

NAME..... INDEX NO.....

233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

CANDIDATE'S SIGN.....

DATE.....

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- (i) Write your **name** and **index number** in the spaces provided **above**.
- (ii) **Sign** and write the **date** of examination in the spaces provided **above**.
- (iii) Answer **ALL** the questions in the spaces provided.
- (iv) Mathematical tables and silent electronic calculators **may be** used.
- (v) All working **must be** clearly shown where necessary.
- (vi) 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 – 29	80	

This paper consists of **12** printed pages. Candidates should check to ascertain that all the pages are printed as indicated and that no questions are missing.

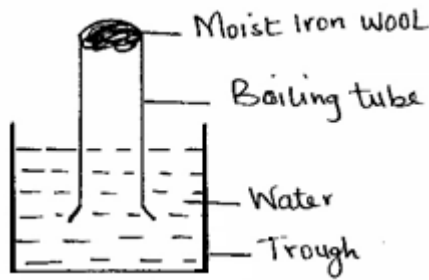
1. Name the most suitable method you can use to separate;
- (a) Xanthophyll and chlorophyll in green leaves. (1 mark)
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- (b) Oil from simsim seeds. (1 mark)
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2. The table below shows atomic numbers of four elements **W**, **X**, **Y** and **Z**.

Element	W	X	Y	Z
Atomic number	20	17	19	9

- (a) Write electron arrangement of the ion of **Z**. (1 mark)
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- (b) (i) Write the formula of the compound formed between **W** and **X**. (1 mark)
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- (ii) Name the bond(s) and structure of the compound in (i) above. (1 mark)
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3. A student set-up an experiment as shown below. Moist iron wool was placed in a boiling tube and inverted over water.



- (a) What was observed after two days? (1 mark)
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- (b) Explain the observations. (1 mark)
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- (c) What would be observed if a large piece of iron wool was used? (1 mark)
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4. Element X is found in period 3 group (IV) it consists of two isotopes ^{28}X and ^{Q}X . A sample of X was found to consist of 90% of ^{28}X if the relative atomic mass of X is 28.3, work out the number of neutrons in ^{Q}X . (3 marks)

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5. Study the table below and answer the questions that follow:

Element	Atomic radius (nm)	Ionic radius (nm)
P	0.168	0.095
Q	0.094	0.133
R	0.124	0.156
S	0.146	0.086

- (i) State the elements which are metals. (1 mark)

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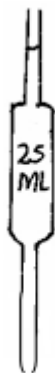
- (ii) Identify the strongest reducing agent. Give a reason. (2 marks)

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6. The diagram below represents an apparatus found in a chemistry laboratory. Give its name. (1 mark)



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7. Given the following bond energies.

C – C	(347kJ mol ⁻¹)
C – H	(413kJ mol ⁻¹)
C = C	(612kJ mol ⁻¹)
H – H	(435.9kJ mol ⁻¹)

- Calculate the enthalpy change of hydrogenation of ethene. (3 marks)

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8. When hydrogen gas was passed over heated lead (II) oxide in a combustion tube and the gaseous products cooled, a colourless liquid was obtained.

(i) Which chemical test would you use to confirm the colourless liquid above? (1 mark)

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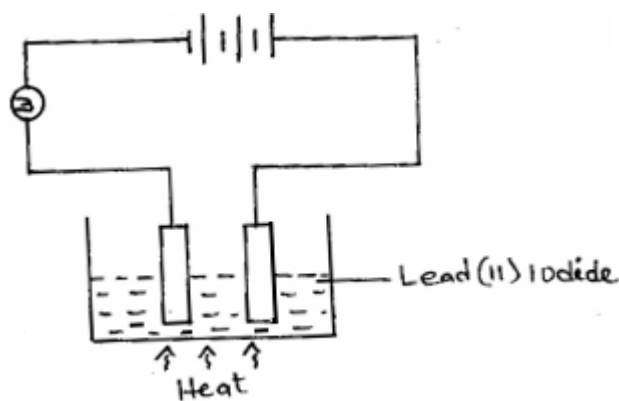
(ii) What observations were made in the combustion tube? (1 mark)

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(iii) Write an equation for the reaction between hydrogen and lead (II) oxide. (1 mark)

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9. The diagram below shows an experiment for investigating electrical conductivity in lead (II) iodide. Study it and answer the questions that follow.



