

NAME.....ADM.NO.....STREAM.....

SIGN.....

233/1

CHEMISTRY Paper 1(Theory)

DECEMBER 2021

Time: 2 Hours

MOKASA II JOINT EVALUATION EXAMINATION

Kenya Certificate of Secondary Education

CHEMISTRY PAPER ONE

- Write your name, Index Number and stream **CLEARLY** in the spaces provided above'
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- ATTEMPT ALL the questions **IN THE SPACES** provided.
- All working must be clearly shown,
- Calculators and Four Figure mathematical tables (KNEC) may be used.
- This paper consists of 10 printed pages.

FOR EXAMINER'S USE ONLY

Question	Maximum Score	Candidate's Score
1 - 28	80	

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

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(b) Name two commonly abused illegal drugs in Kenya (1mk)

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(c) Draw and name an apparatus used to support a crucible while heating in the laboratory. (1mk)

2. Ethanol (C₂H₅OH) and ether (C₂H₆O) have the same relative molecular mass but the boiling point of ethanol is 78 °C while that of ether is -24 °C. Explain this observation. (2mks)

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3. State two applications of crystallization (2mks)

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4. (a) Study the table below and use it to answer the questions that follow.

Solution	pH
X	10.0
Y	6.5
Z	13.0
W	1.0

i) Identify a solution that vigorously produces effervescence with limestone (1mk)

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ii) Describe the nature of solution Z. (1mk)

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5. a) State Graham`s Law of diffusion (1mk)

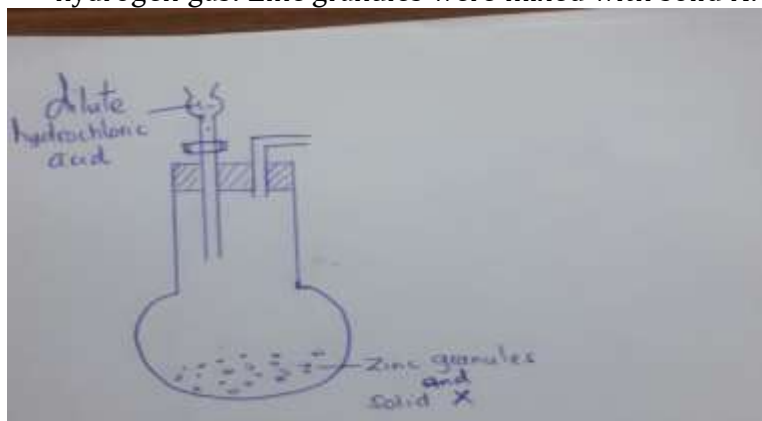
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(b) Sketch a curve representing Boyle's law (1mk)

(c) The relative density of gas A is 1.98 while that of gas W is 2.90. Determine the relative molecular mass of A given that they diffuse under similar conditions given tjhat the relative molecular mass of W is 64. (2mks)

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6. Below is an incomplete diagram for the laboratory preparation and collection of dry hydrogen gas. Zinc granules were mixed with solid X.



(i) Complete the diagram. (3mks)

(ii) At the beginning of the experiment 5g of solid X was used. At the end mass of X was found not to have changed. Identify solid X and state its purpose. (2mks)

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(iii) In addition to one of the reagents above, describe how you can demonstrate that the resultant solution contains chloride ions, given barium nitrate and lead II nitrate solutions **only**. (2mks)

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7. Explain the changes in the mass when the following substances are strongly heated in a crucible.

(i) Calcium carbonate. (1½mks)

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(ii) Copper metal. (1½mks)

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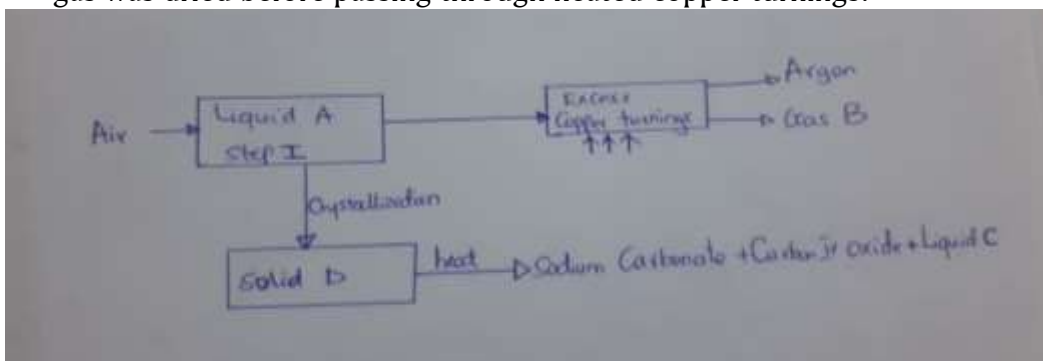
8. (i) What is radioactivity? (1mk)

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(ii). Z grams of a radioactive isotope decays to 5 grams in 100 days. If the half-life of the isotope is 25 days, determine Z. (2mks)

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9. Study the scheme below and use it to answer the questions that follow. The residual gas was dried before passing through heated copper turnings.



