

# NYAHOKAKIRA CLUSTER TWO 2024

Kenya Certificate of Secondary Education

**233/2**

**CHEMISTRY**

**Paper 2**

**(Theory)**

**July 2024 - 2 Hours**

Name: ..... Adm. No: .....

Stream..... School.....

## Instructions to Candidates

- (a) Write your **name, stream and admission number** in the spaces provide above.
- (b) Answer **all** questions in the spaces provided in this question paper.
- (c) All your answers must be written in the spaces provided after every question.
- (d) **This paper consists of 13 printed pages.**
- (e) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (f) **Candidates should answer the questions in English.**

## For Examiner's use only

Questions	Maximum Score	Score
1	08	
2	12	
3	10	
4	12	
5	11	
6	12	
7	12	
<b>TOTAL SCORE</b>	<b>80</b>	

1. (a) Complete the table below by indicating the observation type of change whether permanent or temporary and name of new compound formed. (4 marks)

Experiment.	Observation.	Type of change.	Name of new product.
Heating iodine crystals in a test tube.			
Heating lead (II) nitrate in a test tube.			
Heating hydrated cobalt (II) chloride.			

(b) A student used the following procedure to extract oil from cashew nuts.

- ✓ Crush the cashew nuts with mortar and pestle.
- ✓ Add propanone and continue crushing.
- ✓ Decant the mixture and evaporate in the sun leaving behind oil.

(i) Name the method of separation used. (1 mark)

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(ii) Explain why the cashew nuts were first crushed. (1 mark)

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(iii) State why propanone is suitable for use in the above process. (1 mark)

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(iv) Describe how liquid obtained can be proved to be oil. (1mark)

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2. (a) The grid below show part of the periodic table.(The letter do not represent the actual symbols. Use it to answer the questions that follow.

<b>T</b>								<b>Q</b>
				<b>S</b>		<b>R</b>	<b>K</b>	
<b>A</b>	<b>J</b>		<b>Y</b>		<b>U</b>		<b>L</b>	
<b>W</b>							<b>M</b>	<b>B</b>
	<b>C</b>						<b>N</b>	
<b>P</b>								

(i) Select the most reactive non-metal. (1mk)

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(ii) Select an element that forms a divalent cation. (1mk)

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(iii) Element **Z** has atomic number 14.Show its position in the grid. (1mk)

(iv) How do the atomic radii of **U** and **J** compare? (1mk)

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(v) How do electrical conductivity of **A** and **Y** compare? (1mk)

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(vi) How does the boiling point of elements **K**, **L** and **M** vary? Explain (2mks)

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(vii) Using dots (.) and crosses(x) to represent outermost electrons, show how element **Y** and **L** combine (2mks)

- (b) The table below gives information on four elements by letters V, X, E and G. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electron arrangement	Atomic radius	Ionic radius
V	2:8:2	0.136	0.065
X	2:8:7	0.099	0.181
E	2:8:8:1	0.203	0.133
G	2:8:8:2	0.174	0.099

- (a) Which two elements have similar properties? Explain. (2mks)

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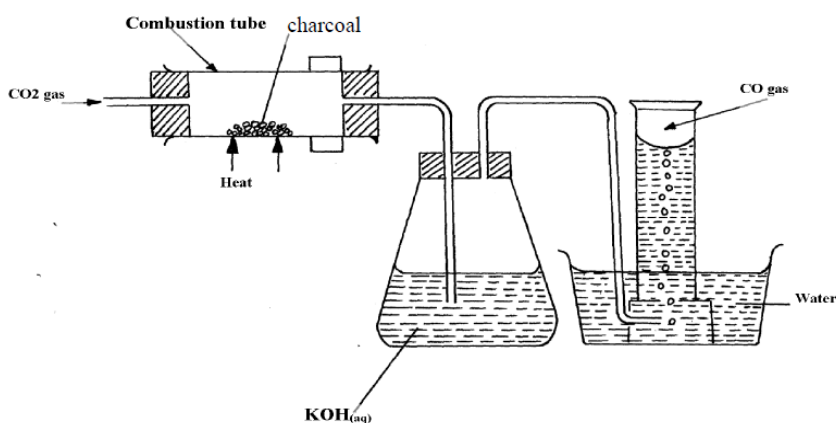
- (b) Which element is a non-metal? Explain. (1mk)

