

THE AMKA CHEMISTRY JOINT EXAMINATION
Kenya Certificate of Secondary Education

233/2

Paper 2



CHEMISTRY – (Theory)

June 2025 - 2 hours



Name Admission Number.....

School Index No.....

Instructions to Candidates

- (a) Write your name and Admission number in the spaces provided.
- (b) Write the Name of the School and the date of examination in the spaces provided.
- (c) Answer **all** the questions in the spaces provided
- (d) ALL working **MUST** be clearly shown where necessary
- (e) Mathematical tables and electronic calculators may be used.
- (f) **Candidates must answer the questions in English.**

FOR EXAMINER'S USE ONLY



QUESTION	Max. Score	Candidate Score
1	12	
2	12	
3	11	
4	11	
5	12	
6	12	
7	10	
TOTAL	80	



The AMKA Chemistry Examination
2025 @ Mock
233/2

1. The table below shows elements from a given family in the periodic table. Use it to answer the questions that follow. The letters do not represent the actual symbols of elements.

Element	Atomic Number	Melting Point (°C)	Boiling Point (°C)
E	9	-208	-188
F	17	-101	-35
G	35	-7	59
H	53	114	184

- (a) Give the physical state of element G at room temperature. (1mark)

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- (b) How does the reactivity of E and F compare. Explain. (2marks)

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- (c) Explain why the boiling point of G is higher than that of F. (2marks)

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- (d) Element A has an atomic number of 13 in the periodic table.

- (i) Identify the bond and structure formed between A and F.

Bond..... (1mark)

Structure..... (1mark)



- (ii) Draw a dot (•) and cross (x) diagram to show the structure identified in (i) above (2marks)

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- (iii) The product formed between A and F lacks a boiling point. Explain. (1mark)

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- (e) (i) Write a chemical equation between F and water (1mark)

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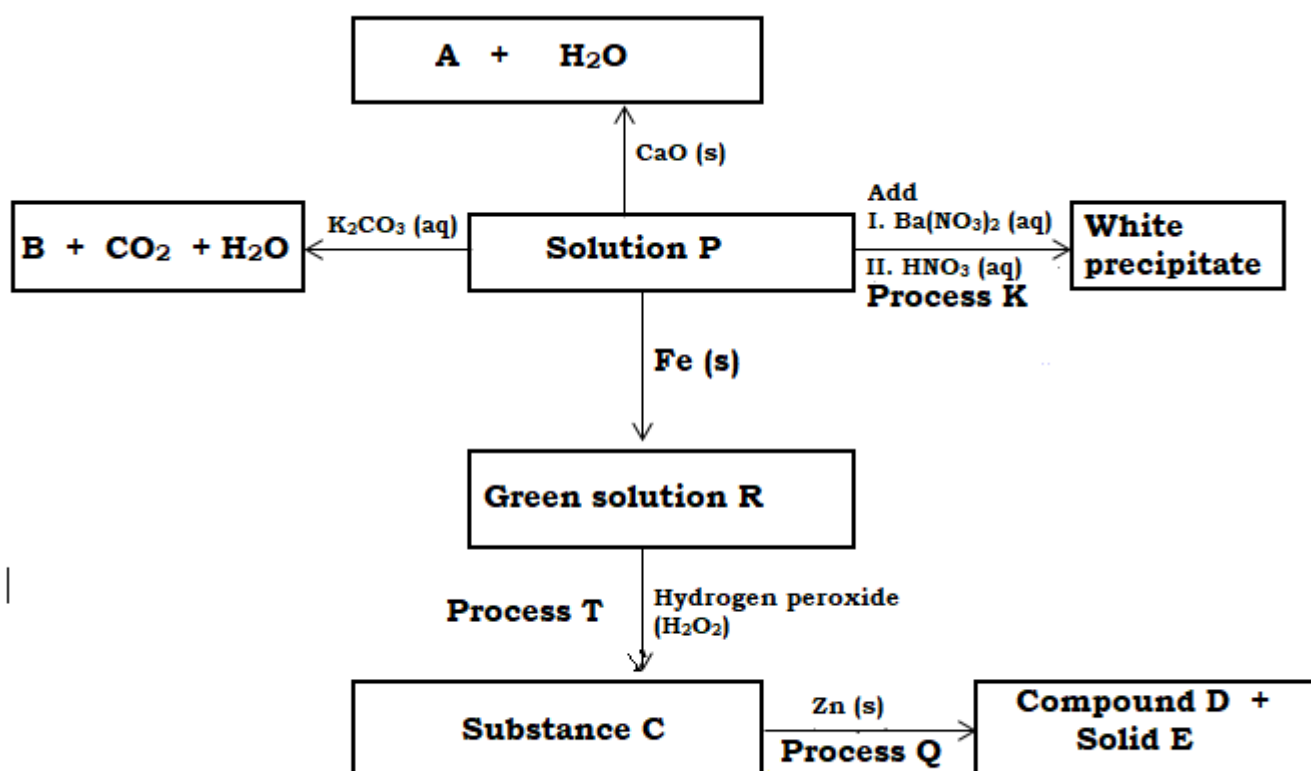
- (ii) Give one use of the product formed in e (i) above. (1mark)