(i) Write an equation for the reaction in step I (1mk)

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(ii) Identify gas B (½ mk)

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(iii) Describe the chemical test for liquid C. (2mks)

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(iv) State one use of Argon (½ mk)

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10. Element M has 17 protons and mass number 35.

(i) Write the electron arrangement of element M. (1mk)

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(ii) What volume of the gas M in cm^3 is required for complete reaction between M and sodium if 4.6 grams of sodium were used at r.t.p?

(M = 35.5, Na = 23, M.G.V at r.t.p= 24 dm^3) (2mks)

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11. The table below shows the ionisation energies of elements U, P, Q and S. study it and use it to answer the questions that follow.

Element	1 st I.E	2 nd I.E
U	736	9534
P	900	1800
Q	550	1060
S	590	1150

(i) With reasons, identify an element which does not belong to the same group as the others listed. (2mks)

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(ii) Explain why the second ionization energy is higher than the first ionization energy. (1mk)

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

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(b) The table below shows the solubility of two salts X and Y at different temperatures.

Temperature in °C		10	20	30	40	50
Solubility in g/100g water	Salt X	4.6	7.0	9.8	13.0	16.9
Solubility in g/100g water	Salt Y	10.2	14.6	20.1	27.4	35.9

A solution contained 15 grams of a mixture of X and Y in the ratio of 1:2 in 50 grams of water at 50 °C. What is the total mass of crystals of salt X that would be formed on cooling this solution to 10 °C? (2mks)

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13. State and explain the observation made when sodium hydrogen carbonate is added to a solution of aluminium chloride in water. (2mks)

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14. (a) Describe how you can prepare a dry sample of silver carbonate starting with silver metal. (3mks)

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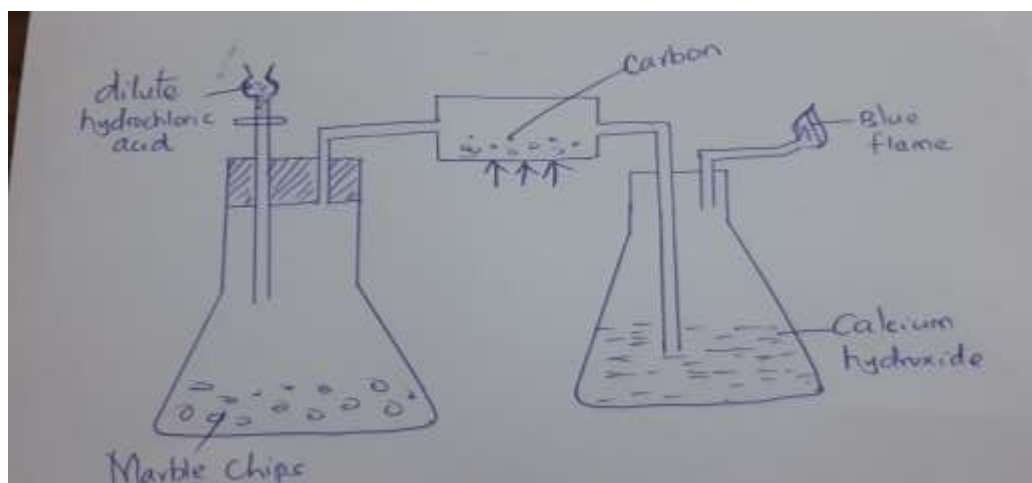
15. 8.5 grams of sodium nitrate was heated to a constant mass.

a) Write down the equation for the reaction that took place. (1mk)

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b) Determine the mass of the solid that was formed (2mks)
(Na = 23,N = 14,O = 16)

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16. Study the set-up below for the laboratory preparation of carbon (IV) oxide.



