

THE AMKA CHEMISTRY EXAMINATION
Kenya Certificate of Secondary Education

233/1**CHEMISTRY****Paper 1****(Theory)****JUNE 2025 - 2 hours**

Name **Index Number**.....

School **Admission No**.....

Date.....

Instructions to Candidates

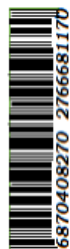
- Write your name and Index number in the spaces provided.
- Write the Name of the School and the Admission number and Date in the spaces provided.
- Answer **all** the questions in the spaces provided
- ALL working **MUST** be clearly shown where necessary
- Mathematical tables and electronic calculators may be used.
- Candidates must answer the questions in English.**

FOR EXAMINER'S USE ONLY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

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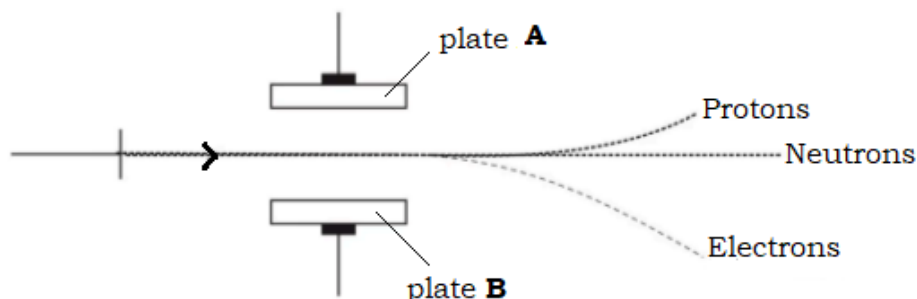
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The AMKA Chemistry Examination
2025 @ Mock
233/1

1. **Figure 1** shows how protons, neutrons and electrons behave differently when they move at the same velocity in an electric field.

Figure 1.



- (a) Identify the charge of the plates marked A and B in the figure. (2marks)

Charge of A.....

Charge of B.....

- (b) Suggest a reason why the atomic mass and the atomic number of two isotopes of an element are not always equal. (1mark)

.....

- 2 Complete combustion of the biofuels made from the sewage sludge produces the greenhouse gas carbon (iv) oxide.

- (a) Suggest one possible environmental concern associated with combustion of these biofuels. (1mark)

.....

- (b) Give the name of another greenhouse gas emitted during combustion of biofuels.

..... (1mark)



3. A patient was given the drugs with a prescription as follows

3 x 3

- (a) Give the interpretation of that prescription. (1mark)

.....

- (b) The patient decided to take the recommended number of tablets at 8.00am.
 Determine the time the patient should take the next set of tablets according to the prescription. (1mark)

.....

- 4 Describe how you would prepare a 2M solution of hydrochloric acid from a 20cm³ of 12.4M hydrochloric acid in the laboratory. (2marks)

.....

- 5 (a) Write the electron configuration of Al³⁺ ion. (1mark)

.....

- (b) When anhydrous aluminium chloride, Al₂Cl₆, is added to water, a solution forms which is strongly acidic.

- (i) Suggest the pH of the solution formed when a universal indicator paper is dipped into the solution. (1mark)

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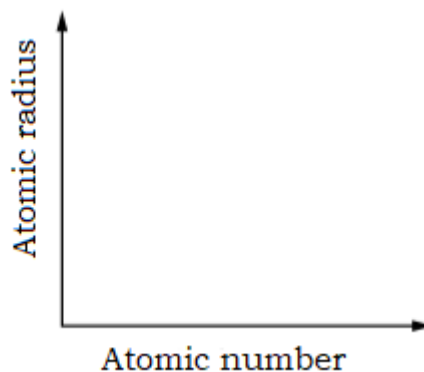
- (ii) Identify the ion in the solution which is responsible for the acidic property of the solution. (1mark)

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- 6 (i) On the **figure 2** below, sketch a graph to show the trend in the atomic radius of successive elements in period 3 of the periodic table. (1mark)

Figure 2



- (ii) Explain your answer in (i) above. (1mark)

.....

- 7 The concentration of dilute hydrochloric acid can be determined by titration using a standard solution of barium hydroxide.

- (a) Hydrochloric acid is added to the burette using a funnel. State why it is good practice to remove the funnel from the burette before the titration. (1mark)

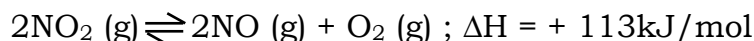
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- (b) Before the first titration, the 25ml pipette is rinsed with small volume of the same barium hydroxide solution. Explain why this practice is important. (1mark)

.....