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2. (a) Hard water containing magnesium ions was passed through an ion – exchange resin. This led to formation of deionized water.
- (i) Explain the term deionized water. (1mark)
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- (ii) Given that the resin contains $R - COO-H^+$, write an ionic equation to show how magnesium ions are removed. (1mark)
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- (b) Study the flow chart below and answer the questions that follow.



- (i) Name the compounds
- A..... (1mark)
- B..... (1mark)
- C..... (1mark)



- (ii) Write an ionic equation for process K that results in formation of white precipitate. (1mark)

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- (iii) Name process T and state the observation made during process T (2marks)

Name.....

Observation made.....

- (c) Describe how you can prepare pure sample of copper carbonate starting with copper metal. (3marks)

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- (d) Zinc hydroxide dissolves in excess aqueous ammonia while lead (II) hydroxide does not. Explain this observation. (1mark)

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3. (a) Hydrogen gas reacts with ethene at high temperature.

- i. Write the equation for the reaction. (1mark)

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- ii. Other than high temperatures, name another condition required for the above reaction. (1mark)

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- iii. Give one economic application of the above reaction. (1mark)

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(b) In a limited supply of air, ethyne undergoes incomplete combustion.

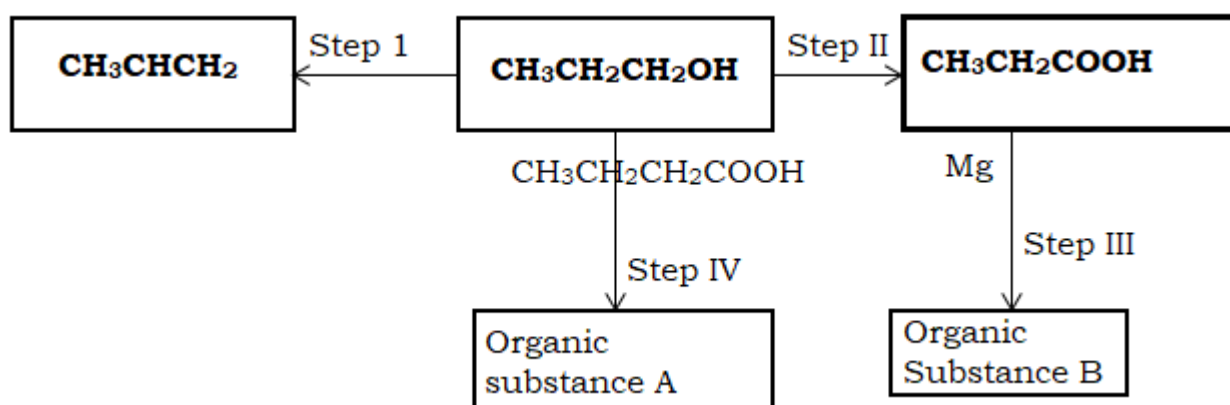
- i. Identify three products formed. (1mark)

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- ii. State the observation made. (1mark)

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(c) Study the reaction scheme given below and use it to answer the questions that follow.



