

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

School.....Class.....

Index No.....

## **KAKAMEGA COUNTY JOINT EVALUATION EXAMINATIONS-2014**

233/2

### **CHEMISTRY**

**Paper 2**

**THEORY**

July 2014

2 hours

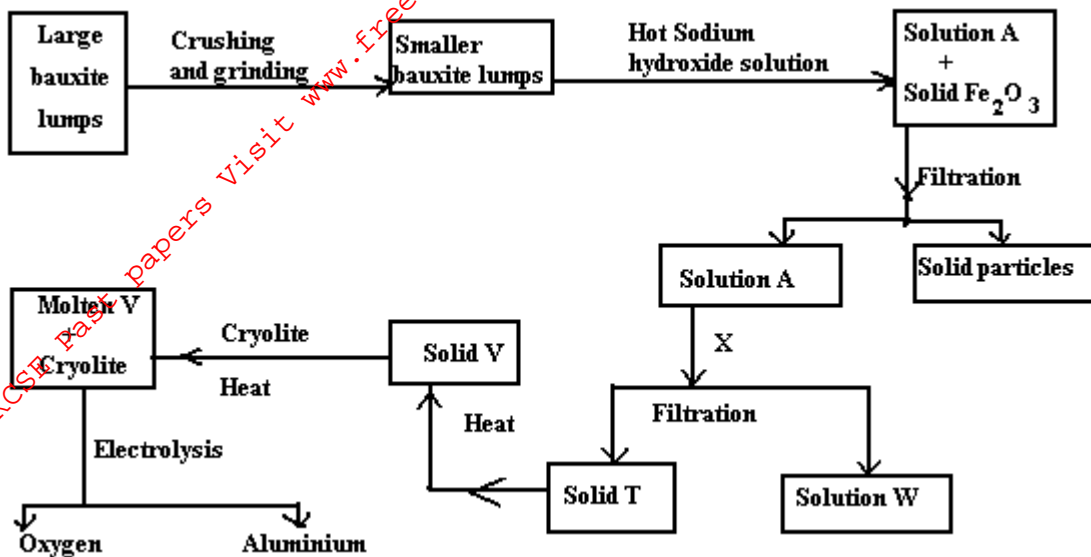
## **KAKAMEGA COUNTY JOINT EVALUATION TEST-2014**

**Kenya Certificate of Secondary Education**

### **Instructions to candidates**

1. *Write your name and index number in the spaces provided above.*
2. *Answer all the questions in the spaces provided in the question paper.*
3. *Mathematical tables and silent electronic calculators may be used.*
4. *All workings MUST be shown where necessary.*