8. Nitrogen (iv) oxide decomposes at a high temperature as shown in the chemical system below.



- (a) State how decomposition of nitrogen (iv) oxide would be affected if the pressure is increased. (1mark)

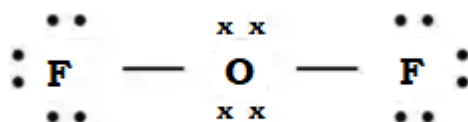
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- (b) A 0.317 moles sample of nitrogen (iv) oxide is placed in a sealed flask and heated at a constant temperature until an equilibrium is reached. Given that at equilibrium, the flask contains 0.120 moles of oxygen gas, determine the moles of nitrogen (iv) oxide gas at equilibrium. (1mark)

.....

- 8 **Figure 4** shows the bonding between oxygen and fluorine in a molecular structure.

Figure 4



- (a) Label the bond shown in the structure. (1mark)

.....

- (b) Determine the oxidation state of oxygen in the molecule. (1mark)

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- (c) Write the electron configuration of oxygen in the molecule. (1mark)

.....



- 9 **Table 1** shows some enthalpy change data. Study the table and answer the questions that follow.

Table 1

	Enthalpy change / kJmol^{-1}
$\text{Ca}^{2+}(\text{g}) \rightarrow \text{Ca}^{2+}(\text{aq})$	- 1650
$\text{Cl}^{-}(\text{g}) \rightarrow \text{Cl}^{-}(\text{aq})$	- 364
$\text{Ca}^{2+}(\text{g}) + 2\text{Cl}^{-}(\text{g}) \rightarrow \text{CaCl}_2(\text{s})$	- 2237

- (a) Determine the enthalpy change that occurs when solid calcium chloride dissolves in water. (2marks)

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- (b) How would the temperature change when calcium chloride dissolves in water? (1mark)

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- 10 (a) Write a chemical equation of reaction of phosphorus with excess oxygen gas to form phosphorus (v) oxide gas. (1mark)

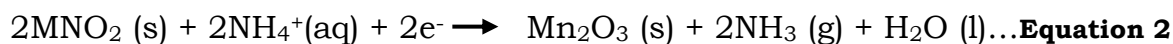
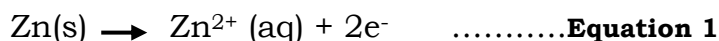
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- (a) Using litmus papers, describe a test you would carry out in a test tube to distinguish between Sodium oxide and the oxide formed in (a) above. (2marks)

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- 11 The half-equations for two electrodes that combine to make a dry cell are



- (b) Identify the oxidizing agent in this cell. (½marks)

.....

- (c) Which equation of the reaction is taking place at the cathode. (½marks)

.....

- 12 By filling in the spaces provided below, describe how a student would give the difference between aqueous solutions of Potassium nitrate and Potassium sulphate

- I. Reagent (1mark)

.....

- II. Observation with potassium nitrate solution (1mark)

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- III. Observation with potassium sulphate. (1mark)

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13. (a) Explain why metals such as magnesium and aluminium are good conductors of electricity (1mark)

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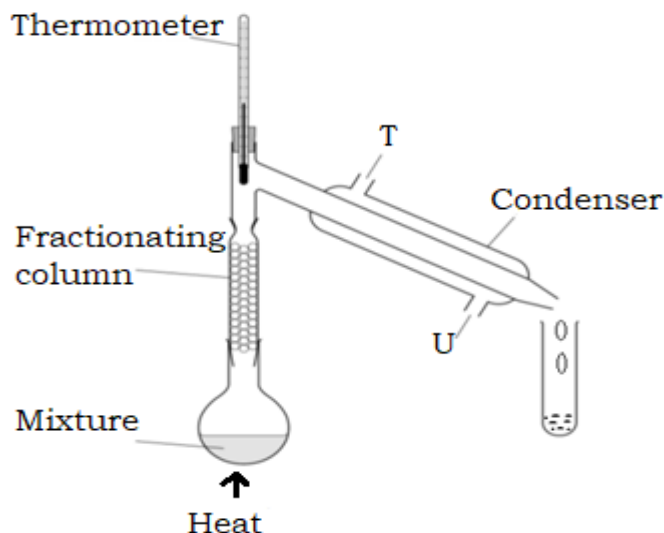
- (b) Give two reasons why aluminium is preferred to magnesium for making cooking pans (2marks)

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14. **Figure 5** shows the apparatus that is used to separate a mixture of liquids K and M using fractional distillation.

