

Name \_\_\_\_\_ Index No. \_\_\_\_\_

Candidate's Signature \_\_\_\_\_

Date \_\_\_\_\_

**233/1**  
**CHEMISTRY**  
**PAPER 1**  
**THEORY**  
**JULY / AUGUST 2016**  
**2 HOURS**

**GATUNDU SOUTH FORM FOUR EVALUATION EXAMINATION**  
**Kenya Certificate of Secondary Education**  
**CHEMISTRY**  
**PAPER 1**  
**2 HOURS**

**INSTRUCTIONS TO CANDIDATES**

- (a) Write your name and index number in the spaces provided.
- (b) Sign and write the date of examination.
- (c) Answer all the questions in the spaces provided.
- (d) All working must be clearly shown
- (e) Mathematical tables and non-programmable silent calculators may be used.

**FOR EXAMINER'S USE ONLY**

<b>QUESTION</b>	<b>MAXIMUM SCORE</b>	<b>CANDIDATE'S SCORE</b>
1 – 27	80	

*This paper consists of 13 printed pages*

**Turn Over**

1. (a) Distinguish between ionization energy and electron affinity. (2 marks)

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- (b) The atomic number of Q and R are 9 and 17 respectively. Compare the electron affinity of Q and R. Explain. (1 mark)

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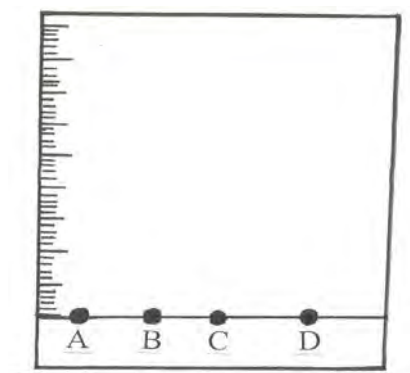
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2. The relative atomic mass of an element is 10.28, it has two isotopes  $^{10}_5\text{R}$  and  $^{11}_5\text{R}$ . Calculate the relative percentage abundance of each isotope. (3 marks)

3. The diagram below shows spots of pure substances A, B and C on a chromatography paper. Spot D is that of a mixture. After development A, B and C were found to have moved 9cm, 4cm and 7cm respectively D has separated into two spots which moved 7cm and 9cm.



- (a) On the diagram

(i) Using 5 units in the alongside scale to represent 1cm Show the position of all the spots after development. (2 marks)

(ii) Identify the substances present in mixture D. (1 mark)

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4. Describe how solid Aluminium chloride can be separated from a solid mixture of sodium chloride and ammonium chloride. ( 3 marks )

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5. The number of protons and neutrons of atoms W, X, Y and Z are shown in the table below.

Atom	No. of protons	No. of neutrons
W	6	6
X	12	12
Y	6	8
Z	17	20

- (a) Write down the electronic configuration of X. (1 marks )

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- (b) (i) Which one of the atoms is of an element in group (VII) of the periodic table. (1 mark )

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- (ii) Name the type of bond which is formed when X and Z reacts. (1 mark )

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6. The table below gives the solubility of potassium bromide and potassium sulphate at 0°C and 80°C.

Substance	0°C	80°C
Potassium bromide	58 g/100g water	77 g/100g water
Potassium sulphate	18 g/100g water	20 g/100g water

When an aqueous mixture containing 60g of potassium bromide and 7g of potassium sulphate in 100g of water was cooled from 80°C to 0°C, some crystals were formed.

- (a) Identify the crystals. (1 mark)

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(b) Determine the mass of crystals formed.

(1 mark)

(c) Name the method used to obtain the crystals.

(1 mark)

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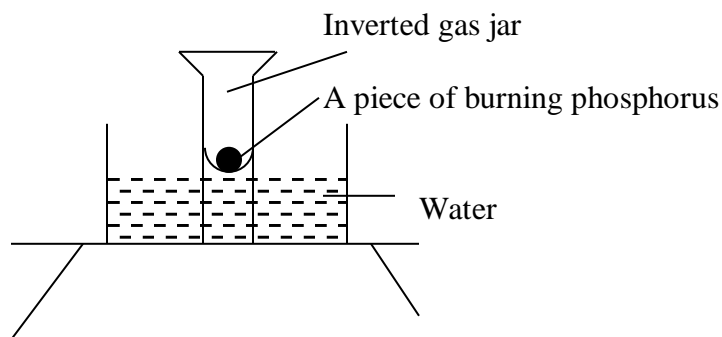
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7. What is the colour of the following.

