

Name.....AdmNo.....Class.....

Index No.....Candidate's sign.....Date.....

233/1  
CHEMISTRY  
PAPER 1  
JULY 2025  
2 HRS

**CATHOLIC DIOCESE OF KAKAMEGA EVALUATION TEST  
JULY/AUGUST EXAM 2025**

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

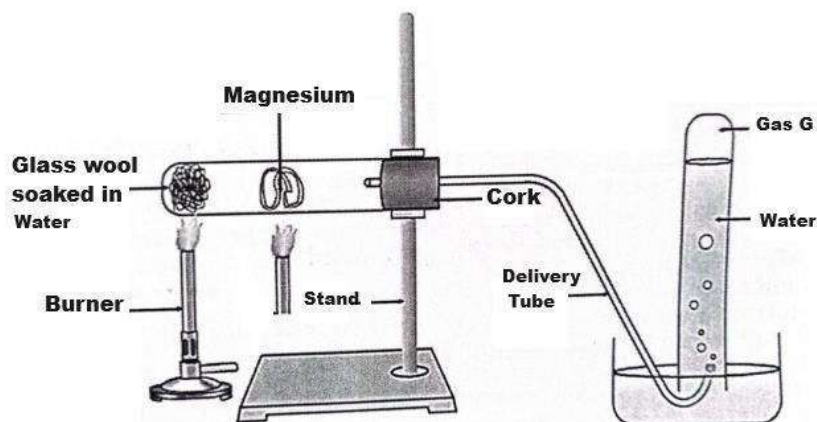
**Instructions to candidates**

- Write your name, admission number, date, school and sign in the spaces provided above.
- Answer **ALL** the questions in the spaces provided.
- All working **MUST** be clearly shown.
- This paper consists of 16 printed pages
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

**FOR EXAMINER'S USE ONLY**

| Questions | Maximum score | Candidate's Score |
|-----------|---------------|-------------------|
| 1-27      | 80            |                   |

1. The diagram below represents the apparatus used to react steam with magnesium.



a. State one observation made in the boiling tube (1mark)

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 .....

b. Write an equation for the reacting that takes place in the boiling tube. (1mark)

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c. State the precaution required before the heating is stopped (1mark)

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

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 .....

b) Element W has two isotopes  $^{36}\text{W}$  and  $^{40}\text{W}$  which occur in the ratio K:4. Given that

R.A.M of W is 37.25. find the value of K. (2 marks)

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3. (a) Name **a reagent** that can be used to **distinguish** between  $\text{Al}^{3+}$  and  $\text{Zn}^{2+}$  ions (1mk)

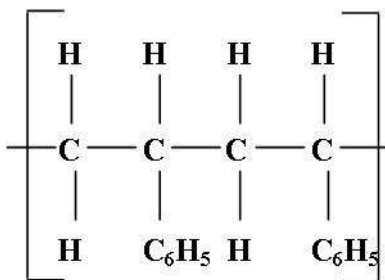
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(b) State what is **observed** if each ion is treated separately **with the reagent** (2marks)

$\text{Al}^{3+}$  - .....

$\text{Zn}^{2+}$  - .....

4. The following is a small section of polystyrene polymer. Study it and answer the questions that follow.



(a) Draw the structure of the monomer unit of polystyrene. (1mk)

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(b) Calculate the number of monomers used to form the polystyrene polymer of relative molecular mass of 18,096. ( $\text{H}=1$ ,  $\text{C}=12$ ) (2mks)

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5. A form three student from Eregi girls High school was interested in determining the pigments present in amaranthus leaves that makes it have the green and yellow colourations

a) Identify the substances responsible for the green and the yellow colourations. (1 mark)

