Name…….. Adm No: ……

233/1 Candidate's Signature ……

CHEMISTRY Date: ……

PAPER 1,THEORY

SEPTEMBER, 2021

TIME: 2 HOURS

MOMALICHE FORM IV

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

233/1

Chemistry

Paper 1

2 Hours

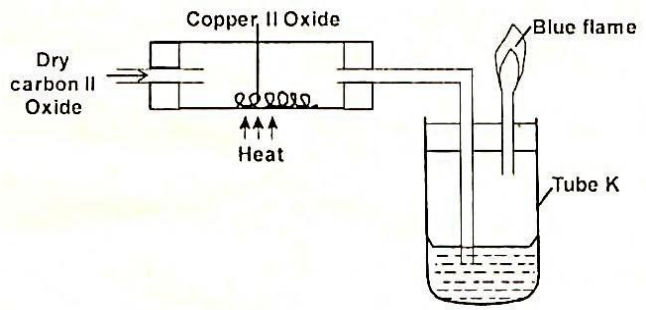
INSTRUCTIONS TO CANDIDATES

- Write your **name** and **admission number** in the spaces provided above
- **Sign** and write the **date** of examination in the spaces provided.
- Answer ***all*** the questions in the spaces provided.
- Mathematical table and silent electronic calculators may be used.
- All working **must** be clearly shown where necessary.

FOR EXAMINERS USE ONLY

Question	Maximum score	Candidate's score
1-27	80	

1. The apparatus shown below was used to investigate the effect of carbon(II) oxide on copper(II)oxide.



a) State the observation that was made in the combustion tube by the end of the experiment.

(1 mark)

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b) Write an equation for the reaction that took place in the combustion tube. (1mark)

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c) Why is it necessary to burn gas coming out of tubeK? (1mark)

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2.Name the process which takes place when:

(i) Iodine changes directly from solid to gas
(1mk)

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(ii) The process of hardening rubber by heating it together with sulphur(1mk)

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(iii) White sugar changes to black solid when mixed with excess concentrated sulphuric (VI) acid

(1mk)

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3.A student was asked to prepare dry lead (II) sulphate salt using the following reagents; dilute nitric (V) acid, lead (II) carbonate and magnesiumsulphate solution. Describe how the salt can be prepared.(3 mks

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4.In a reaction $20cm^3$ of 0.1M sodium carbonate completely reacted with $12.5cm^3$ of dilute sulphuric (VI) acid. Find the concentration of suphuric (VI) acid in moles per litres. (3mks)

5. Whencalcium carbonate is placed in a solution of hydrogen chloride gas in water, there is effervescence while there is no effervescence when placed ina solution of hydrogen chloride gas dissolved in methylbenzene .Explain this observation
(2mk)