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- (c) Which one of the elements is the strongest reducing agent? (1mk)

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3. (a) The diagram below shows the set-up used to test a property of carbon in the laboratory. Study it and use it to answer the questions that follow.



i. State the role of potassium hydroxide solution (1 mk)

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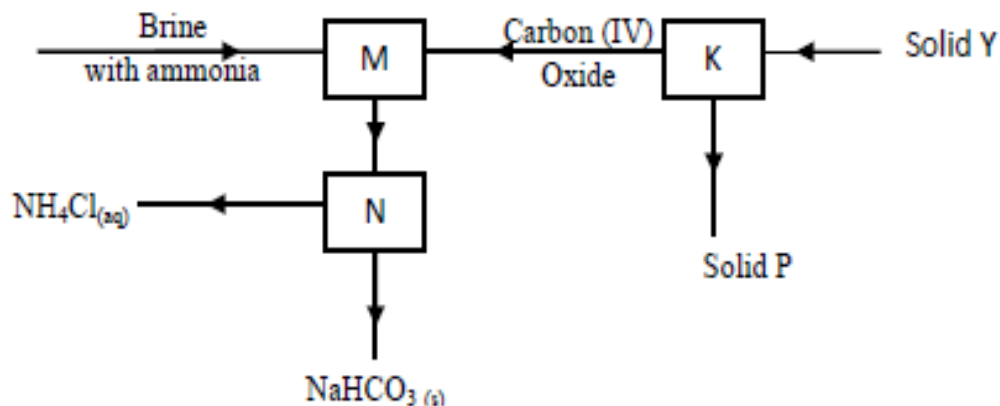
ii. Write an equation for the reaction in the combustion tube (1 mark)

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iii. State the property of carbon being investigated. (1 mark)

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(b) Sodium carbonate is prepared industrially using Solvay process. The flow diagram below shows some of the reactions in the process. Study it and use it to answer the questions that follow



i. Identify; (2 mks)

Solid Y .....

Solid P .....

ii. Write an equation for the reaction taking place in chamber M (1 mk)

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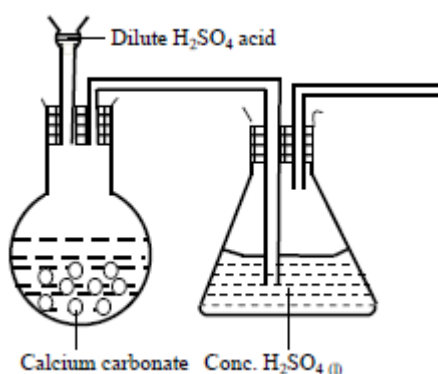
iii. Name the process taking place in chamber N. (1 mk)

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iv. State two uses of sodium carbonate (2 mks)

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(c) The set-up below was used to prepare carbon (IV) oxide gas in the laboratory. Study it and answer the questions that follow.



i. Identify the mistake in the set-up and suggest a possible correction. (2 mks)

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ii. Complete the diagram showing how the gas can be collected (1 mk)

4. (a) (i) Name the following organic compounds. (2 mks)