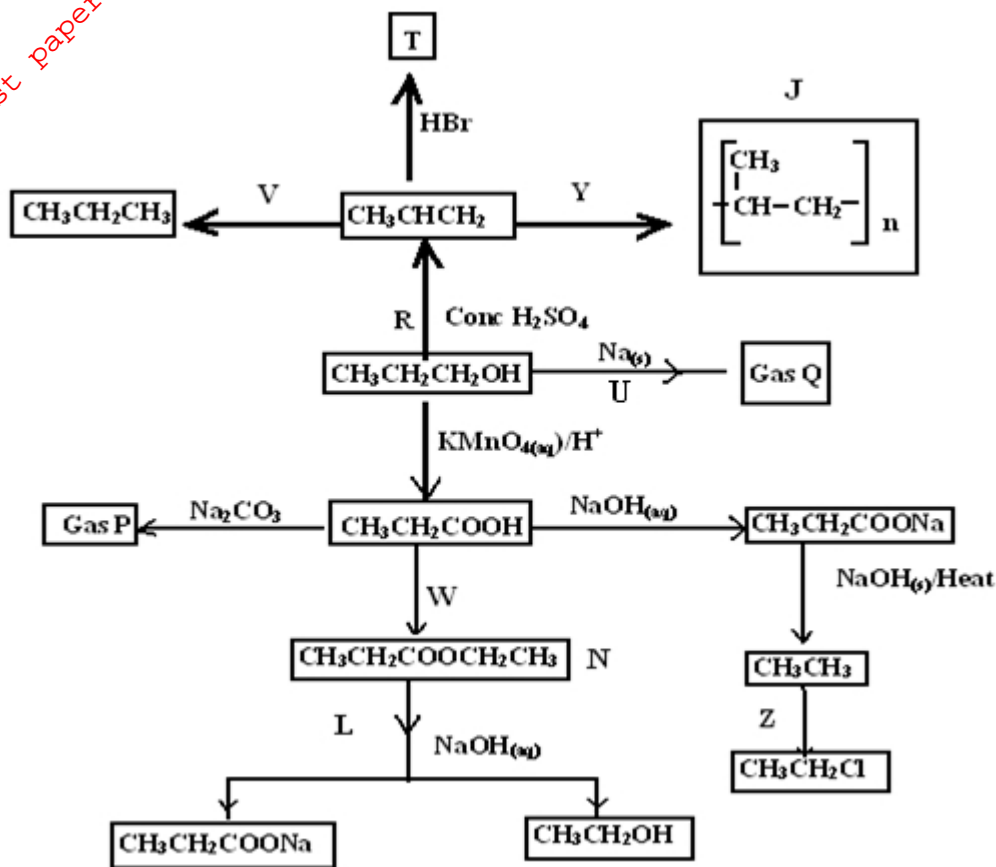
The flow diagram below shows the processes of purification of an aluminium ore and extraction of aluminium from it.



- State why bauxite is first crushed and ground into smaller particles? (½mk)  
\_\_\_\_\_
- Only aluminium oxide and silicon (IV) oxide dissolves chemically in the hot concentrated sodium hydroxide to form solution A, Iron (III) oxide does not.  
What property make aluminium oxide and silicon (IV) oxide react with sodium hydroxide solution?
  - Silicon (IV) oxide \_\_\_\_\_ (1mk)
  - Aluminium oxide \_\_\_\_\_ (1mk)
- Write ionic equation for the reaction between sodium hydroxide solution and
  - Silicon (IV) oxide \_\_\_\_\_ (1mk)
  - Aluminium oxide \_\_\_\_\_ (1mk)
- Identify solid T \_\_\_\_\_ (1mk)
  - Name substance X that could be used to precipitate out solid T from solution Q. (1mk)  
\_\_\_\_\_
  - Write equation for the formation of solid V from solid T (1mk)  
\_\_\_\_\_
- Why is cryolite added to substance V? (½mk)  
\_\_\_\_\_
- Write half equation for the formation of aluminium at the cathode during electrolysis (1mk)  
\_\_\_\_\_
- Give one advantage of locating aluminium extraction plant near the
  - Source of hydroelectricity \_\_\_\_\_

- \_\_\_\_\_ (1mk)
- II. Aluminium deposits or sea port. \_\_\_\_\_ (1mk)
- h. Explain why an alloy of aluminium, instead of aluminium is used in overhead electric power cables. (1mk)
- \_\_\_\_\_
- i. State why the ore for extracting aluminium is known as bauxite and not aluminium oxide (1mk)
- \_\_\_\_\_

1. Study the reaction scheme below and answer the questions that follow.



- a. Name I gas P \_\_\_\_\_
- II gas Q \_\_\_\_\_
- III Substance J \_\_\_\_\_ (1½mks)

b. Give the most probable structural formula of product T (1mk)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

c. I. Name reaction producing substance labeled N (1mk)

II. State the characteristic property of N (1mk)

d. Complete the table below.

Reaction	Reagents	Condition
W		
Z		
V		

(3mks)

e. I. Name the organic product of reaction U

(½mk)

II Write the equation for the reaction represented by U

(1mk)

f. What is the specific name of process Y?

(½mk)

g. What is the type of reaction represented by Z?

(½mk)

h. Give two reasons why ethanoic acid has a higher melting point than ethanol when both of them have two carbon atoms.