- (a) On the diagram;
- (i) Label the cathode. (1 mark)
 - (ii) Show the direction of movement of electrons. (1 mark)

(b) Write an equation for the reaction that takes place at the anode. (1 mark)

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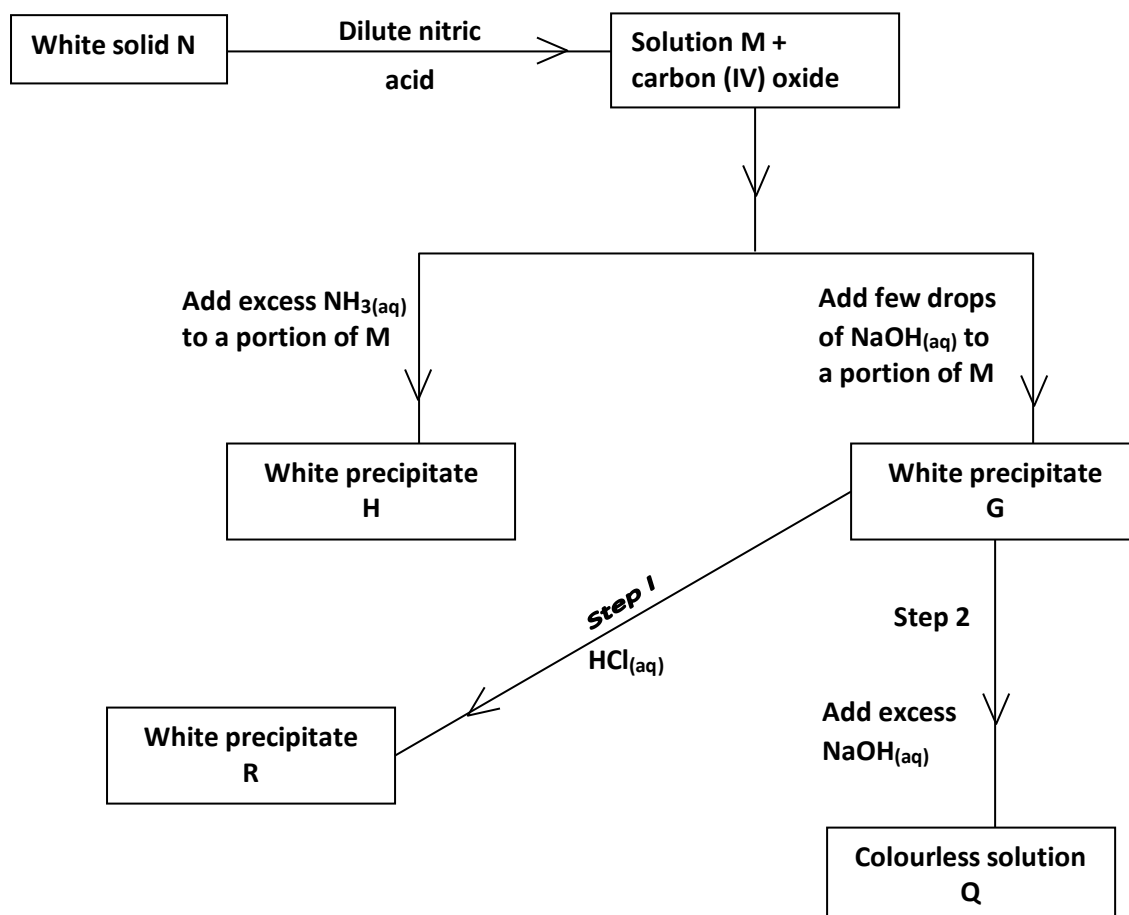
10. (a) State the Graham's law of diffusion. (1 mark)

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(b) Two gases A and B diffuse in the ratio 2: 1 if the molecular mass of gas A is 16g, find the molecular mass of B. (2 marks)

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



(a) Identify solid **N**. (1 mark)

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(b) Write down the equation for the reaction that leads to the formation of solution **Q** from the white precipitate **G**. (1 mark)

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(c) State the property of precipitate **G** that is demonstrated by Step **1** and **2**. (1 mark)

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12. The basic raw material for extraction of aluminium is bauxite.

(a) Name the method that is used to extract aluminium from bauxite. (1 mark)

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(b) Cryolite is used in the extraction of aluminium from bauxite. State its role. (1 mark)

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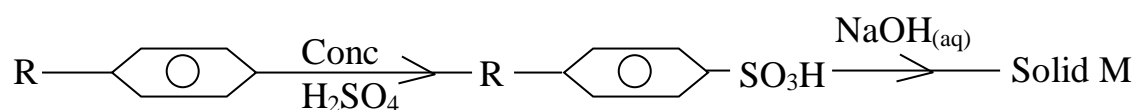
(c) Aluminium is a reactive metal yet utensils made of aluminium do not corrode easily. Explain this observation. (1 mark)

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13. The scheme below represents the manufacture of a cleansing agent **M**.