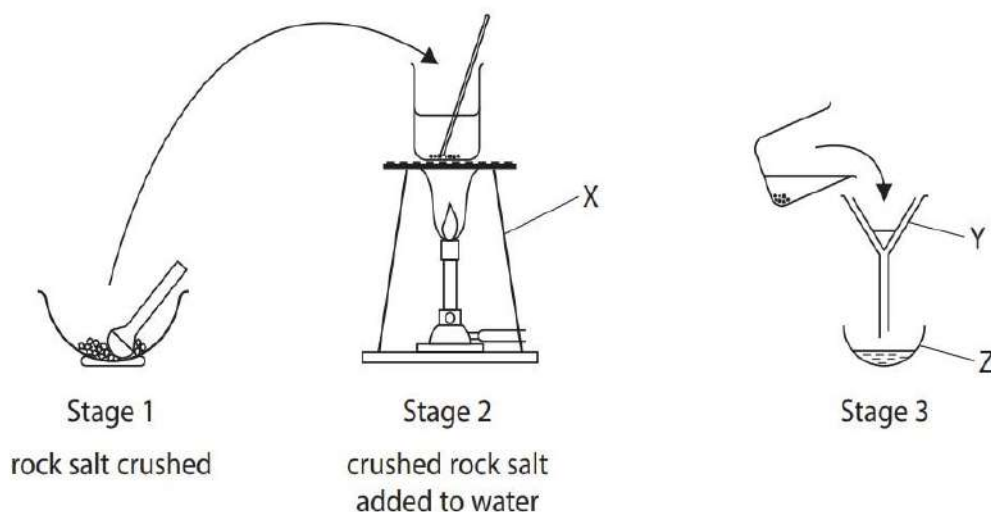
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b) State the two processes that make the separation of the pigments possible. (1 mark)

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6. Rock salt is a mixture of the soluble salt, sodium chloride, and some insoluble impurities.

The diagram shows the first three stages of a method used to obtain pure sodium chloride from rock salt.



(a) Name the pieces of apparatus labelled X, Y and Z ( 1 ½ Marks)

X .....

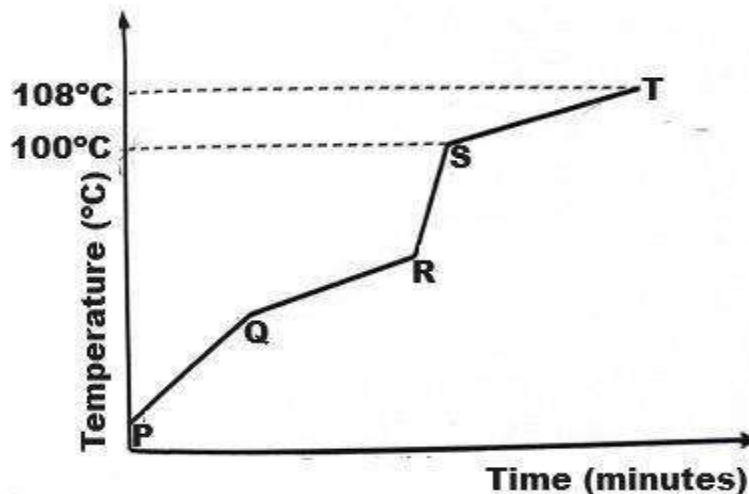
Y .....

Z .....

(b) State why the mixture of rock salt and water is warmed and stirred in stage 2. (1 marks)

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7. The diagram below shows a heating curve of water in the laboratory. Study it and use it to answer the questions that follow.



i. At what temperature does the water boil? (1mark)

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 .....

ii. Is the curve for a pure water or impure water? Give a reason for your answer. (2marks)

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 .....

iii. What is the effect of impurities on the boiling point of water? (1mark)

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 .....

8.(a) State Charles' Law.

(1 mark)

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 .....  
 .....

(b) The volume of gas Y at a temperature of 25 °C and 600 mmHg pressure is  $9.6 \times 10^{-2} \text{ m}^3$ . Calculate the temperature at which the volume of the gas would be  $6.4 \times 10^{-2} \text{ m}^3$  pressure remains constant. (2 marks)

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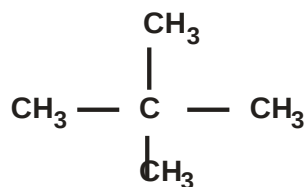
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9. a) Define hydrocarbons.

(1 mark)

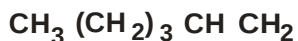
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b) Name the following organic compounds.

(2 marks)



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10. Ethanedioic acid,  $(\text{COOH})_2$ , was used to prepare carbon (II) oxide instead of methanoic acid,  $\text{HCOOH}$ , in the laboratory. It gave equal volumes of carbon (II) oxide and carbon (IV) oxide.

a) Write an equation for the dehydration of ethanedioic acid.

(1 mark)

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b) Explain how pure carbon (II) oxide can be obtained from the mixture of the two gases?