(i) Write down the equation for the reaction taking place in the combustion tube. (1mk)

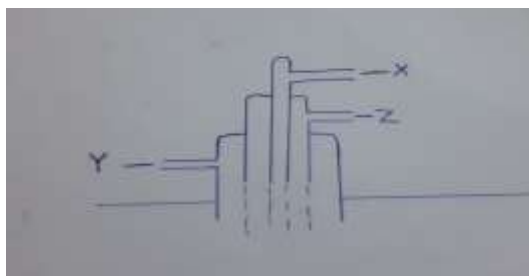
(ii). Why is it necessary to pass the gas through calcium hydroxide before burning? (1mk)

17. Ammonia is reacted with oxygen in presence of platinum catalyst. State and explain the observations made during the reaction. (3mks)

18. A form one student was provided with three solutions that were not labelled. One of the solutions was acidic, one basic and another one neutral. The student was given a choice to use either phenolphthalein or methyl orange indicators to correctly identify the solutions. Advise the student on the indicator to use. (2mks)

19. (a) Briefly describe how Rhombic sulphur is prepared (2mks)

(b) Study the diagram below for the extraction of sulphur



Identify and give the purpose of substance X and Y

X (1mk)

Y (1mk)

20. Given the equation: $\text{NH}_4^+_{(aq)} + \text{H}_2\text{O}_{(l)} \longrightarrow \text{NH}_{3(g)} + \text{H}_3\text{O}^+_{(aq)}$
Identify the acid in the reaction above. Explain (2mks)

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21. 3.10 grams of a compound containing carbon, hydrogen, and oxygen burnt completely to produce 4.4 grams of carbon IV oxide and 2.7 grams of water. Determine the empirical formula of the compound (3mks)

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22. A student accidentally added sodium chloride into a mixture of zinc oxide and aluminium chloride. Describe how you can help him obtain pure sodium chloride. (3mks)

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23. Hydrogen chloride reacted with compound P to form a compound whose formula is $\text{CH}_3\text{CHCl}(\text{CH}_2)_2\text{CH}_3$.

(i) Draw the structural formula and give the name of P (2mks)

(ii) Name the type of reaction taking place between P and chlorine (1mk)

24. 50 cm^3 of 2M hydrochloric acid and 50 cm^3 of 2M sodium hydroxide both at 22°C were mixed in a plastic beaker then stirred to a maximum temperature of 35°C . Given $c = 4.2 \text{ kJ/kg/K}$ and density of the solution is 1 g/cm^3 , determine the molar heat of neutralization of hydrochloric acid. (3mks)

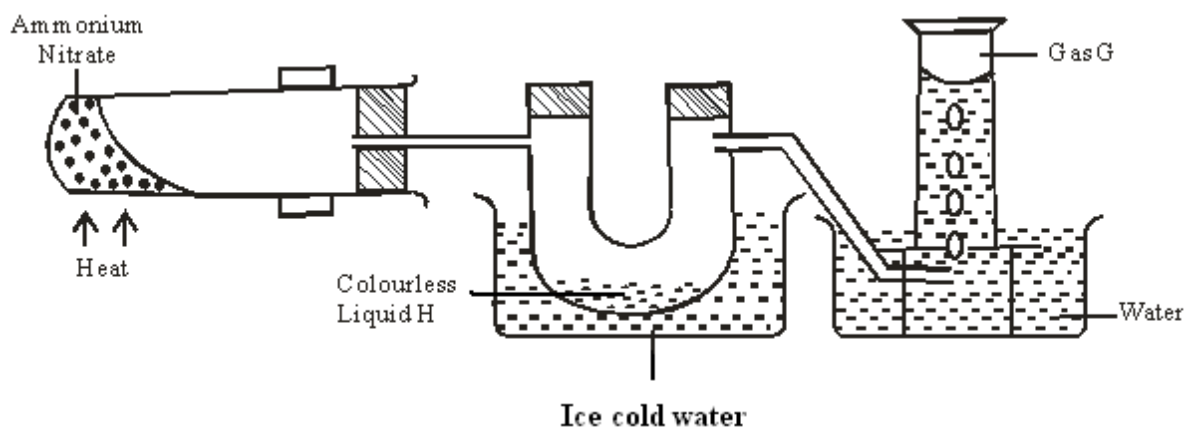
25. Complete the following table by filling in the missing sections. (3mks)

	GAS	TEST	OBSERVATION
I	Chlorine	bubble the gas into a solution of potassium bromide.	
II		Put a filter paper dipped in a solution of orange acidified potassium chromate (VI)	paper turns green
III	Butane		Red-brown colour of the liquid turns colourless.

26. Three metal oxides XO, YO, and ZO are heated with powdered metal Y. Hot powdered Y will remove oxygen from XO but not from ZO. Arrange the metals in order of reactivity, starting with the most reactive. (1mk)

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27. Ammonium nitrate was gently heated and the products collected as shown in the diagram.



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

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b. State one similarity and one difference between gas G and oxygen. (2mks)

Similarity:

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Difference:

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28. Write the following abbreviations in full as used in Chemistry.

i. TNT (1mk)

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ii. PTFE (1 mk)

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~ END ~