

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

233/2  
CHEMISTRY  
Paper 2  
(THEORY)  
July/August, 2011  
2 hours

CANDIDATE'S SIGNATURE.....

DATE.....

## BARINGO COUNTY EDUCATIONAL IMPROVEMENT EXAMINATION 2011

Kenya Certificate of Secondary Education  
233/2  
CHEMISTRY  
Paper 2  
2 hours

### Instructions to candidates:

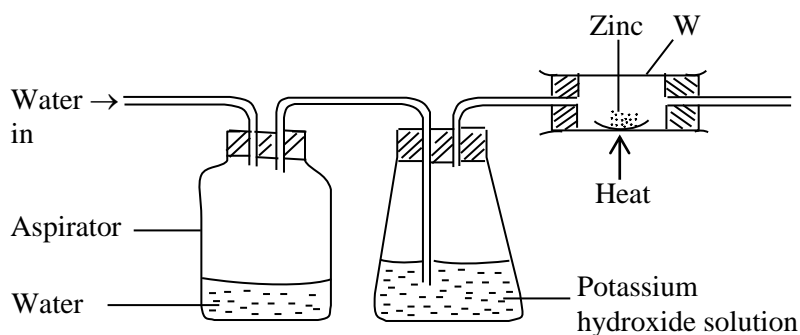
- Write your **Name** and **Index number** in the spaces provided **above**.
- **Sign** and write the **date** of examination in the spaces provided **above**.
- Answer **ALL** the questions in the spaces provided in the question paper.
- All working **must be** clearly shown where necessary.
- Electronic calculators and Mathematical tables **may be** used.

### For Examiner's Use Only

Questions	Maximum Score	Candidate's Score
1	10	
2	11	
3	12	
4	12	
5	12	
6	12	
7	11	
<b>Total Score</b>	<b>80</b>	

This paper consists of 12 printed pages. Check to ensure that all the pages are printed as indicated and that no questions are missing.

1. (a) Below is an incomplete diagram of a set-up of the apparatus used to obtain nitrogen gas from the air.



(i) Complete the diagram to show how nitrogen gas is collected. (1mk)

(ii) State the role of the following:

I Water entering the aspirator. (1mk)

\_\_\_\_\_

II Potassium hydroxide solution. (1mk)

\_\_\_\_\_

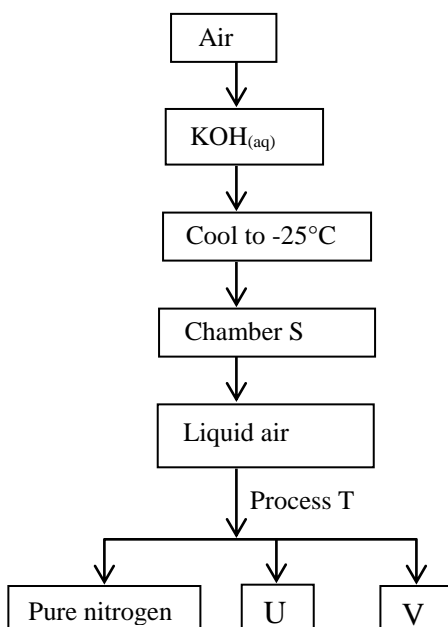
(iii) Write a chemical equation for the reaction that takes place in combustion tube W. (1mk)

\_\_\_\_\_  
\_\_\_\_\_

(iv) Nitrogen obtained using the above set-up is not pure. Name **one** major impurity present.

\_\_\_\_\_ (1mk)

(b) If pure nitrogen gas is required, the process in (a) above is modified as represented by the flowchart below. Study it and answer the questions that follow.



(i) Give the identity of:  
I Process **T**. \_\_\_\_\_ (1mk)

II Substances **U** and **V**. (1mk)

**U** \_\_\_\_\_

**V** \_\_\_\_\_

(ii) Briefly describe how air is liquefied in chamber S. (2mks)

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(c) State **one** industrial use of nitrogen gas. (1mk)

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2. (a) The electron arrangements of ions  $A^{3+}$  and  $B^{2-}$  are 2.8 and 2.8.8 respectively.  
Write down the electron arrangement of the elements A and B. (2mks)

**A** \_\_\_\_\_

**B** \_\_\_\_\_

(b) Study the information in the table below and answer the questions that follow. The letters are not the actual symbols of the elements.