- i. Aluminium oxide is used in step I. Give two functions of Aluminium oxide. (1mark)

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- ii. Draw the structural formula of substance A. (1mark)

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- iii. Write a balanced chemical equation for the reaction in step III (1mark)

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(d) (i) Name any two natural polymers. (1mark)

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(ii) Polymethylmethacrylate commonly known as Perspex is an example of addition polymer. In the spaces below draw a structure that shows three repeat units of the polymer. (1mark)

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(iii) Identify one of the most common use of the polymer drawn above. (1mark)

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4. (a) Chemical reactions occur as a result of collisions of particles. Give a reason why not all collisions are effective. (1mark)

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(b) State and explain how the following factors affect the rate of reaction.

i. Concentration (1mark)

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ii. Pressure (1mark)

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- (c) Exactly 3.0g of powdered carbonate of M, MCO_3 were mixed with excess dilute hydrochloric acid. The mass of the reaction vessel and its contents were recorded at various times. From these readings the total loss in mass of the reaction vessel and its contents was calculated and recorded in the table below.

Time (sec)	0	30	60	90	120	150	180	210
Total loss in mass (g)	0	0.40	0.78	0.98	1.19	1.28	1.32	1.32

- i. Draw a set up that was used to carry out the above experiment. (3marks)

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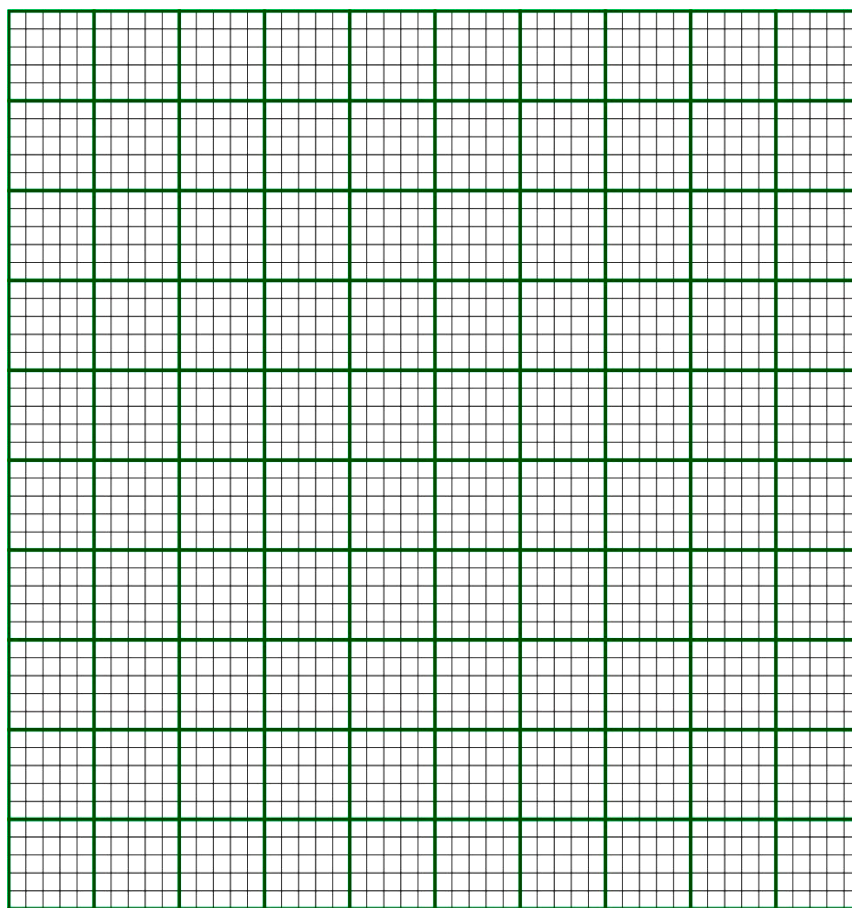
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- ii. Plot a graph of total loss in mass against time. (3marks)



iii. Calculate the rate of reaction between 30th and 60th second. (1mark)

