

# NYAHOKAKIRA CLUSTER TWO 2024

Kenya Certificate of Secondary Education

**233/1**

**CHEMISTRY**

**Paper 1**

**(Theory)**

**July 2024 - 2 Hours**

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

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

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## Instructions to Candidates

- (a) Write your **name, admission number, stream and school** 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 12 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.**
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## For Examiner's use only

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1 – 29	80	

1. The table below indicates the PH value of solutions labelled M, L, N, P and Z.

PH	4	14	1	10	7
Solution	M	L	N	P	Z

(i) **Which** solution has the highest concentration of hydrogen ions? (1mk)

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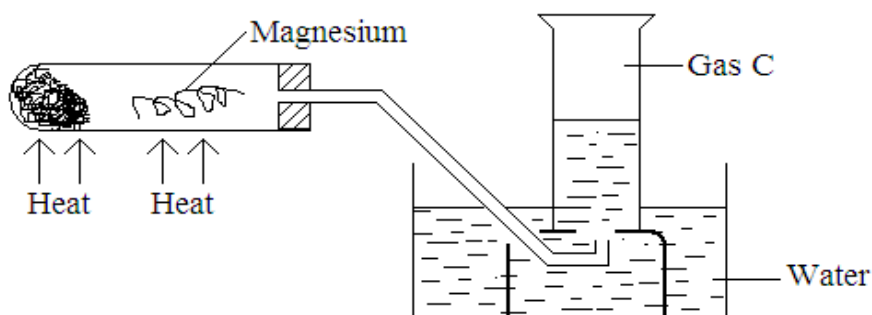
(ii) **Which** solution can be used as an anti-acid? **Give** a reason for your answer. (2mks)

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



a. **State** the observation made in the boiling tube. (1mk)

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b. **Write** an equation for the reaction that takes place in the tube. (1mk)

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c. What property makes it possible for gas C to be collected as shown? (1mk)

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3. In which homologous series do the following compounds belong?

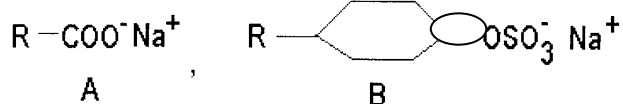
(i)  $\text{CH}_3\text{CHCH}_2$  (2 mks)

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(ii)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

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4. The structures shown below represent two cleansing agent A and B.



(a) Name the type of cleansing agent A. (1 mk)

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(b) Which of the two cleansing agents is more suitable for washing in water containing calcium chloride? Give a reason.

(2 mks)

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5. (a) Name the two common ores from which Zinc metal can be extracted. (1 mk)

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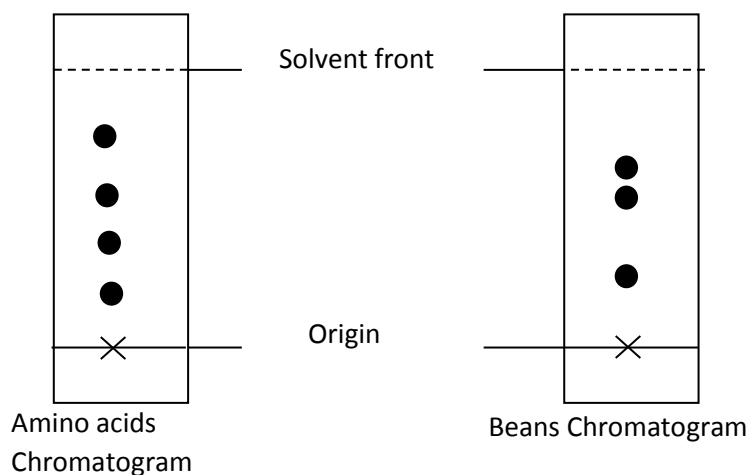
(b) Taking one of the ores named in (a) above, write a chemical equation for the roasting process to get the required oxide. (1 mk)

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(c) Outline any two uses of Zinc metal. (1 mk)

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6. Paper chromatography was carried out to investigate presence of amino acids in beans. Study the chromatograms below to answer the question that follow:-



What conclusion can be drawn from these results? (2 mks)

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7. Starting with Zinc metal describe how you would obtain a sample of solid zinc carbonate. (3 mks)

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8. i) The percentage of  $^{69}_{31}\text{X}$  is 60% and  $^{71}_{31}\text{X}$  is 40% for an isotopic element X. Calculate the relative atomic mass of X. (2 mks)

ii) Why do the two species have the same chemical properties? (1 mk)

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9. 15.8g of Sodium nitrate saturated 29.3cm<sup>3</sup> of water at 32<sup>0</sup>C. Determine the solubility of Sodium nitrate at 32<sup>0</sup>C. (Density of water =1g/cm<sup>3</sup>). (3 mks)