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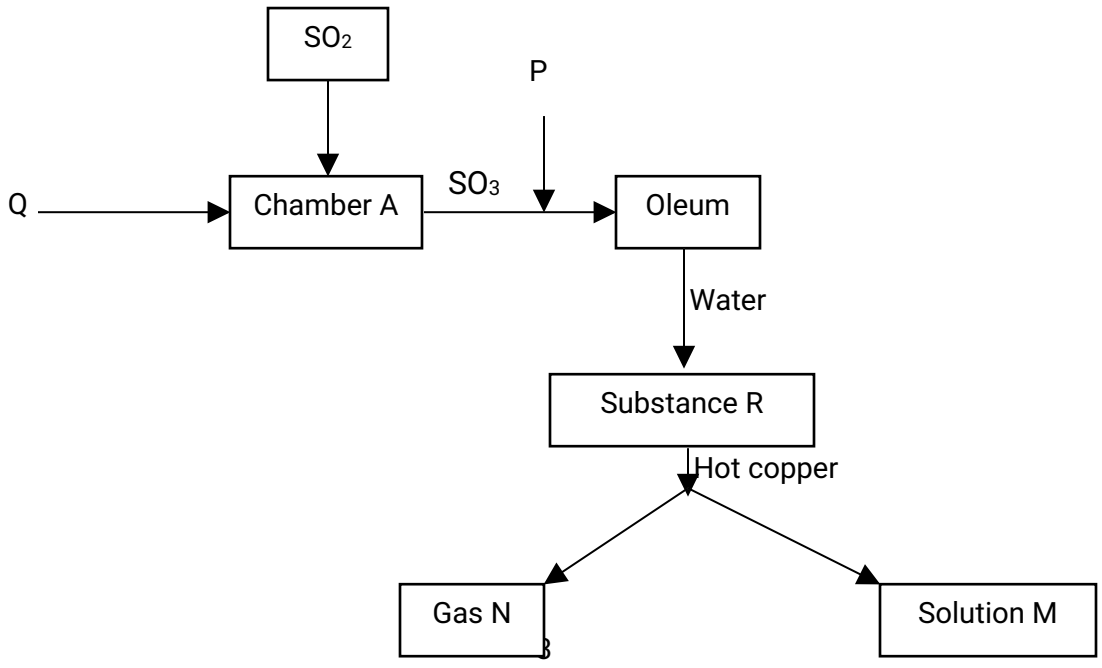
6.Study the chart below for the Contact process and other extensions.



a) Identify the substances: (2 mks)

Q ……

P ……

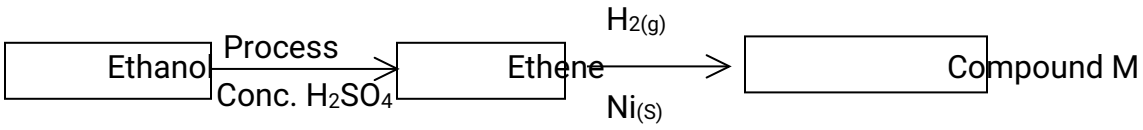
R……

N……

b) Name solution M and state its colour. (1 mk)

Name ……
Colour……

7. Use the reaction scheme below to answer the questions that follow.



a) Give one necessary condition for process P (1 mark) ……

b) Name the Process P. ($^1/_2$ mark)

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(c) Draw and name the structure of compound M ($1^1/_2$ mark)

8. Use the bond energies given below to answer the questions that follow.

Bond	Bong energy (KJ /mole)
C – H	414
Cl – Cl	244
C – Cl	326
H – Cl	431

a) Calculate the heat change for the reaction. (3mks)

$CH_{4\,(g)} + Cl_{2\,(g)} \longrightarrow CH_3Cl_{\,(g)} + HCl_{(g)}$

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b) State the condition necessary for the above reaction to occur. (1 mk)

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9. Using dots (.) and crosses (x) to represent electrons, show:

(a)bonding in sodium chloride (1 mk)

(b) the structure of an ion illustrated by the formula $^{27}_{13}Al^{3+}$ (1 mk)

10.On complete combustion of a hydrocarbon; 1.257g of carbon (IV) oxide and 0.514g of water were produced. If the relative molecular mass of the hydrocarbon is 84, determine the molecular formula of the hydrocarbon (*C=12, H=1,O=16)*

(4mks)

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11. Below is a diagram of set-up of apparatus that is used to investigate the effect of electric current on a binary electrolyte, lead (II) bromide.

i) Explain what is meant by a 'binary electrolyte'. (1mark)