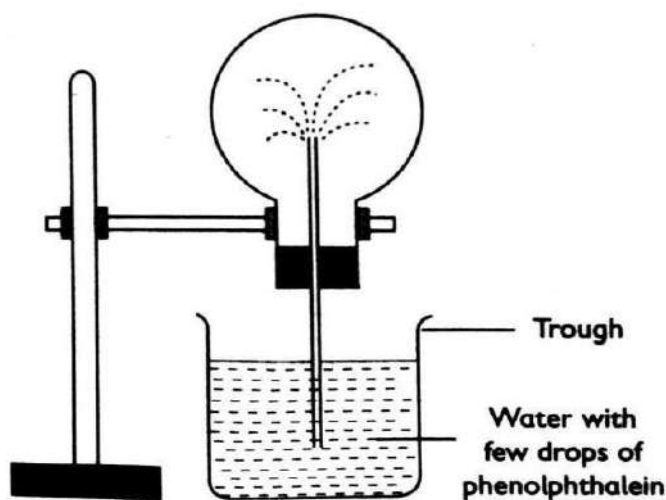
(1 mark)

c) State two physical properties of carbon (II) oxide which make it be referred to as a “silent killer.”

(1 mark)

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11. A property of ammonia gas was investigated using the setup shown in the diagram below.



- i) What name is used to describe the experiment? (1mark)

.....

- ii) Name the property of ammonia gas demonstrated by the experiment. (1mark)

.....

- iii) Identify another gas that may be used instead of ammonia gas. (1mark)

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 .....  
 .....

12. The table below gives information about ions of **P** and **Y**

| Ion                  | <b>P</b> <sup>+</sup> | <b>Y</b> <sup>2-</sup> |
|----------------------|-----------------------|------------------------|
| Electron arrangement | 2.8                   | 2.8.8                  |
| Number of Neutrons   | 12                    | 16                     |

- a) Write the electron arrangement for the atom of **Y** (1mark)

.....  
 .....

b) How many protons are there in the nucleus of (2marks)

(i) **P**.....

(ii) **Y**.....

c) Write the formula of the compound formed when **P** and **Y** react (1mark)

.....

13. The data below was recorded when metal M was completely burnt in air (M is not the actual symbol of the element, R.A.M; M=207, O = 16)

Mass of the empty crucible and lid =10.2 g

Mass of crucible, lid and metal M = 16.41g

Mass of crucible, lid and metal oxide =17.37 g

a) Determine the mass of:

i) Metal M

(½ mark)

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ii) Oxygen

(½ mark)

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b) Determine the empirical formula of the metal oxide.

(2 marks)

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14. Some reactions of metals P, Q, R and S are given below.

| Metal | Reaction with water                                          | Reaction with dilute hydrochloric acid       |
|-------|--------------------------------------------------------------|----------------------------------------------|
| P     | A few bubbles form slowly in water                           | Vigorous reaction. Gas is given off          |
| Q     | Vigorous reaction, metal melts, gas given off.               | Explosive reaction. Should not be attempted. |
| R     | No reaction                                                  | No reaction                                  |
| S     | Does not react with cold water. Hot metal reacts with steam. | Steady fizzing.                              |

(a) Arrange the metals in order of the reactivity starting with the least reactive. (1mark)

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.....

(b) Write a chemical equation for the reaction between metal Q and water. (1mark)

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(c) Which of the metals could be:

(i) Copper (½ mark)

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.....

(ii) Magnesium (½ mark)

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15. Complete the table below (3marks)

| Metal                | Aluminum | Lead      | Sodium    |
|----------------------|----------|-----------|-----------|
| Chief ore            | Bauxite  |           | Rock salt |
| Chemical formulae    |          |           |           |
| Method of extraction |          | reduction |           |

16. The table below shows elements W, X, Y and Z and their atomic numbers. The letters are not the actual symbols of the elements. Use the letters to answer the questions that follow.

| Element | Atomic number. |
|---------|----------------|
| W       | 16             |
| X       | 11             |
| Y       | 18             |
| Z       | 12             |

- (a) Select an element which forms  
(i) Anions. (1mk)

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- (ii) An insoluble carbonate. (1mk)

.....

- (b) Which element has the largest atomic radius (1mk)

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17. During an experiment to prepare dry sample of Sulphur (IV) oxide gas, 50cm<sup>3</sup> of 2M Hydrochloric acid was reacted with sodium sulphite. Determine the volume of the gas in cm<sup>3</sup> produced at r.t.p (Molar gas volume = 24 dm<sup>3</sup>) (3mks)

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18. Using dots (●) and crosses (x) diagrams to represent electrons, show bonding in:

- (i) the compound formed when fluorine and nitrogen combine. (1 ½ marks)  
(atomic numbers N = 7, fluorine = 9)

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(ii) potassium oxide.