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10. Calculate the oxidation number of manganese in:

i)  $\text{KMnO}_4$  (1mark)

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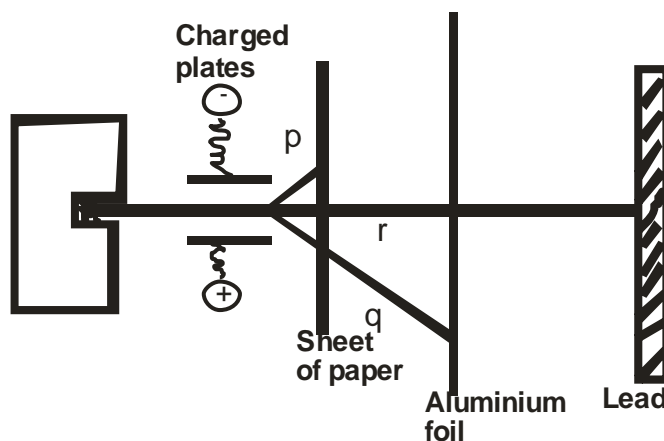
ii)  $\text{MnCl}_2$  (1mark)

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2. Study the diagram below to answer the questions that follow.



Name the radiations p, q and r

i) p ..... (1mk)

ii) q..... (1mk)

iii) r..... (1mk)

3. a) Name **two** types of flame of the Bunsen burner. (1mk)

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b) Which is the better flame for heating in the laboratory. Give **two** reasons. (2 mks)

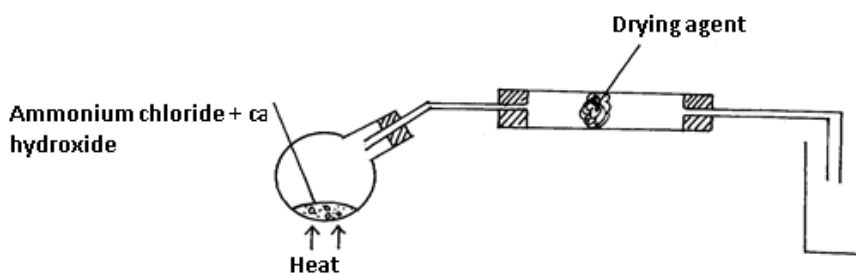
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13. a) State Boyle's law. (1 mk)

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b)  $60\text{cm}^3$  of oxygen gas diffused through a porous portion in 50 seconds. How long would it take  $60\text{cm}^3$  of sulphur (IV) oxide gas to diffuse through the same portion under same conditions. (S=32.0, O=16.0) (2 mks)

14. A student set up the apparatus as shown below to prepare and collect dry ammonia.



i) Identify **two** mistakes in the set up and give a reason for each mistake. (2 mks)

I.....  
II.....

ii) Name a suitable drying agent for ammonia (1 mk)

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15. Chlorine gas was bubbled through potassium iodide solution.

a) State the observation that would be made. (1 mk)

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b) Write the ionic equation for the reaction that took place in (a) above. (1 mk)

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c) Identify the oxidizing agent in the ionic equation (b) above. (1 mk)

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16. In the Haber process, the optimum yield of ammonia is obtained when a temperature of 450°C, pressure of 200 atmospheres and an iron catalyst are used. Equation for the reaction is shown below.



How the yield of ammonia would be affected if:

i) Temperature raised to 600°C (1 mk)

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ii) Pressure raised to 250 atmospheres. (1 mk)

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iii) The amount of catalyst doubled (1 mk)

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17. Use the standard electrode potentials for the elements to answer the questions that follow. The letters do not represent the actual symbols.

	$E^\ominus$ (V)
$\text{D}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{D}_{(\text{s})}$	+0.34
$\text{B}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{B}_{(\text{s})}$	+ -2.38
$\text{E}_{2(\text{g})} + 2\text{e}^- \longrightarrow 2\text{e}^-_{(\text{aq})}$	+0.54
$2\text{C}^+_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{C}_{2(\text{g})}$	+0.00

i) Which element is likely to be hydrogen? Explain (1 mk)

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- ii) Identify **two** half cells from the above that when combined will give an electrochemical cell with the largest e.m.f. calculate the e.m.f. (2 mks)

18. The table below gives melting points and ionization energies of 3 metallic elements A, B, and C. The metals are arranged as they occur in the periodic table.