Figure 5



- (a) Explain why fractional distillation is preferred to simple distillation to separate liquids K and M. (1mark)
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-
- (b) Suggest labels that should be added to positions T and U in the figure to show the direction of flow of water. (1mark)
- Position T..... Position U.....
15. In the extraction of metals, both carbon and carbon (ii) oxide are used as the reducing agents .
- (a) Explain why Sodium metal is not extracted using reduction method (1mark)
-
- (b) Why is carbon (ii) oxide and not carbon being referred to as the chief reducing agent . (1mark)
-
-



16. C_{60} forms hydrocarbons with similar chemical properties to those of alkenes. One such hydrocarbon is $C_{60}H_{18}$.

(a) Explain why $C_{60}H_{18}$ is referred to as a hydrocarbon? (1mark)

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(b) $C_{60}H_{18}$ is an alkene though with multiple double covalent bonds. Identify one chemical that can be used to test for the presence of double bonds between carbon atoms in the alkene molecules. (1mark)

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(c) State the observations made when the test is carried out using the chemical identified in (b) above. (1mark)

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17. Chlorine is added to some drinking water supplies to decrease the risk of people suffering from diseases such as cholera.

(a) State why the amount of chlorine added must be controlled. (1mark)

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(b) Give the chemical family name of the group in the periodic table in which chlorine belong. (1mark)

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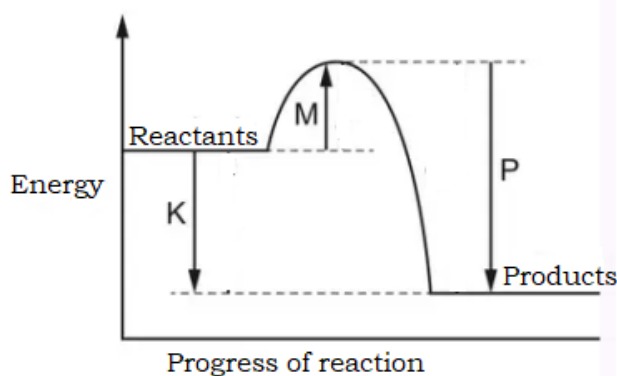
(c) Using a solution of lead (ii) nitrate, explain how the presence of chloride ions in the drinking water can be confirmed. (2marks)

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18. **Figure 6** below shows a reaction pathway. Study it and answer the questions that follow.

Figure 6



- (a) Give the name of the type of the reaction shown. Give reason for your answer.
 (2marks)

- (b) Identify the arrow which represents
- I. Activation energy (½marks)

- II. Heat change for the reaction. (½marks)

19. In the extraction of sulphur by Frasch process, water at a temperature of 170°C is pumped into the sulphur deposits.

- (a) State the role of the water. (1mark)

- (b) Explain how a temperature of 170°C is achieved. (1mark)



20. A student reacted nitric (v) acid with a base to form a solution of magnesium nitrate

(a) Write the chemical formula of the base. (1mark)

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(b) The student evaporates the water and obtained a solid magnesium nitrate. In the space provided below, draw a labeled set up diagram which could have been used to evaporate the solution. (2marks)

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(c) Give the name of the products formed when solid magnesium nitrate is heated until there is no further change in mass. (1mark)

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(d) State how the thermal stability of the nitrates of group II metals change down the group. (1mark)

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21. In terms of structure and bonding, explain why silicon (iv) oxide has a higher melting point than carbon (iv) oxide. (2marks)

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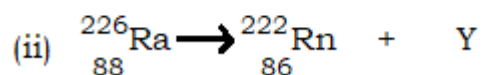
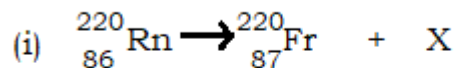
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22. (a) Complete the following nuclear equations to show the mass numbers and atomic numbers of the emitted particles X and Y. The letters are not the actual symbols of the particles.



Give the actual names of particles X and Y. (2marks)

Particle X.....

Particle Y.....

- (b) Determine if the nuclide ${}_{86}^{222}\text{Rn}$ is stable or not. Show your working. (2marks)

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23. (a) State the kinetic theory of matter. (1mark)

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- (b) Explain how the decrease in volume of a fixed mass of gas affects its pressure?