(a) (i) Draw the structure of **M**. (1 mark)

(ii) To which type of cleansing agent does **M** belong? (1 mark)

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14. If chlorine gas is passed over heated iron fillings and the product dissolved in water, a yellow solution is formed.

(i) Identify the yellow solution. (1 mark)

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(ii) What would be observed if aqueous sodium hydroxide solution was added to the yellow solution? (1 mark)

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(iii) Write an ionic equation for the reaction between the yellow solution and sodium hydroxide. (1 mark)

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15. Using excess zinc powder and dilute sulphuric (VI) acid describe how a sample of dry zinc sulphate crystals can be prepared. (3 marks)

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16. An organic compound Y was analysed and found to contain carbon, hydrogen and oxygen only. 1.29g of Y on complete combustion gave 2.64g of carbon (IV) oxide and 0.81g of water. Find the empirical formula of Y. (C = 12, H = 1, O = 16). (3 marks)

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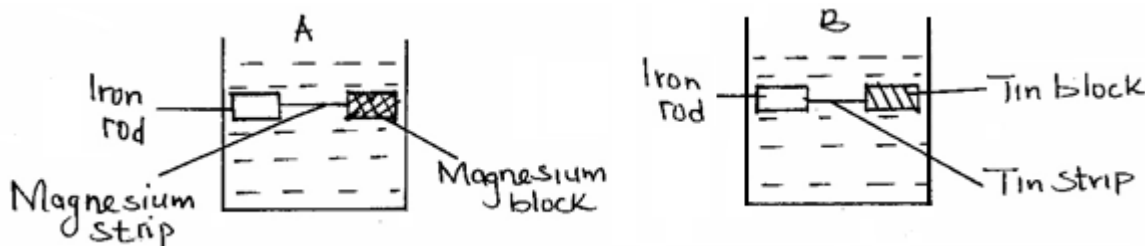
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17. The diagrams below were set up by form 4 students to investigate methods of preventing rusting.



- (i) It was observed that rusting occurred in set up B and not in set up A. Explain. (2 marks)

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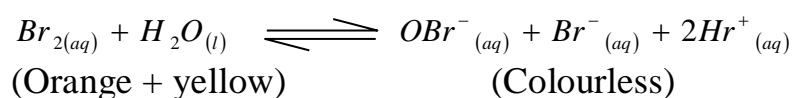
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- (ii) State **one** other method of preventing rusting in iron. (1 mark)

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18. An equilibrium exists between the reactants and products as shown in the equation below.



- (i) Select the species that acts as an acid. Explain. (1 mark)

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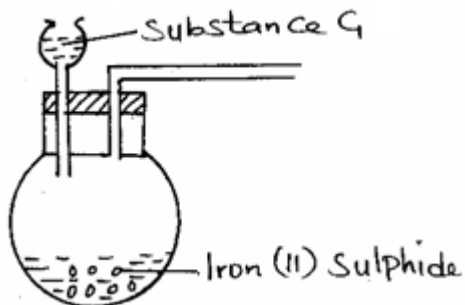
- (ii) State and explain the observations made when aqueous sodium hydroxide solution is added to the above equilibrium. (1 mark)

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19. The apparatus shown below were set-up to prepare and collect hydrogen sulphide gas.



(a) Name substance G. (1 mark)

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(b) Complete the set up to show how a dry sample of hydrogen sulphide gas is collected. (2 marks)

20. The boiling points of some compounds of hydrogen and some elements in group (IV) and (VI) of the periodic table are given below.

Compound	Boiling point (°C)	Compound	Boiling point (°C)
CH ₄	-174.0	H ₂ O	100
SiH ₄	-112.0	H ₂ S	-61

(a) Which of the compounds CH₄ and SiH₄ has stronger intermolecular forces. Give a reason. (1 mark)

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(b) Explain why the boiling points of H₂O and H₂S show different trends from that of CH₄ and SiH₄. (4 marks)

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21. Radon $^{222}_{84}\text{Ra}$ undergoes alpha decay to form lead, taking 15 days for the original mass to reduce to 6.25%.