Element	Atomic number	Boiling point ( $^{\circ}\text{C}$ )
K	3	1333
L	13	2470
M	16	445
N	18	-186
P	19	774

(i) Which element  
I is a gas at room temperature? Explain, taking room temperature as  $25^{\circ}\text{C}$ . (1½mks)

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II does not form an oxide? Explain. (1mk)

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- (ii) Write down the  
I formula of the sulphite of element L. (1mk)

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- II equation for the reaction between elements K and M. (1mk)

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- (iii) What type of bond would exist in the compound formed when elements M and L react?  
Give a reason for your answer. (1½mks)

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- (iv) Select the most electropositive element. Explain. (1½mks)

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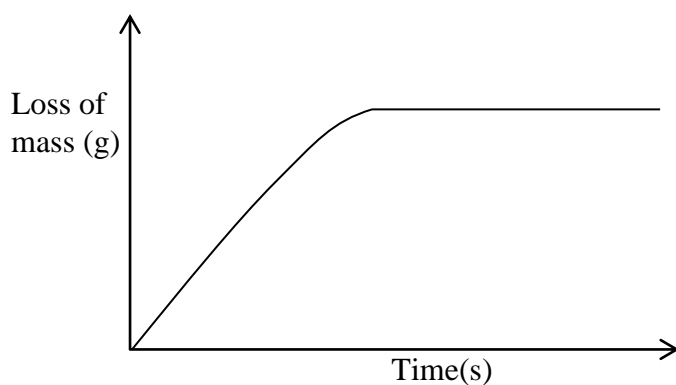
- (v) Explain why the boiling point of element L is higher than that of element K. (1½mks)

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3. (a) The sketch below represents a graph obtained when zinc granules were reacted with excess 0.2M sulphuric acid in the presence of a catalyst in a conical flask placed on an electronic balance.



- (i) Write an equation for the reaction that took place. (1mk)

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(ii) Explain why there is loss in mass. (1mk)

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(iii) Name the catalyst used. (1mk)

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(iv) Sketch, on the same axes, the curves obtained when:  
I the same mass of zinc powder was used under the same conditions. (1mk)

II no catalyst was used.. (1mk)

(b) In the contact process, sulphur (IV) oxide is converted to sulphur (VI) oxide in the catalytic chamber in which a dynamic chemical equilibrium is reached.



(i) What is meant by dynamic equilibrium? (1mk)

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(ii) State and explain how each of the following would affect the position of equilibrium.

I Decrease in temperature. (2mks)

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II Decrease in pressure. (2mks)

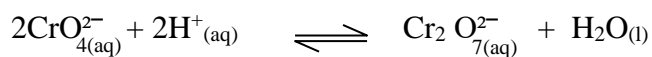
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(c) An equilibrium exists between chromate and dichromate ions as shown below.



(Yellow)

(Orange)

State and explain the observation made when aqueous sodium hydroxide is added to the above mixture. (2mks)