(2 marks)

Metal oxide	Colour when hot	Colour when cold
Zinc (II)oxide		
Lead (II) oxide		

8. The diagram below represents a set up that was used to show that part of air which is used during burning.



(a) If excess phosphorus was used in the set up. Draw a diagram of the set up at the end of the experiment when there was no further observable change.

(2 marks)

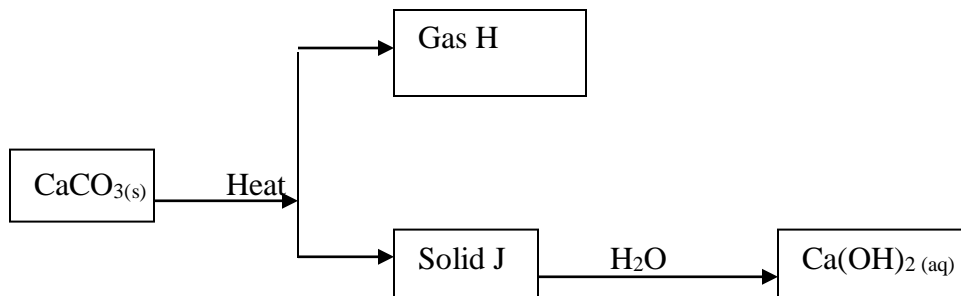
(b) Suggest one modification that should be made on the apparatus if the percentage of the air used is to be determined. (1 mark)

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9. Use the scheme below to answer the questions that follow.



(a) Identify the substances H and J.

H \_\_\_\_\_ (1 mark)

J \_\_\_\_\_ (1 mark)

(b) State one commercial use of solid J. (1 mark)

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10. Sulphur exists in two crystalline forms

(a) Name one crystalline form of sulphur. (1 mark)

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(b) Give any two uses of sulphur. (2 marks)

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11. (a) The equation below represents a redox reaction.

$$2\text{FeCl}_2(\text{aq}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{FeCl}_3(\text{aq})$$
 Identify the oxidizing agent. Give a reason. (2 marks)

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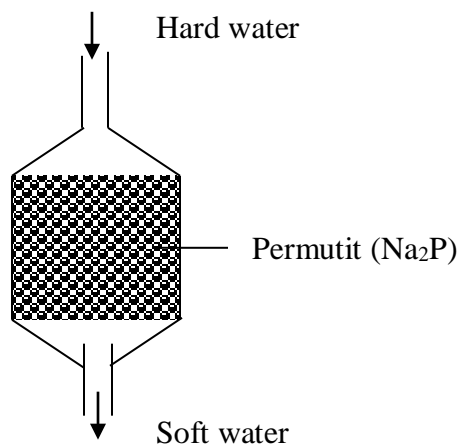
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(b) What is the oxidation number of chlorine in  $\text{ClO}_4^-$  ?

( 1 mark )

12. The column below was used to soften water



(a) Explain how the hard water was softened as it passed through the column.

(1 mark )

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(b) After some time the material in the column is not able to soften hard water.  
How can the material be reactivated?

(1 mark )

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(c) State one advantage of using hard water for domestic purposes.

(1 mark)

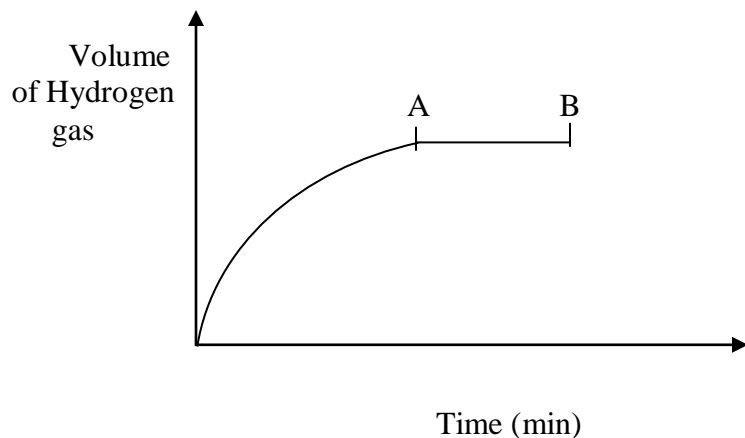
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13. In an experiment magnesium ribbon was reacted with dilute sulphuric (VI) acid and the volume of hydrogen gas produced with time noted. The graph below shows the volume of gas produced with time



Explain the following observations.