(a) Write the nuclear equation for the reaction. (1 mark)

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(b) Calculate the half-life of radon. (2 marks)

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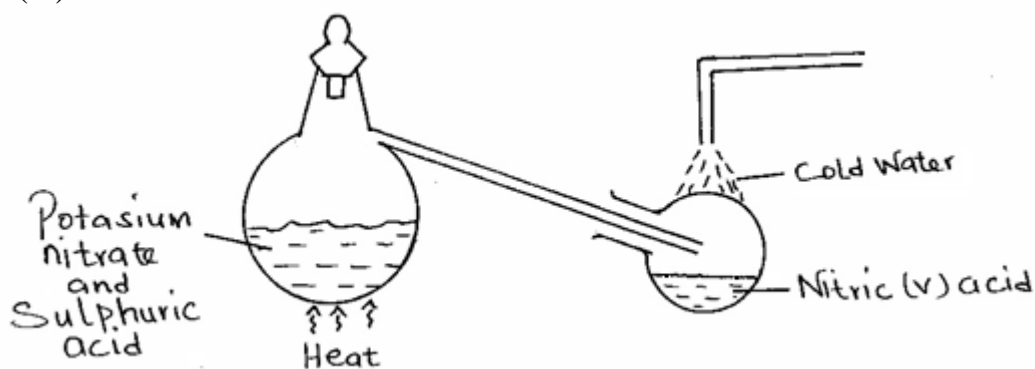
22. Ethanol and pentane are miscible liquids. Explain how water can be used to separate a mixture of ethanol and pentane. (2 marks)

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23. Illustrate bonding in carbon (II) oxide using dot (•) and cross (x) (C – 6, O – 8). (2 marks)

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24. The diagram below shows a set-up that was used to prepare and collect a sample of nitric (V) acid.



(a) Give a reason why it is possible to separate nitric (V) acid from sulphuric (VI) acid in the set up. (1 mark)

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(b) Name another substance that can be used instead of potassium nitrate. (1 mark)

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(c) Give **one** use of nitric (V) acid. (1 mark)

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25. A mixture of kerosene and water was shaken and left to stand, ammonia gas was then bubbled into the mixture followed by a few drops of phenolphthalein indicator. State and explain the observations made. (2 marks)

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26. Trona is a double salt of sodium with formula $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$. Trona is collected, dried and heated to convert it to sodium carbonate.

(i) Write an equation for the decomposition of trona by heat. (1 mark)

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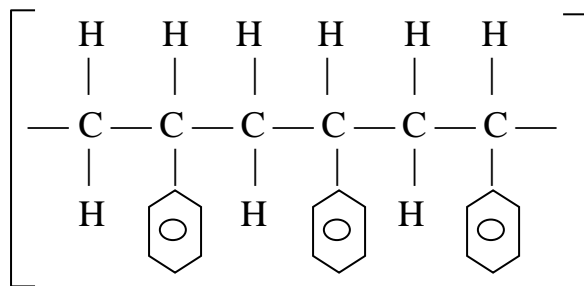
(ii) State **two** uses of sodium carbonate. (2 marks)

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27. Below is part of a synthetic polymer. Study it and answer the questions that follow.



(i) Draw the structure of its monomer. (1 mark)

- (ii) Determine the number of monomers making the above compound if its relative molecular mass is 104,000. The benzene ring has six carbon atoms and five hydrogen atoms (C = 12, H = 1). (2 marks)

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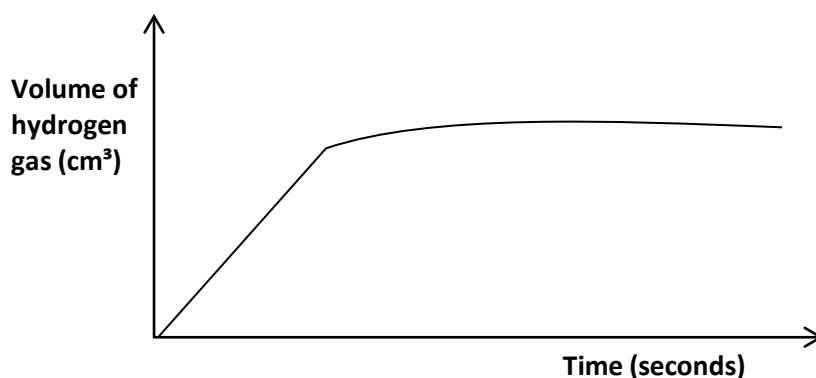
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28. In an experiment to prepare hydrogen gas using magnesium ribbon and dilute hydrochloric acid, a student plotted volume of hydrogen gas against time as shown in the sketch below.



- (a) (i) On the same axes, sketch the curve that would be obtained if a few crystals of copper (II) sulphate are added and label it curve C. (1 mark)
- (ii) What would be the function of copper (II) sulphate in the reaction?

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29. 1g of element T was completely converted to its chloride, TCl_2 . The mass of the chloride formed was 3.96g. Calculate the relative atomic mass of element T. (Cl = 35.5). (3 marks)

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