(2mks)

2. I. The following table gives the standard electrode potential for a number of half reactions.

Half equation	$E^{\ominus}$ /volts
$\text{Zn}^{2+}_{(\text{aq})} + 2\text{e}^{-} \longrightarrow \text{Zn}_{(\text{s})}$	-0.76
$\text{Fe}^{2+}_{(\text{aq})} + 2\text{e}^{-} \longrightarrow \text{Fe}_{(\text{s})}$	-0.44
$\text{I}_{2(\text{l})} + 2\text{e}^{-} \longrightarrow 2\text{I}^{-}_{(\text{aq})}$	+0.54
$\text{Fe}^{3+}_{(\text{aq})} + \text{e}^{-} \longrightarrow \text{Fe}^{2+}_{(\text{aq})}$	+0.77

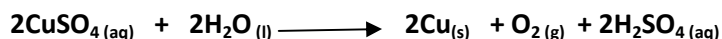


- a) Which half equation is used as the standard for the electrode potentials? (1mk)
- \_\_\_\_\_
- b) From the table identify:
- i. Strongest oxidizing agent \_\_\_\_\_ (½mk)
- ii. Strongest reducing agent \_\_\_\_\_ (½mk)
- (c) Identify two substances from the table which could be used to convert iodide ions to iodine. (1mks)
- \_\_\_\_\_

d. A half cell (I) is constructed by putting platinum electrode in a solution of 1M with respect to  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  ions. The half cell is then connected to another half cell (II) with  $\text{Fe}^{2+}$  ions.

- i. What is the e.m.f of this cell (1mk)
- \_\_\_\_\_
- ii. Write equation for reactions taking place in each cell. (2mks)
- (I) \_\_\_\_\_
- (II) \_\_\_\_\_
- iii. In which direction do electrons flow in the circuit? (½mk)
- \_\_\_\_\_

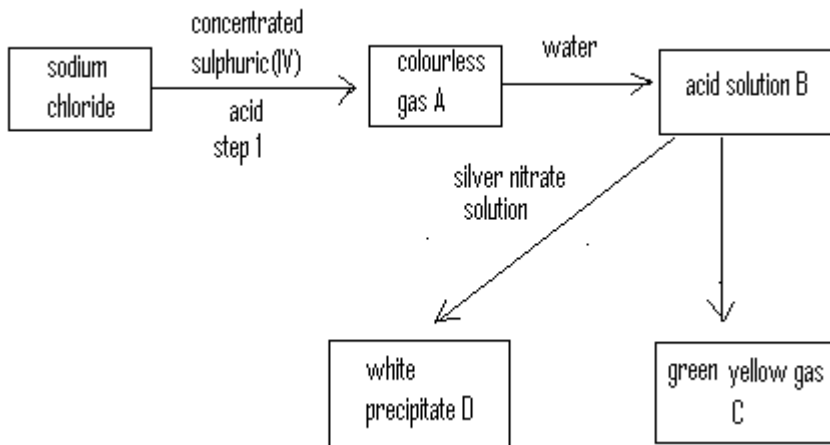
II. When copper (II) sulphate solution is electrolysed using platinum electrodes, the equation for the overall changes can be written as:



- a) State the observation made at
- i. Anode \_\_\_\_\_ (½mk)
- ii. Cathode \_\_\_\_\_ (½mk)
- iii. In the solution \_\_\_\_\_ (½mk)
- b) Write ionic half equation for the reaction occurring at the anode. (1mk)
- \_\_\_\_\_
- c) During electrolysis, 1.27g of copper is produced. Calculate
- i. The volume of oxygen, measured at room temperature that would be produced in the same time. (Cu=63.5, MGV= 24dm<sup>3</sup>, IF= 96) (2mks)
- \_\_\_\_\_

ii. The time for which a current of 0.5A would be maintained to form these products. (1mk)

3. I. The diagram below summarizes the results of a series of chemical reactions.



a) Name: A \_\_\_\_\_ (2mks)

B \_\_\_\_\_

C \_\_\_\_\_

D \_\_\_\_\_

b) What reagent would you use to convert B into C? (1mk)

\_\_\_\_\_

c) Write equation for the reaction in step 1 (1mk)

\_\_\_\_\_

d) Chlorine is used as bleaching agent. Name another substance that must be present for bleaching to occur.