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iv. Calculate the rate of reaction at 105th second. (1mark)

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5. (a) Calculate the oxidation number of the named element

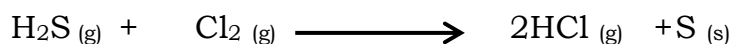
i. Chromium in dichromate (VI) ion ($\text{Cr}_2\text{O}_7^{2-}$) (1mark)

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ii. Oxygen in hydrogen peroxide (H_2O_2). (1mark)

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(b) Use oxidation numbers to identify the oxidizing agent in the following equation (2marks)



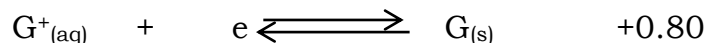
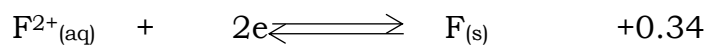
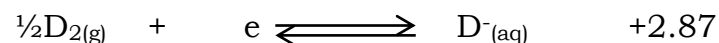
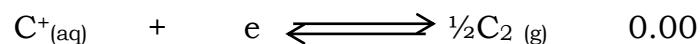
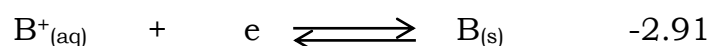
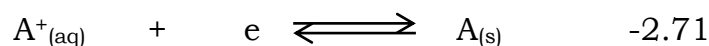
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(c) i. Define the term standard electrode potential of an element. (1mark)

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ii. Use the standard electrode potentials given below to answer the questions that follow.



I. State whether G^+ can oxidize F^{2+} . Give a reason. (2marks)

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II. Select two half cells which when combined will give the highest e.m.f. (1mark)

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III. Give the cell representation for the cell formed in (II) above. (1mark)

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IV. State any two standard conditions for assigning element C an electrode potential of 0.00 volts. (1mark)

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V. Lead – acid accumulators is an example of secondary cell.

a. Identify the electrolyte used in this cell. (1mark)