(1 ½ marks)

(Atomic numbers K = 19, O=8)

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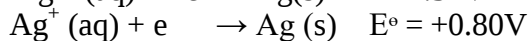
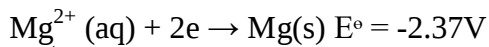
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19. Below is a representation of an electrochemical cell.



a) What does the symbol // represent? (1mark)

b) Calculate the electromotive force of electrochemical cell formed when the two half cells below are combined. (1mark)



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20. Use the bond enthalpies given below (at 298K) to answer the questions that follow.

| $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ |                    |
|------------------------------------------------------------------------------------------|--------------------|
| Bond                                                                                     | Bond energy kJ/mol |
| H – H                                                                                    | 436                |
| N - H                                                                                    | 388                |
| N $\equiv$ N                                                                             | 944                |

a) Work out the enthalpy change for the reaction above.

(2 marks)

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b) Draw an energy level diagram showing the activation energy for the above reaction (2mks)

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21. “JIK” is common house hold bleach which contains sodium hypochlorite as the active ingredient.

a) Write down an equation to show how the active ingredient in “JIK” bleaches a colored dye. (1mark)

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b) Name the process by which “JIK” bleaches a coloured dye. (1 mark)

.....

c) Suggest why it is better to use “JIK” as bleach when washing clothes instead of using chlorine water. (1 mark)

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22. The table below gives the solubility of substances T and U at 10°C and 40°C. When an aqueous mixture containing 55g of T and 12g of U at 80°C was cooled to 10°C, crystals formed.

| Substance | Solubility in g/100g of water at: |                   |
|-----------|-----------------------------------|-------------------|
|           | 10 <sup>0</sup> c                 | 40 <sup>0</sup> c |
| T         | 40                                | 65                |
| U         | 15                                | 17                |

a) Identify the crystals formed ( ½ mark)

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b) Determine the mass of crystals formed.(1mark)

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c) Name the method used to obtain the crystals (1mark)

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23. A school laboratory technician left a sample of concentrated sulphuric (VI) acid in an open boiling tube for 24 hours and she found out that the volume had increased slightly.

a) What property of concentrated sulphuric (VI) acid was shown by the above observation? (1 mark)

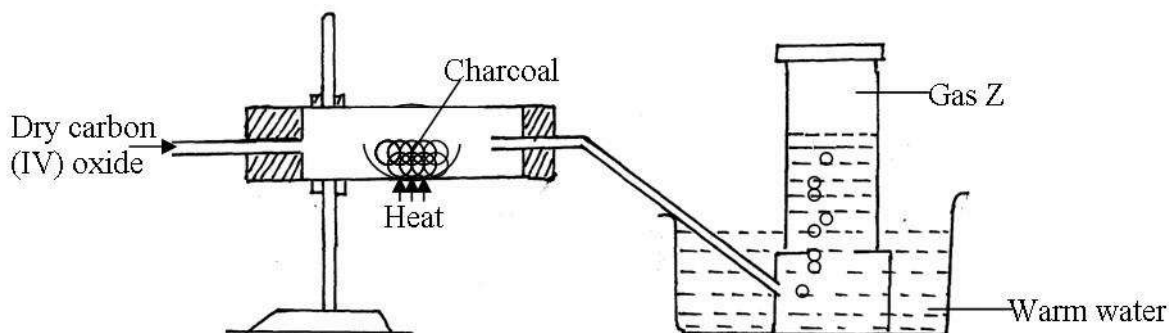
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b) Give one use of concentrated sulphuric (VI) acid based on the property named in (a) above. (1 mark)

c) Determine the oxidation state of Sulphur in  $\text{S}_2\text{O}_7^{2-}$  (1 mark)

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24. Study the diagram below and answer the questions that follow.



(a) Identify gas Z. (1mk)

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(b). Write the chemical equation for the reaction which produces gas Z (1mk)

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 .....

(c). State why the above experiment should be carried out in a fume chamber. (1mk)

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25. During the production of hydrogen iodide, hydrogen reacts with iodine as follows.



State and explain how the following will affect yield of hydrogen iodide

i) Increase in pressure (2mks)

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 .....  
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ii) Increase in temperature.

(2mks)

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26. Starting with recycled copper, describe how copper (II) sulphate crystals can be prepared in the laboratory. (3 marks)

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27. a) P grams of a radioactive isotope sample takes 160 days to disintegrate to 7g. The half-life of the isotope is 40days. Find the initial mass P. (2 marks)

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b) State one danger associated with radioactivity. (1 mark)

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