Element	Melting point (°C)	First ionization energy KJ/mol
A	180	520
B	98	496
C	64	419

- a. Which of these elements is the strongest reducing agent? (1 mk)

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- b. Are these elements members of the same group or period? (1 mk)

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- c. Using 'dot' and 'cross illustrate bonding in Carbon (II) Oxide (1 mk)

19. Silicon (iv) oxide is a solid at room temperature whereas carbon (iv) oxide is a gas at room temperature. Explain. (2 mk)

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20.  $20.0\text{cm}^3$  of a solution containing 4g per litre of sodium hydroxide was neutralized by  $8.0\text{cm}^3$  of dilute sulphuric (vi) acid. Calculate the concentration of sulphuric (vi) acid in moles per litre  
(Na = 23.0, O = 16.0 H = 1.0 ) (3 mks)

21. When a sample of concentrated sulphuric (vi) acid was left in an open beaker in a room for two days, the volume was found to have increased slightly.

a. Name property of concentrated sulphuric (vi) acid shown by the above reaction? Explain (2 mks)

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b. State one use of concentrated sulphuric (vi) acid that depends on the property named above. (1 mk)

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22. The standard heat of combustion of carbon is  $-393\text{kJ/mol}$ , for hydrogen is  $-286\text{kJ/mol}$  and that of Butane is  $-2877\text{kJ/mol}$ . Calculate the heat of formation of Butane and draw an energy level. (3 mks)

23. Barium nitrate and Barium chloride were mixed with water to form solution 'X' Sodium carbonate and potassium chloride solutions were mixed to form solution 'Y'. Solution 'X' and 'Y' were then mixed. Write an ionic equation of the reaction that took place when the two solutions were mixed. (1 mk)

24. An iron sculpture was produced to commemorate the anniversary of founder of a certain village. To prevent it from rusting, the village elder attached it by a wire to a block of zinc which was stored underground out of sight.

(i) Explain how the village elder's action would prevent the rusting of the sculpture. (1mk)

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(ii) What name is given to this method of preventing rusting? (1 mk)

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(iii) List down **two** other ways in which rusting of the statue could be prevented. (1 mk)

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25. The grid below is part of the periodic table. Use it to answer the questions that follow. (The letters do not represent the actual symbols of elements)

						<b>R</b>	<b>S</b>	
<b>N</b>	<b>Q</b>						<b>T</b>	<b>U</b>
<b>P</b>								

(a) Indicate in the grid the position of an element represented by letter V, whose atomic number is 14. (1 mk)

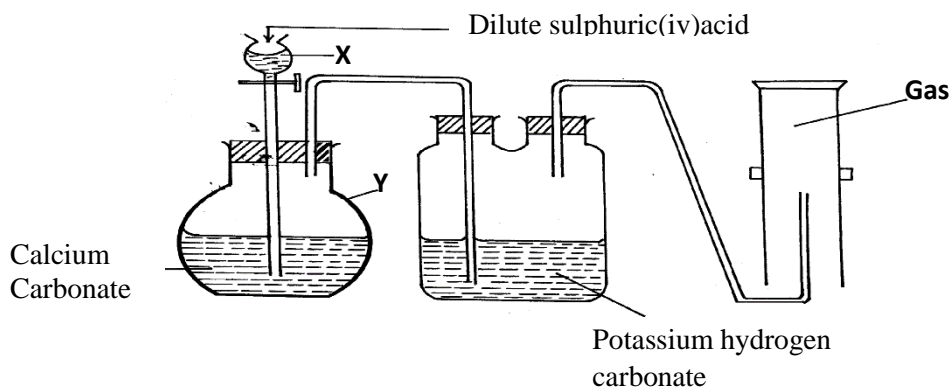
(b) Select a letter which represents a monoatomic gas. (1 mk)

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(a) Write an equation for the reaction between Q and T (1 mk)

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26. A student set up the apparatus for the preparation of carbon (IV) oxide gas as shown below. Study the set up and answer the questions that follow.



(a) Explain using an equation why the reaction in apparatus Y occurs for a very short time then stops. (1 mk)

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(b) What is the purpose of passing the gas through potassium hydrogen carbonate? (1 mk)

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(c) **State** and **explain** why there is no sample of carbon (IV) oxide gas collected. (1 mk)

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27. 3.1g of an organic compound containing carbon ,hydrogen and oxygen only produced 4.4g of carbon(iv) and 2.0 of water on combustion

(a) Calculate its empirical formulae (2 mks)

(b) Calculate its molecular formula if its mass 90. (1 mk)

28. 50g of a radioactive substance was reduced to 6.25g in 36.3years. Calculate the half-life of the substance. (2 mks)

29. Explain the effect of the following on the rate of reaction in terms of the collisions theory (3 mks)

(a) Increase in concentration

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(b) Change in pressure

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(c) Use of catalyst

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