I.  $C_4H_8$

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II.  $CH_3CCH$

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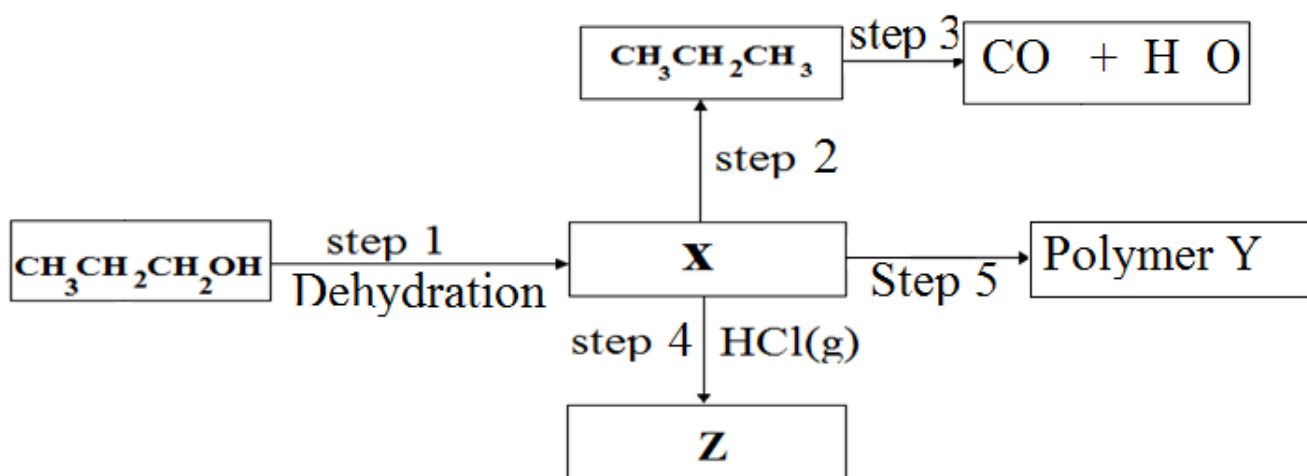
(b) When is a hydrocarbon molecule considered to be saturated? (1 mk)

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(c) Draw and name isomers of  $C_4H_{10}$

(2 mks)

(d) **Figure 2** shows a flow chart involving reactions of some organic compounds.



i) Write the formula and give the names of compounds:

I. X (2 mks)  
Name Formula

.....

II. Z (2 mks)  
Name Formula

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ii) Give the reagents and conditions necessary for carrying out: (1 mk)

I. Step 1

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II. Step 2

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iii) Write the equation for the reaction in step 3. (1 mk)

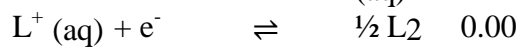
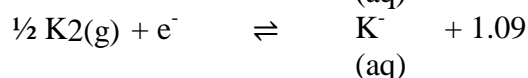
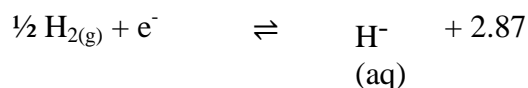
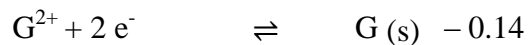
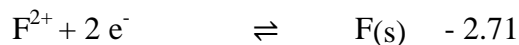
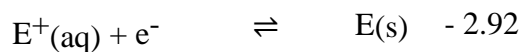
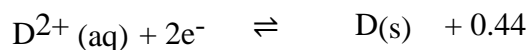
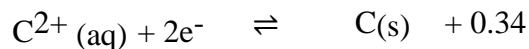
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iv) Name polymer Y (1 mk)

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5. Use the information below on standard electrode potentials to answer the questions that follow: The letters are not the actual symbols of the elements.

Electrode reaction  $E^\ominus$  volts



(a) (i) Select the strongest reducing agent. Give a reason. (2 mks)

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(ii) Calculate the e.m.f of the cell formed by connecting half cells C and D. (1 mk)