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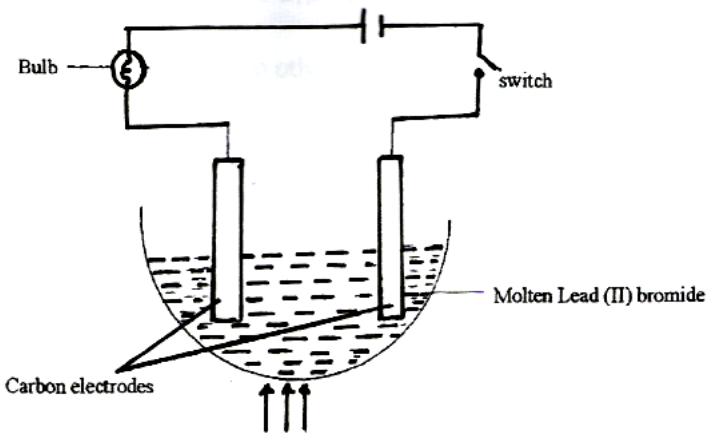

ii) State the importance of heating in the above experiment. (1mark)

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iii) Give an observation made at the cathode (1 mark)

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12.a) (i) Name the following organic compounds. (2marks)

a) $CH_3 - CH=C(CH_3) - CH_2 - CH_2 - CH_3$

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b) $CH_3\ CH_2CH_2CH_2CH_3$

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(ii) Describe one chemical test that can be used to distinguish between substances (**a**) and **(b)** above. (1 mark)

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13. (a) Define the term solubility. (1mk)

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(b) 35g of salt W were added to $60cm^3$ of water at 25^0C.After stirring 5g of crystals of salt W were filtered out. Determine the solubility of salt W at 25^0C. (2mks)

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14. Temporary water hardness can be removed by boiling

a) What is hard water? (1 mk)

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b) Name the anion responsible for temporary hardness of water. (1 mk) .....

c) State **one** advantage of hard water. (1 mk) .....

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15. (a) State Graham's law.
(1mark)

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(b) 60cm³ of oxygen gas diffused through a porous hole in 50 seconds. How long will it take 80cm³ of sulphur (IV) oxide, SO_2 to diffuse through the same hole under the same
conditions. (S = 32, O=16). (2marks)

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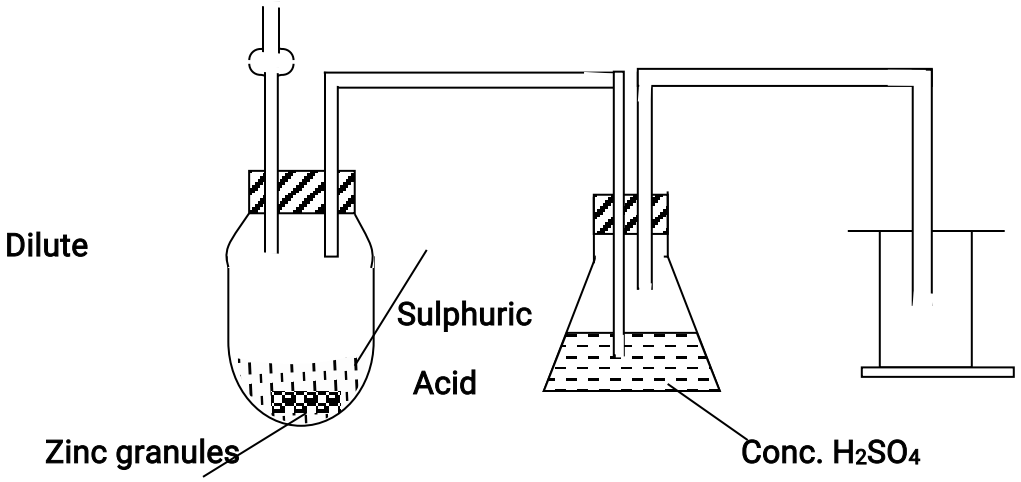
16. The set-up below shows laboratory preparation of hydrogen gas, use it to answer the questions that follow.



a) Identify **two** mistakes in the set-up (2 mks)

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b) Why is itnot advisable to use potassium metal as an alternative of zinc for the preparation of hydrogen gas? (1mks)