\_\_\_\_\_ (½mk)

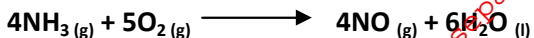
e) Give one other use of chlorine. (1mk)

\_\_\_\_\_

f) Explain the observation made when white precipitate D is exposed to sunlight. (2mks)

\_\_\_\_\_

II One stage in the manufacture of nitric acid involves the oxidation of ammonia by the reaction:

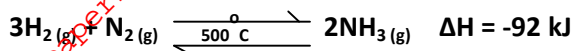


- a. State one condition under which this reaction is carried out. (1mk)

\_\_\_\_\_

\_\_\_\_\_

- b. Below is equation for the Haber process for the manufacture of ammonia.



- i. Name one material which is available in large scale and can be used as a source of hydrogen for this process. (1mk)

- ii. Give one reason why the reaction of nitrogen with hydrogen cannot be used to produce ammonia at room temperature and pressure. (1mk)

\_\_\_\_\_

- iii. To maintain a constant temperature, the bed of catalyst particles must be cooled. Why would the temperature of the catalyst rise if it were not cooled? (½mk)

\_\_\_\_\_

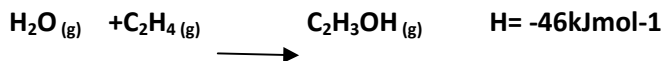
- iv. The iron catalyst used is fed in form of  $\text{Fe}_3\text{O}_4$ , but this is converted to minute crystals of iron when it is exposed to the hot mixture of nitrogen and hydrogen gases. Write an equation for the reaction which converts the iron oxide to iron. (1mk)

\_\_\_\_\_

- v. Suggest one disadvantage of using pure ammonia as fertilizer. (1mk)

\_\_\_\_\_

4. I. The equation below is for the manufacture of ethanol by direct hydration of ethane.



- a) State the effect an increased in pressure will have on the equilibrium yield of ethanol and give a reason for your answer. (2mks)

\_\_\_\_\_

\_\_\_\_\_

- b) At high pressure, addition polymerization of one of the compounds in the reaction mixture may occur. Give the name of the polymer produced and structure of the repeating unit. (2mks)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- II. In an experiment, excess solid calcium carbonate was added to  $100\text{cm}^3$  of  $0.2\text{M}$  hydrochloric acid at  $20^\circ\text{C}$ . The volume of carbon (IV) oxide produced was measured at regular time interval. The results of the experiment are as shown in the table below.

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100
Volume of carbon(IV)oxide( $\text{cm}^3$ )	0	18	30	40	48	53	57	58	58	58	58

- a) Draw a diagram of suitable apparatus for the experiment. (2mks)