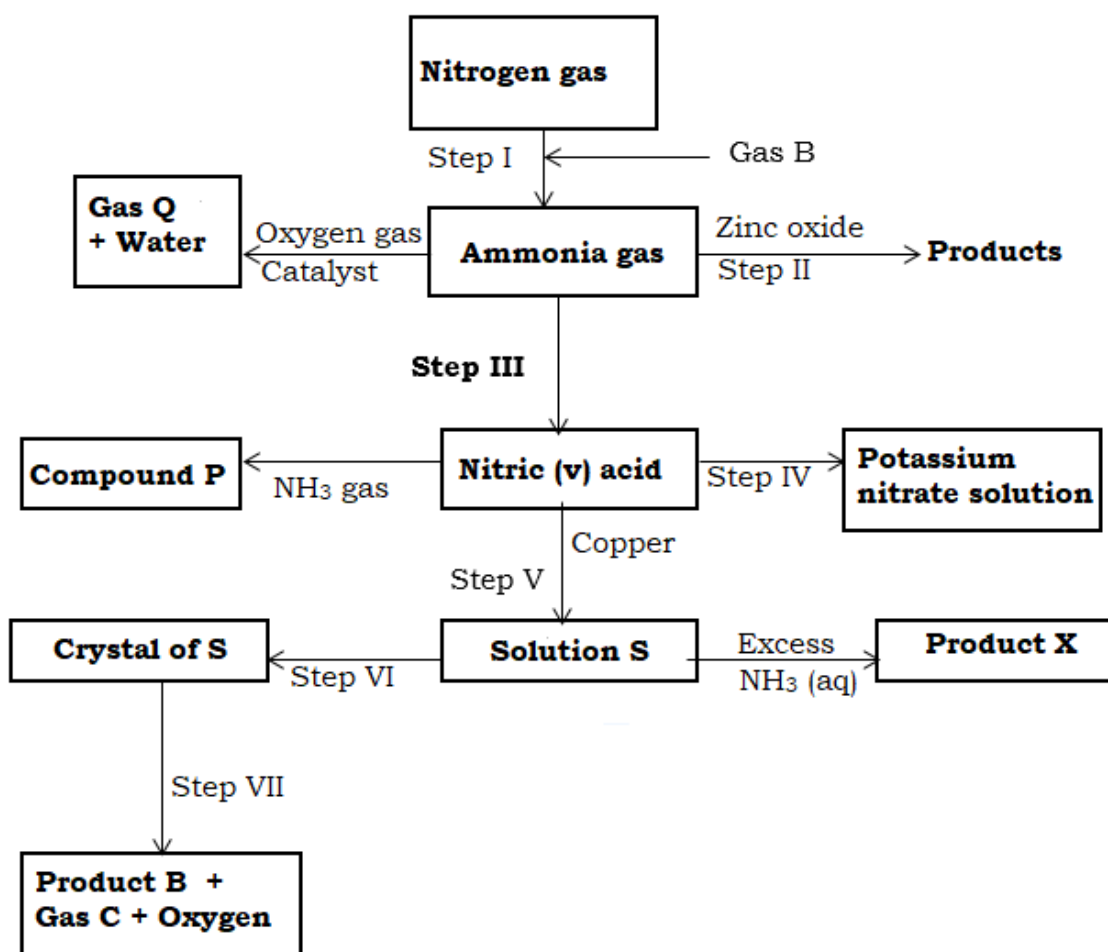
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b. Write an equation for discharging this cell. (1mark)

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6. Study the flow chart below and answer the questions that follow.



a) State one source of gas B (1mark)

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b) Name the catalysts used in:

i. Step I (1mark)

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ii. Step III (1mark)

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c) Write chemical equations for reactions in:

i. Step II (1mark)

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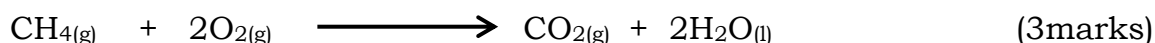
- ii. Step VII (1mark)
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- d) Name the process that takes place in ; (2marks)
- i. Step IV
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- ii Step VI
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- e) Name and write the chemical formula of product X
- i. Name (1mark)
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- ii. Formula (1mark)
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- f)
- i. State one laboratory use of compound P (1mark)
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- ii. Identify any other gas that can be used instead of ammonia in step II (1mark)
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- iii. State one use of gas Q. (1mark)
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7. (a) Use the table of bond energies given below to answer the questions that follow.

Bond	Bond Energy (kJ/mol)
C - H	413
O = O	496
C = O	805
H - O	464

Calculate the enthalpy change for the reaction.



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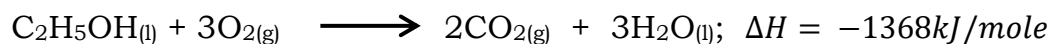
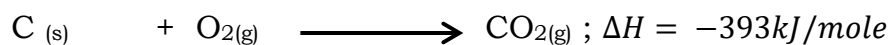
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- (b) (i) Define the term heat of formation (1mark)

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- (ii) Given the following information



Draw an energy cycle diagram and use it to calculate the enthalpy of formation of ethanol. (3marks)

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(c) Draw an energy level diagram to represent the reaction in b(ii) above. (2marks)

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(d) Using the information given in part b(ii) above, calculate the heating value of ethanol. (1mark)

(C =12, H = 1, O = 16)

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