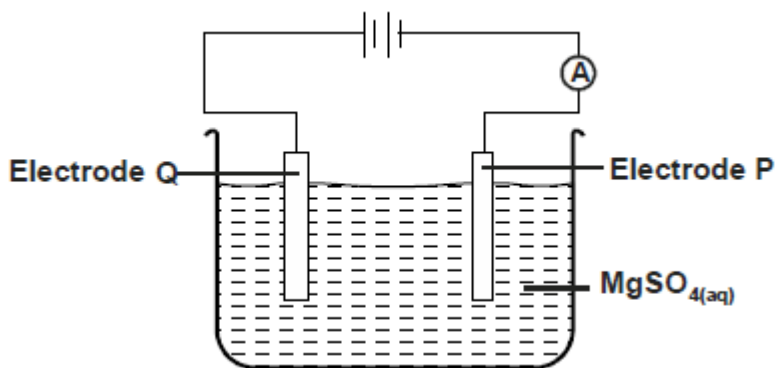
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(b) Draw and label a diagram of the electrochemical cell formed by connecting half cells of **K** and **D**. On the diagram indicate the direction of flow of electrons. (3 mks)

(c) The set-up below was used during the electrolysis of a solution of Magnesium sulphate using inert electrodes.



(i) State the observation made in electrode Q. Explain (2 mks)

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(ii) Write an equation for the reaction in electrode P (1 mk)

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(iii) A current of 0.5 Amperes was passed through the cell for 16 minutes and 5 seconds. Calculate the volume of product at the anode at RTP (1M= 24l ,I F=96500C) (3 mks)

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(d) Give one application of electrolysis (1 mk)

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6. (a) In an experiment to determine the molar heat of reaction when magnesium displaces copper, excess magnesium powder was added to 25.0cm<sup>3</sup> of 2.0M copper (II) chloride solution at 23°C. The temperature rose to 38°C.

(i) Apart from increase in temperature, state and explain the observations which were made during the reaction (2 mks)

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(ii) Calculate the heat change during the reaction. (2 mks)  
(Specific heat capacity of the solution =4.2 J g<sup>-1</sup> K<sup>-1</sup>, density of the solution =1g/cm<sup>3</sup>).

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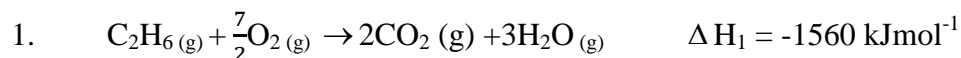
(iii) Write the ionic equation for the reaction. (1 mk)

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(iv) Determine the molar heat of displacement of copper by magnesium. (2 mks)

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(b) Use the thermochemical equations below to answer the questions that follow.



(i) Name two types of heat changes represented by  $\Delta H_3$ . (2 mks)

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(ii) Draw an energy level diagram for the reaction represented by equation 1 (2 mks)