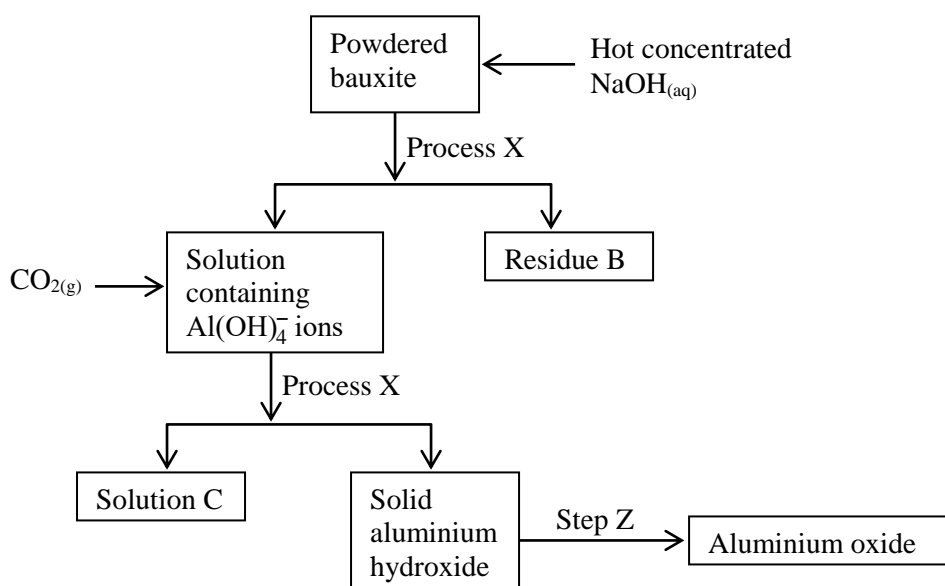
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4. The extraction of aluminium from its bauxite ore takes place in two stages, namely purification/concentration stage and electrolysis stage. The flow diagram below shows the purification stage. Study it and answer the questions that follow.



(a) Name **two** major impurities in bauxite. (2mks)

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(b) State the role of the following in the purification process.

(i) Hot concentrated sodium hydroxide. (1mk)

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(ii) Carbon (IV) oxide gas. (1mk)

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(c) Name process X. \_\_\_\_\_ (1mk)

(d) Name the main substance in: (2mks)

(i) residue B. \_\_\_\_\_

(ii) solution C. \_\_\_\_\_

(e) State the property of aluminium oxide that makes it possible to dissolve in hot concentrated sodium hydroxide solution. (1mk)

\_\_\_\_\_

(f) Give a condition necessary for step Z to take place. (1mk)

\_\_\_\_\_

(g) Write an equation for the reaction that produces aluminium oxide at step Z. (1mk)

\_\_\_\_\_

\_\_\_\_\_

(h) State **two** reasons why aluminium is used to make electric overhead cables. (2mks)

\_\_\_\_\_

\_\_\_\_\_

5. (a) Substances P and Q are colourless liquids in bottles whose labels have fallen off.

P :  $C_2H_5OH$

Q :  $CH_3COOH$

Describe how to distinguish between P and Q using potassium carbonate powder. (3mks)

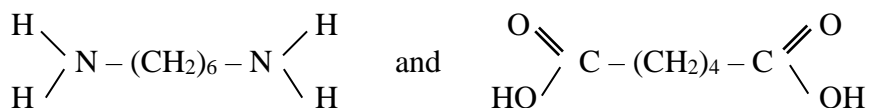
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(b) The two monomers below combine to form a certain polymer.



(i) Name the type of polymerization that occurs. (1mk)

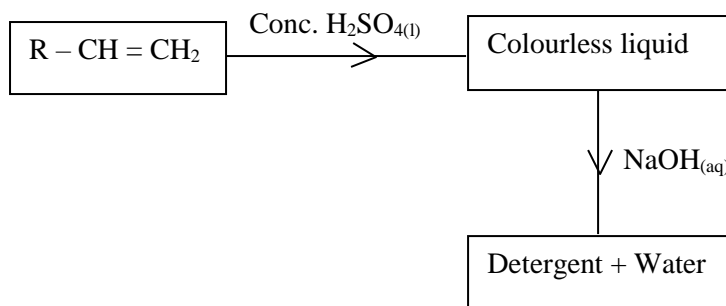
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(ii) Give **one** use of the polymer formed. (1mk)

\_\_\_\_\_

\_\_\_\_\_

(c) Study the flowchart below and answer the questions that follow.