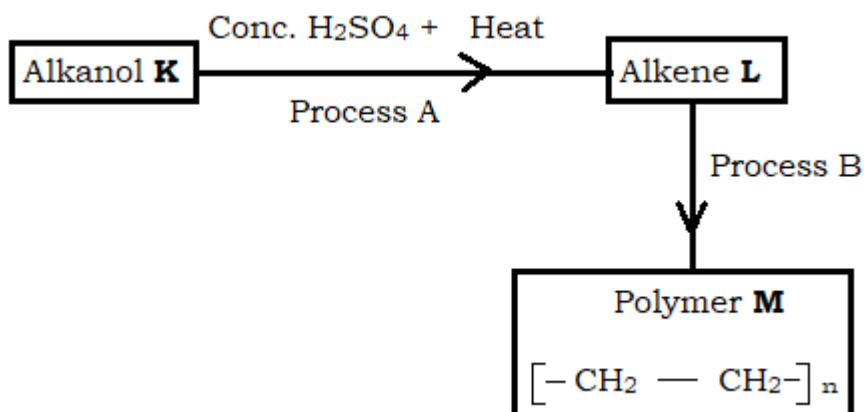
..... (1mark)

- (c) Identify the gas law which gives the relationship between the volume and the pressure of a fixed mass of gas. (1mark)

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



(a) Identify

(i) The alkanol K..... (½marks)

(ii) The alkene L..... (½marks)

(b) Give the name of the process marked A and B. (1mark)

Process A.....

Process B.....

(c) Explain one environmental effect of usage of compound M. (1mark)

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25. (a) State the difference between temporary water hardness and permanent water hardness. (1mark)

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(b) Explain why sodium and potassium salts do not cause water hardness. (1mark)

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(c) Explain why filtration of hard water does not remove its hardness. (1mark)

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26. One of the methods used in the manufacture of sodium hydroxide and chlorine is by the use of mercury cell. The electrolyte used is a concentrated solution of sodium chloride.
- (a) The anode in the cell is made of carbon or titanium. Give reason. (1mark)

- (b) Chloride (Cl^-) ions and not Hydroxide (OH^-) ions are preferentially discharged at the anode. Give reason. (1mark)

- (c) Explain why mercury cell is not commonly used to manufacture sodium hydroxide and chlorine. (1mark)

27. When a piece of sodium is added to 200cm^3 of water in a large plastic beaker, a vigorous reaction occurs and the temperature of the water rose by 25°C .
- (a) Write a chemical equation of the reaction. (1mark)

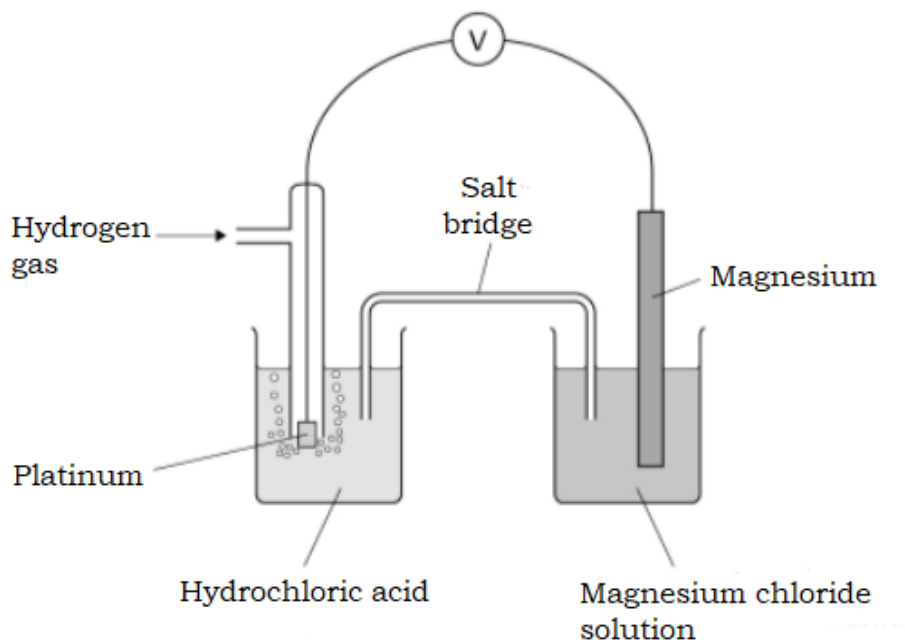
- (b) Explain why it is not advisable to react a similar piece of sodium with 10cm^3 of water in a boiling tube. (1mark)

- (c) Determine the heat change for the reaction. (2marks)
 The heat capacity is $4.2 \text{ kJkg}^{-1}\text{K}^{-1}$



28. **Figure 7** Shows a cell used to measure the standard electrode potential of Magnesium electrode using Hydrogen as the reference electrode.

Figure 7



- (a) Identify the standard conditions for measuring the electrode potential (1mark)
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-
- (b) Identify an ionic compound that could be used in the salt bridge. (1mark)
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-
- (c) Write the electrode potential of the standard hydrogen electrode (1mark)
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- (d) Water is added to the beaker containing the concentrated magnesium chloride to form a solution. Explain the effect on the e.m.f of the cell? (1mark)
-
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