APRIL EXAMS 2020

CHEMISTRY PAPER THREE

233/3

CHEMISTRY

PAPER 3

THEORY

TIME: 2 HOURS

FORM THREE APRIL 2020

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

INSTRUCTIONS TO THE CANDIDATES

Write your *name school and index number in the spaces provided*

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 apparatus for the first 15 minutes of the 2 ¼ hrs allowed for this paper. This time is enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need

Mathematical tables and electronic calculators may be used.

*All working **MUST** be clearly shown where necessary.*

Mathematical tables and electronic calculator may be used.

FOR EXAMINERS USE ONLY

QUESTION	MAX. SCORE	CANDIDATE'S SCORE
1	20	
2	14	
	06	
Total Score	40	

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

You are provided with:

Solid A : 0.5g of metal carbonate M_2CO_3

Solution B: 0.2M sulphuric (vi) acid solution

Solution C: sodium hydroxide solution

You are required to determine:

The relative formula mass of M_2CO_3

Relative atomic mass of M

PROCEDURE I

Fill the burette with solution B. Pipette 25cm^3 of solution C and transfer into a conical flask. Add two drops of phenolphthalein indicator. Titrate against solution B from the burette. Repeat two more times and record your results in table 1.

Table 1

Titre	i	ii	iii
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution B used (cm^3)			

(4mks)

Determine the average volume of solution B used.

(1mk)

Calculate the moles of sulphuric (vi) acid that reacted.

(1mk)

Calculate the concentration of sodium hydroxide solution C.

(3mks)

PROCEDURE II

Using a 100ml measuring cylinder, measure 100cm^3 of solution B and transfer into a clean conical flask. Add the whole of solid A to the solution B in the conical flask. Shake to dissolve solid A until no more effervescence occurs. Label the resultant solution as D.

Pipette 25cm^3 of solution C and transfer into a conical flask and add two drops of phenolphthalein indicator. Fill the burette with solution D. titrate solution C against solution D from the burette. Repeat two more times and record your results in table II.

Table II

Titre	i	ii	iii
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution D used (cm^3)			

(
4mks)

Calculate:

The average volume of solution D used.

(1mk)

The moles of solution **D** in d (i) above.
(2mks)

The moles of H_2SO_4 in 100cm^3 of solution
D. (2mks)

The moles of in H_2SO_4 100cm^3 of solution
B. (1mk)

The number of moles of the acid (**solution B**) that reacted with the carbonate.
(1mk)

The moles of carbonate in 0.5g of the carbonate.
(2mks)

Calculate;

The relative formula mass of the carbonate.
(2mks)

The relative atomic mass of
M. (1mk)

You are provided with solid **Q**. carry out the tests below. You should identify any gases evolved. Record your observations and inferences in the table below.

Place half of solid **Q** in a test tube and heat strongly.

observation	inference
(2mks)	(1mk)

Place the remaining solid **Q** in a test tube and add 3cm³ of distilled water.
Divide the resultant mixture into two portions

observation	inference
(1mk)	(½ mk)

To the first portion add aqueous ammonia drop wise till in excess.

observation	inference
(1mk)	(1mk)

To the second portion add barium nitrate solution followed by dilute nitric acid

observation	inference
-------------	-----------

(2mks)	(1mk)
--------	-------

You are provided with solid P. carry out the tests below and record your observations and inferences in the table below.

- a) Place half of solid P in a clean spatula and ignite.

observation	inference
(1 ¹ / ₂ mks)	(1 ¹ / ₂ mk)

Transfer the remaining solid P into a test tube and add about 4 cm³ of distilled water and shake. Divide the resultant mixture into two portions.

To the first portion add two drops of acidified potassium manganate (vii)

observation	inference
(1mk)	(1 ¹ / ₂ mk)

To the second portion add two drops of acidified potassium dichromate (vi)

observation	inference
(1mk)	(1 ¹ / ₂ mk)