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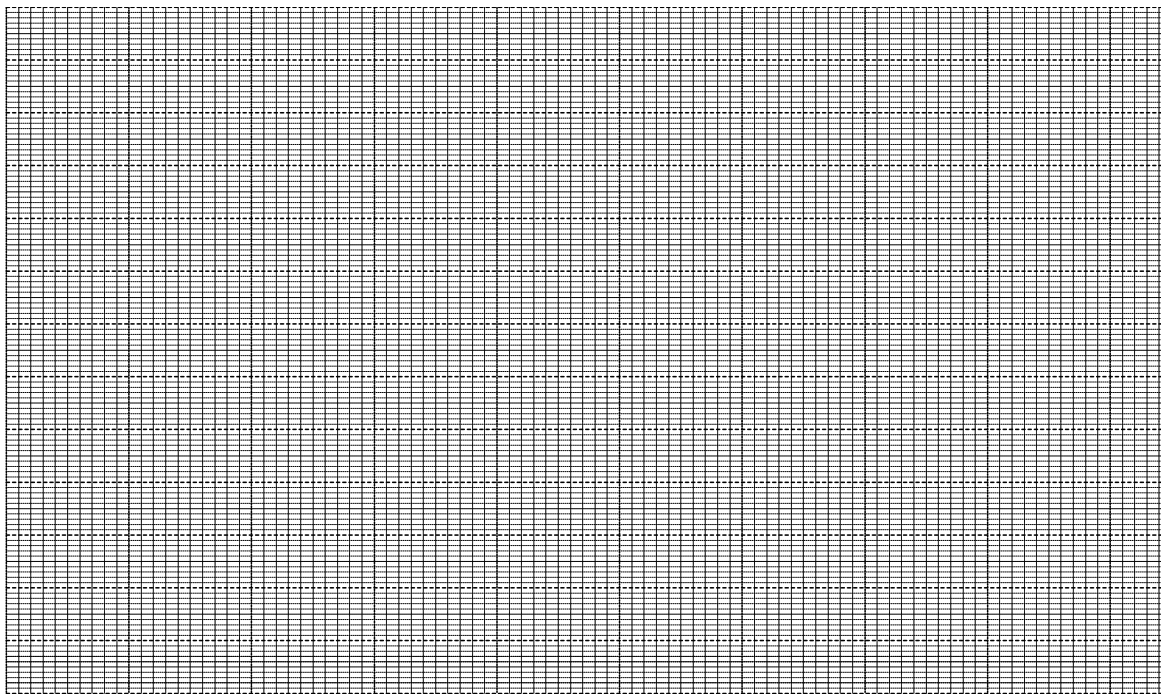


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- b) On the grid provided plot of volume of  $\text{CO}_2$  produced against time. (3mks)



- c) On the grid plot a graph you would expect if the acid was kept at  $30^\circ\text{C}$ . (1mk)
- d) What is the rate of reaction if the volume of hydrogen per minute between 4<sup>th</sup> and 5<sup>th</sup> second (1mk)

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- e) Other than raising the temperature state two ways by which the rate of reaction would be increased. (2mks)

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5. Below is a section of the periodic table. Use it for the questions below.



A									
B	C							D	

a. In the grid, place

i. M in the space with the most reactive non metal. (1mk).

ii R in the space which could be occupied by an element capable of forming a covalent compound  $RD_3$  (1mk)

b). Explain how the reducing power changes from A to B (2mks)

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c). How many protons are there in the atom of element C? \_\_\_\_\_ (1mk)

d. Element B reacts with water.

i. State two observations you would expect to make when a small piece of B is added to water. (2mks)

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ii. Name the aqueous product formed in the above reaction and write chemical equation for the reaction. (2mks)

Product \_\_\_\_\_

Equation \_\_\_\_\_

6. a. I. Aluminium chloride exists as a dimeric molecule  $Al_2Cl_6$ . Draw its dimeric structure. (2mks)

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II. State why aluminium chloride exist as a dimer. (1mk)

b. The table below gives some properties of four substances. Use it to answer the questions that follow.

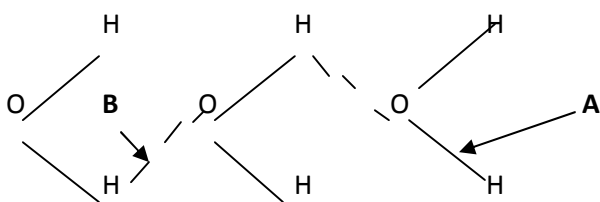
Substance	M.P. ( $^{\circ}\text{C}$ )	B.P. ( $^{\circ}\text{C}$ )	Electrical conductivity	
			Solid	Solid
V	1128	2657	Good	Good
X	-166	-95	Poor	Poor
Y	854	1790	Poor	Poor
Z	2230	3714	Poor	Poor

i. Which substance has

Giant atomic structure \_\_\_\_\_ (1mk)

Giant metallic structure \_\_\_\_\_ (1mk)

ii. The structure of water molecule can be represented as shown below.



Name the type of bonds represented by letters A \_\_\_\_\_ (½mk)

B \_\_\_\_\_ (½mk)

C Explain why sodium chloride conducts electricity when molten but not when solid. (2mks)

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