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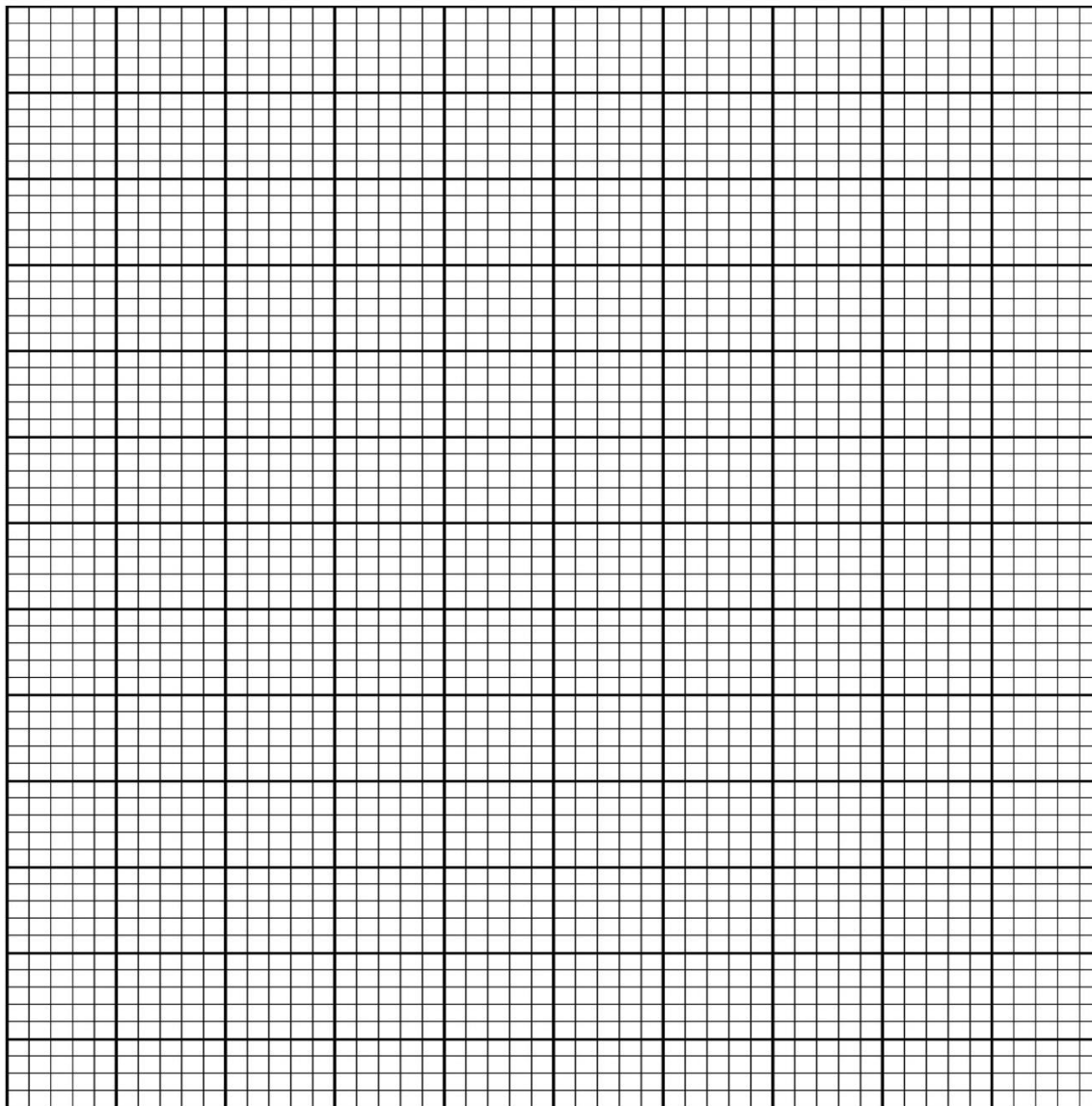
(iii) Calculate the standard enthalpy of formation of ethane. (2 mks)

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7. In an experiment to study the rate of reaction a 10cm length of magnesium ribbon was reacted with 50cm<sup>3</sup> of 1M hydrochloric acid. The table below gives the data that was collected.

Time(sec)	0	10	20	30	40	50	60	70	80	90
Volume of hydrogen (cm <sup>3</sup> )	0	60	90	105	112	116	118	120	120	120

(a) (i) Plot a graph of volume of hydrogen against time. (3 mks)



(ii) From the graph find:

- I. the volume of hydrogen that had been produced when time was 35 seconds. (1 mk)

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- II. the rate of reaction when time is 45 seconds. (1 mk)

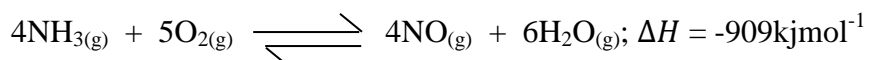
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III. Sketch on the diagram the curve you would obtain if the reaction is repeated using 0.5M HCl. Label this curve as C (1 mk)

(b) (i) State what is meant by the term “dynamic equilibrium”. (1 mk)

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(ii) One of the reactions in the manufacture of Nitric (V) acid involves catalytic oxidation of ammonia as shown in the equation.



The reaction is carried out at a pressure of 10 atmospheres and a temperature of 900<sup>0</sup>C. State the effect on the position of equilibrium if the reaction is carried out;

I. at 10 atmospheres pressure and 450<sup>0</sup>C. (1 mk)

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II. at 900<sup>0</sup>C and 20 atmospheres pressure. (1 mk)

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III. In the absence of a catalyst. (1 mk)

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