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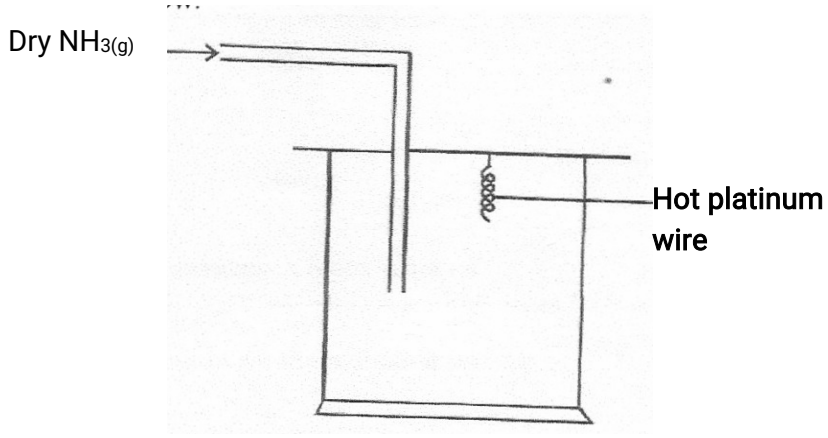
17. The apparatus below was set up to show the catalytic oxidation of ammonia. Study the diagram and answer the questions that follow



(i) Write an equation for the reaction that takes place in the gas jar (1mk)

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(ii) What is the role of hot platinum wire? (1mk)

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(iii) Write the formula of the complex ion formed when excess ammonia gas is passed through a solution containing Zn^{2+} ions. (1mk)

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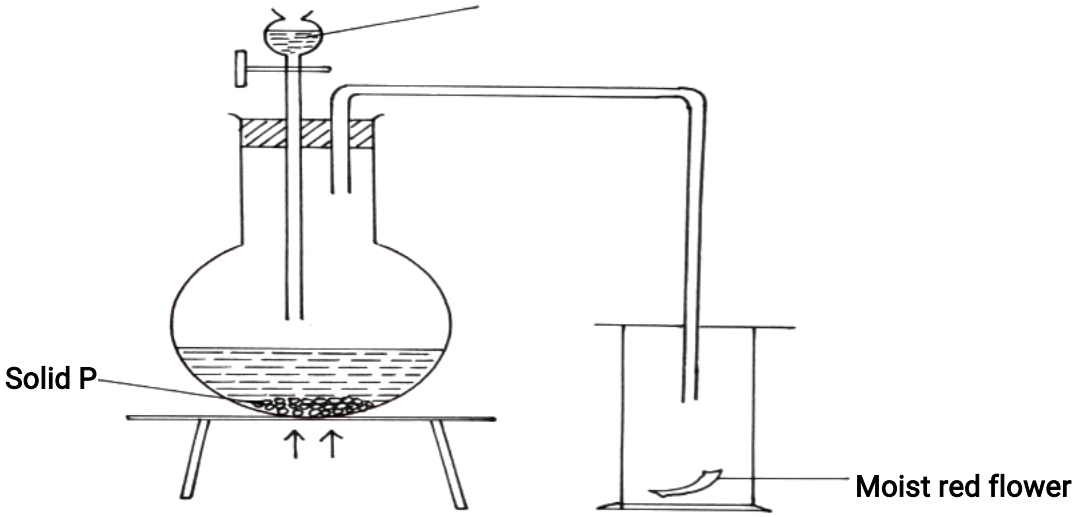
18. The diagram below shows the set-up that was used to prepare and collect sulphur (iv) oxide gas.