(i) What is the type of detergent prepared in this process? (1mk)

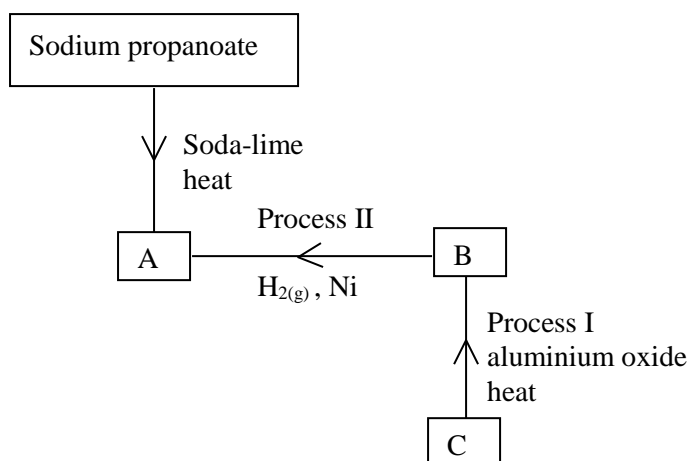
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(ii) State what would be observed if this detergent is used in hard water. (1mk)

\_\_\_\_\_

\_\_\_\_\_

(d) Study the reaction scheme below and answer the questions that follow.



(i) Identify substance. (1½mks)

**A** \_\_\_\_\_

**B** \_\_\_\_\_

**C** \_\_\_\_\_

(ii) Another substance D combines with one mole of hydrogen gas to form substance B. Give the structural formula of D. (1mk)

\_\_\_\_\_

(iii) Name process I. \_\_\_\_\_ (1mk)

(iv) What property of substance B makes process II possible? (½mk)

\_\_\_\_\_



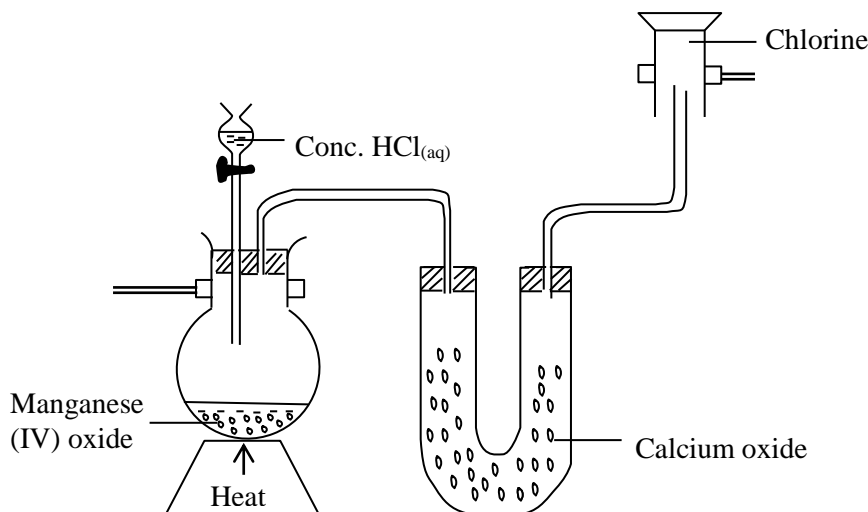
(e) State **one** disadvantage of synthetic polymers.

(1mk)

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6. I (a) The diagram below represents a set-up intended for the preparation and collection of dry chlorine gas. Study it and answer the questions that follow.



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

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- (ii) State the role of manganese (IV) oxide. (1mk)

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- (b) Chlorine, in the presence of water, is a bleaching agent. Name the substance responsible for the bleaching action. (1mk)

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- (c) Write down an equation for the reaction between dry chlorine and heated iron filings. (1mk)

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- (d) Write an ionic equation for the reaction between potassium bromide solution and chlorine. (1mk)

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- II (a) Give **two** differences between diamond and graphite. (2mks)

Diamond	Graphite

- (b) Carbon reacts with hot concentrated sulphuric (VI) acid.  
 (i) What property of carbon is illustrated by this reaction? (1mk)

\_\_\_\_\_

- (ii) Write down an equation for this reaction. (1mk)

\_\_\_\_\_

\_\_\_\_\_

- (c) Carbon (IV) oxide is bubbled into an aqueous solution of sodium hydroxide until it is in excess. A sample of the resulting solution is heated to dryness in an evaporating dish.  
 (i) Identify the residue formed. (1mk)