- (i) The curve of the graph is steepest at the beginning. (1 mark)

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- (ii) The curve of the graph completely flattens at region AB. (1 mark)

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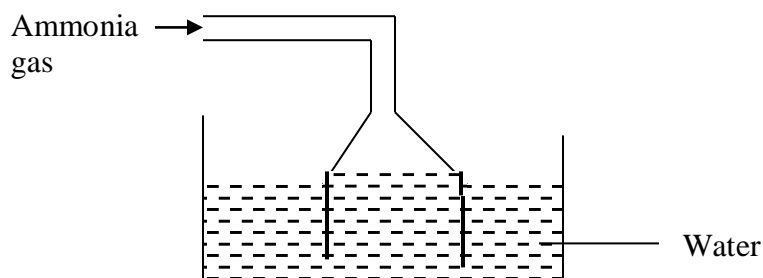
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- (iii) On the same axis plot the curve that would be obtained if the acid used was ethanoic acid. Label it ethanoic acid (1 mark)

14. Ammonia gas was passed into water as shown below.



- (a) What is the use of the inverted funnel. (1 mark)

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(b) Explain why the pH of the solution is above 7. (1 mark)

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(c) Explain why hydrochloric acid displays acidic properties when dissolved in water, while in methylbenzene, the acid does not display the acidic properties. (1 mark)

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15.  $60\text{cm}^3$  of oxygen gas diffused through a porous partition in 50 seconds. How long will it take  $120\text{cm}^3$  of sulphur (IV) oxide gas to diffuse through the same partition under the same conditions. (3 marks)

16. The data below was recorded when metal K was completely burnt in air. K is not the actual symbol of the metal. (R.A.M; K = 56, O = 16)

Mass of empty crucible and lid = 10.240g

Mass of crucible, lid and metal K = 10.352g

Mass of crucible, lid and metal oxide = 10.400g

(a) Determine the mass of  
(i) Metal K (½ mark)

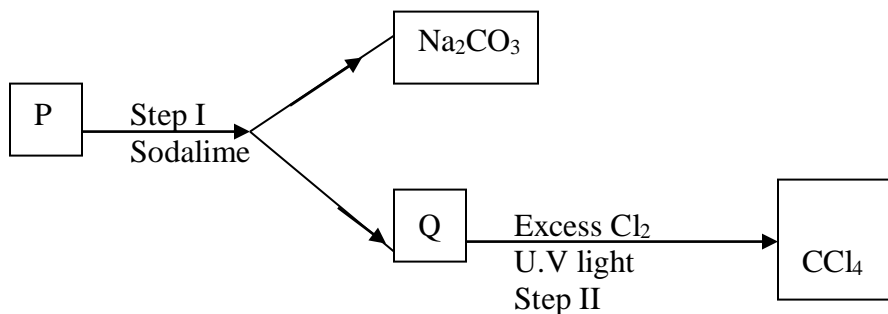
(ii) Oxygen (½ mark)



(b) Determine the empirical formula of the metal oxide.

(2 marks)

17. Study the flow chart below and answer the question that follow.



(a) Identify P and Q.

P \_\_\_\_\_

(1 mark)

Q \_\_\_\_\_

(1 mark)

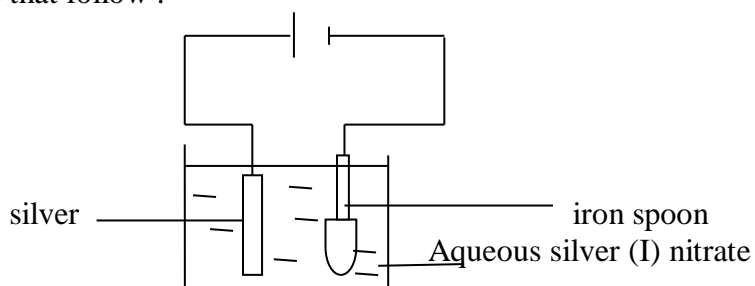
(b) What name is given to the type of reaction in step 2? (1 mark)

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18. The set-up below was used to electroplate a metallic spoon. Study it and answer the questions that follow.



(a) Write an equation for the reaction that occurred at the anode.

(1 mark)

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(b) State and explain what happened to the cathode.

(2 marks)

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19. The structures below represents two cleansing agents



(a) In the table below, give one advantage and one disadvantage of using each of them. (2 marks)

	Advantage	Disadvantage
$R - COO^- Na^+$		
$R - OSO_3^- Na^+$		

(b) Which of the two cleaning agents is the better for washing. Explain. (1 mark)

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20. The table below shows the observations made on tests carried out on a colourless liquid sample.