(a)Identify solid **P** (1mk)

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(b) (i) Why is it possible to collect sulphur (IV) Oxide as shown? (1mk)

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(ii) What happened to the red flower? (1mk)

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19. Hydrogen sulphide gas was passed through a solution of iron(III) chloride

(i) State and explain the observations made (2mks)

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(ii) Write an ionic equation for the reaction taking place in (i) above (1mk)

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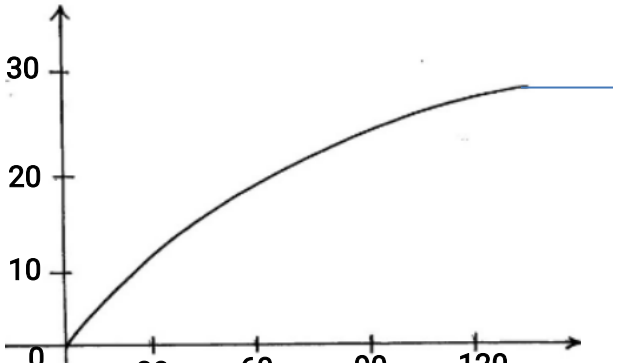
20. A Certain mass of a metal reacted with excess dilute hydrochloric acid at 25^0C. The volume was recorded after every 30secs. The results were presented as shown below.



Volume of gas produced (cm^3)

Time (sec.)

(a) Name **one** piece of apparatus that may be used to measure the volume of the gas liberated.

(1mk) ……

(b)(i) On the same axis, sketch the curve that would be obtained if the experiment was repeated at 35^0C

(1mk)

(ii) Explain how increase in temperatureaffects the rate of a chemical reaction.
(2mks)

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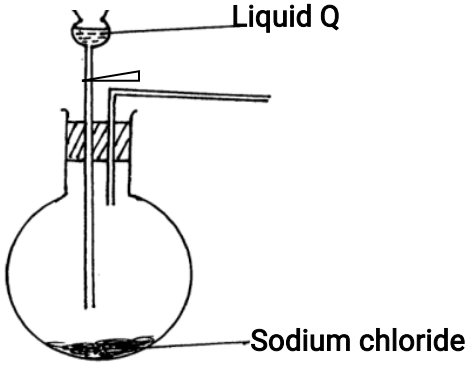
21. The set up below was used to prepare dry hydrogen chloride gas.



(a) Complete the diagram to show how dry hydrogen chloride gas is collected.
(2marks)

(b) Identify liquid **Q** (1mark)

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(c) Write a balanced equation for the reaction that produces hydrogen chloride gas in the above experiment (1mark)

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22. The relative atomic mass of an element **R** is 10.28; it has two isotopes ^{10}R and ^{11}R.Calculate the relative percentage abundance of each isotope. (3marks)

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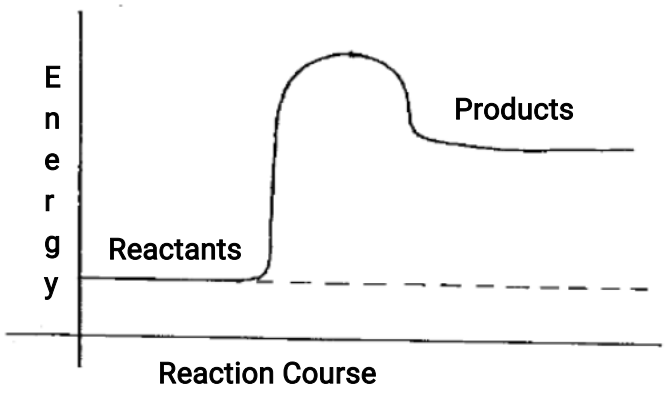
23. Below is a sketch of a reaction profile.



a) On the diagram show the heat of reaction **ΔH** (1mk)

b) State and explain the type of reaction represented by the profile
(2mks)

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24. Describe how you would obtain oil from groundnuts. (2mks)

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25. State any **two** differences between luminous and non-luminous flames (2mks)

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26.A sample of water is suspected to contain some dissolvedchloride ions. Describe a chemical test for establishing the presence of the chloride ions in the water sample.
(2mks)

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27.Sketch a graph of temperature against time for a pure substance A with a melting point of 10^0C and boiling point of 80^0C and it is heated from 0^0C to 90^0C.
(3marks)