\_\_\_\_\_

- (ii) Write an equation for the reaction that forms the residue. (1mk)

\_\_\_\_\_

\_\_\_\_\_

7. (a) An aqueous solution of a salt was electrolysed using carbon electrodes. Colourless gases were evolved at both electrodes. Describe what tests you would carry out to identify the gases. (2mks)

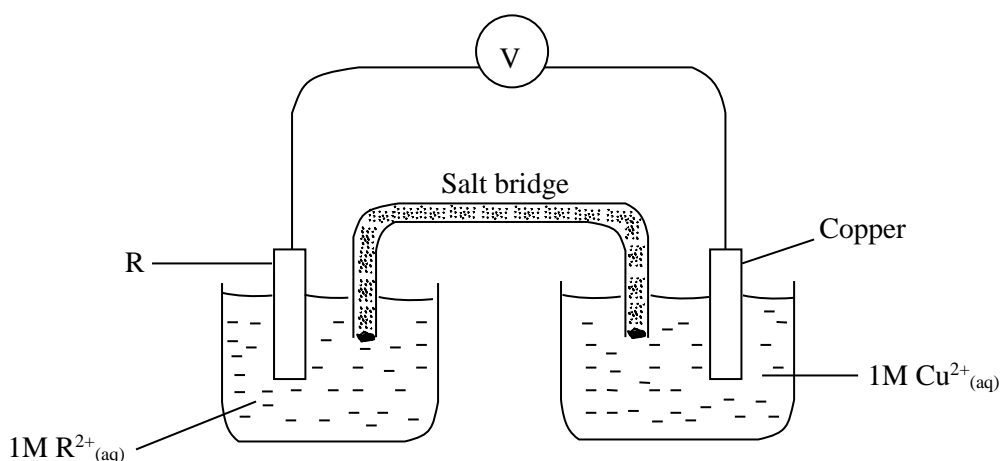
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- (b) The diagram below represents the set-up that can be used to determine the standard electrode potential of  $R^{2+}/R$  electrode.



Given that electromotive force of the cell is 2.72V and the standard electrode potential of  $\text{Cu}^{2+}_{(\text{aq})}/\text{Cu}_{(\text{s})}$  electrode is +0.34V

(i) Write down the cell representation. (1mk)

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(ii) Determine the standard electrode potential for  $\text{R}^{2+}/\text{R}$  electrode. (1½mks)

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(c) Use the standard electrode potentials for elements A, B, C, D and F given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

	$E^{\theta}$ (volts)
$\text{A}^{2+}_{(\text{aq})} + 2\text{e}^{-} \rightleftharpoons \text{A}_{(\text{s})}$	-2.90
$\text{B}^{2+}_{(\text{aq})} + 2\text{e}^{-} \rightleftharpoons \text{B}_{(\text{s})}$	-2.38
$\text{C}^{+}_{(\text{aq})} + \text{e}^{-} \rightleftharpoons \frac{1}{2}\text{C}_{2(\text{g})}$	0.00
$\text{D}^{2+}_{(\text{aq})} + 2\text{e}^{-} \rightleftharpoons \text{D}_{(\text{s})}$	+0.34
$\frac{1}{2}\text{F}_{2(\text{g})} + \text{e}^{-} \rightleftharpoons \text{F}^{-}_{(\text{aq})}$	+2.87

(i) Which element is likely to be hydrogen? Give a reason for your answer. (1mk)

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(ii) What is the  $E^{\theta}$  value of the strongest reducing agent? (½mk)

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(d) During electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2 amperes was passed through the cell for 5 hours?

(i) Write an ionic equation for the reaction that took place the anode. (1mk)

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- (ii) Determine the change in mass of the anode which occurred as a result of the electrolysis process. (Cu = 63.5; 1 Faraday = 96,500 coulombs). (2mks)

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- (e) An iron spoon is to be electroplated with silver. Draw a labeled diagram of the apparatus that could be used to carry out this process. (2mks)