Exp	Test	Observation
(i)	Addition of excess $NaOH_{(aq)}$	White precipitate soluble in excess
(ii)	Addition of dilute $H_2SO_{4(aq)}$	White precipitate
(iii)	Addition of $AgNO_{3(aq)}$	White precipitate

(a) Identify (i) Cation in the sample \_\_\_\_\_ (1 mark)

(ii) Anion in the sample \_\_\_\_\_ (1 mark)

(b) Write the ionic equation for the reaction taking place in experiment (III). (1 mark)

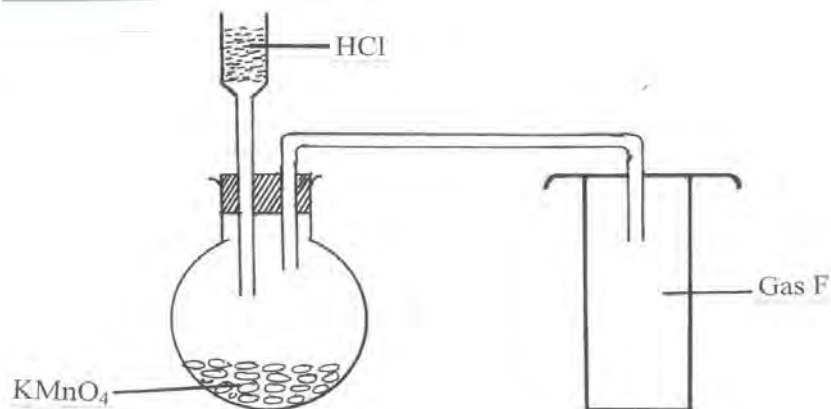
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21. An experiment was set as shown below



(a) Name the gas F \_\_\_\_\_ ( 1 mark )

(b) State one physical characteristic of gas F. (1 mark )

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(c) What would be observed if a litmus paper was put in a solution of gas F. ( 1 mark )

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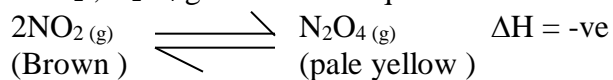


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22. At 20<sup>0</sup>C NO<sub>2</sub> ; N<sub>2</sub>O<sub>4</sub> gases exist in equilibrium as shown in the equation below.



(a) What is the significance of the negative sign as in the equation above. (1 mark )

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(b) State and explain the observations that would be made when  
 (i) a syringe containing the mixture was immersed in warm water. (1 mark )

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(ii) The volume of the gaseous mixture in the syringe was increased. (1 mark)

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23. (a) Explain why its not advisable to use woodash for cleaning aluminium utensils. (1 mark)

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(b) Aluminium metal is a good conductor and its used for over-head cables. State any other two properties that makes aluminium suitable for this use. (2 marks)

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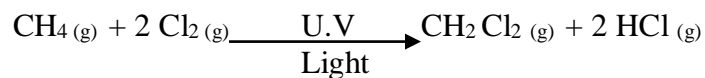
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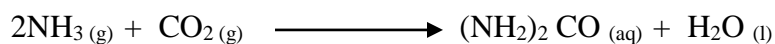
24. Study the information in the table below and answer the questions that follow.

Bond	Bond energy
C – H	414
Cl – Cl	244
C – Cl	326
H – Cl	431

Calculate the enthalpy change of the reaction: (3 marks)



25. Urea (NH<sub>2</sub>)<sub>2</sub>CO is prepared by the reaction between ammonia and carbon (IV) oxide gas.



In one process, 620kg of ammonia were reacted with excess carbon (IV) oxide gas. Calculate the mass of the urea that was formed.

(H = 1.0, C =12.0, N = 14,O = 16 and RMM of ammonia is 17 ) (3 marks )

26. Below is a list of oxides.

MgO, N<sub>2</sub>O, K<sub>2</sub>O, CaO and Al<sub>2</sub>O<sub>3</sub>

From the above list select

(a) A neutral oxide. (1 mark )

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(b) An oxide that can react with both potassium hydroxide and dilute hydrochloric acid. (1 mark)

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(c ) What property is exhibited by the reaction in b above. (1 mark )

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27. a)The electronic configuration of an ion P<sup>2-</sup> is 2.8.8.. Draw the structure of the atom just above element P in the periodic table. (2 marks )

28. State one use of a luminous flame. (1mk)

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