NAME: …… **INDEX NO.** ……..……...

SCHOOL: …… **DATE:** …….....

CANDIDATE'S SIGN: ……..…….....

233/2
CHEMISTRY
PAPER 2
JULY/AUGUST 2014
TIME: 2 HOURS

KISUMU WEST SUB-COUNTY JOINT EXAMINATION-2014

Kenya Certificate of Secondary Education (K.C.S.E.)

CHEMISTRY
PAPER 2

INSTRUCTIONS TO CANDIDATES:

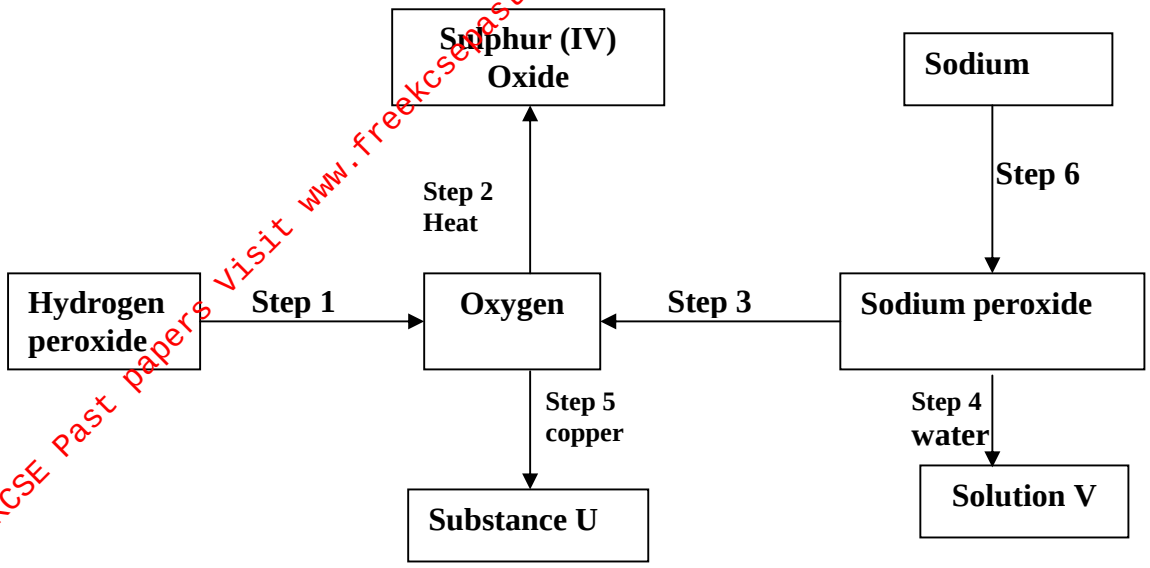
- *Write your **name, school** and **index number** in the spaces provided above*
- ***Sign** and write the **date** of examination in the spaces provided.*
- *Answer **all** the questions in the spaces provided.*
- *All working **must** be clearly shown where necessary.*
- *Mathematical tables and electronic calculators can be used.*

For Examiners Use Only

Question	Maximum score	Candidate's score
1	11	
2	10	
3	14	
4	11	
5	15	
6	11	
7	08	
Total	**80**	

This paper consists of 10 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

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



a) Identify the substances labelled:

i) Substance **U** (1mk)

……..

ii) Solution **V**. (1mk)

……..

b) Name the reagents necessary for the reactions in the following steps. (4mks)

i) Step 1

……..

ii) Step 2

……..

iii) Step 3

……..

iv) Step 6

……..

c) Give the condition necessary for the reaction in step 5 to take place. (1mk)

……..

d) Write equations for the reactions in the following steps (3mks)

i) Step 1

……..

ii) Step 2

……..

iii) Step 5

……..

e) State and explain the observation made in step 5. (1mk)

……..

2. a) The results of an experiment to determine the solubility of solid **Y** in water at 40^0C were as follows.

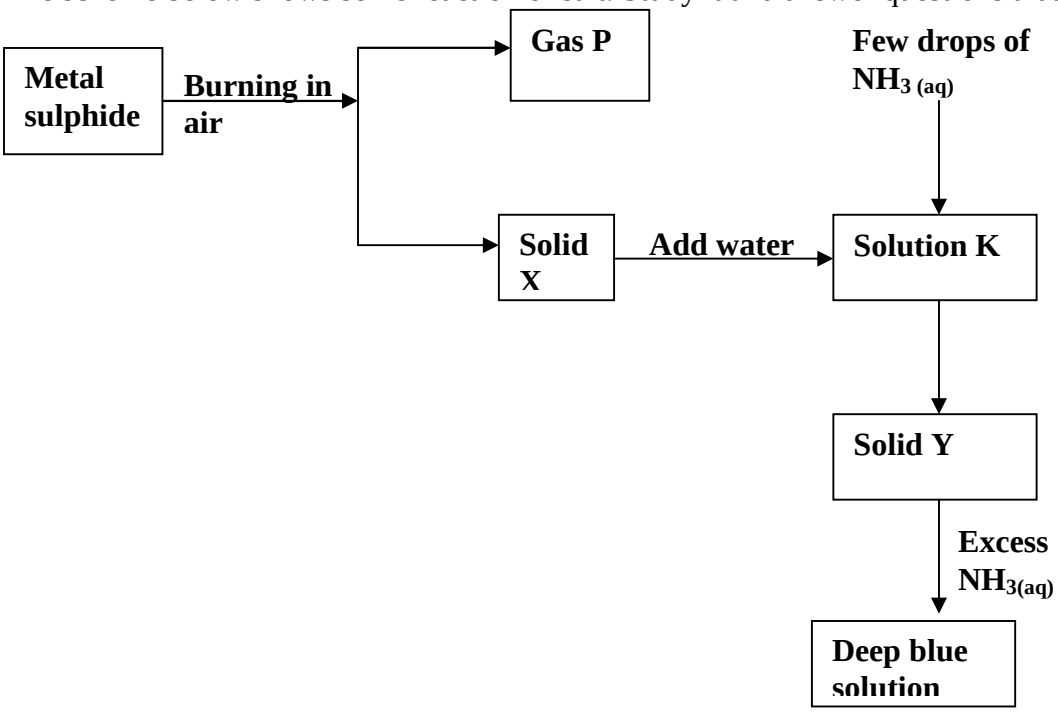
Mass of dish = 16.95g

Mass of dish + saturated salt at 40^0C = 26.955g

Mass of dish + solid after evaporation to dryness = 17.96g

Determine solubility of solid **Y** using the data above. (3mks)

b) The scheme below shows some reaction of salt. Study it and answer questions that follow.



i) Write an equation for the reaction to show formation of gas **P** and solid **X.** (1mk)

……..

ii) Give the name and formula of the complex ion responsible for the deep blue colour in the solution. (2mks)

……..

……..

c) Study the equation below and answer the questions that follow:

$$NH_4^+{}_{(aq)} + H_2O_{(l)} \rightleftharpoons NH_{3(aq)} + H_3O^+{}_{(aq)}$$

Identify the reactant that acts as an acid in the reverse process. Explain your answer. (2mks)

……..

……..

d) i) What is meant by hard water? (1mk)

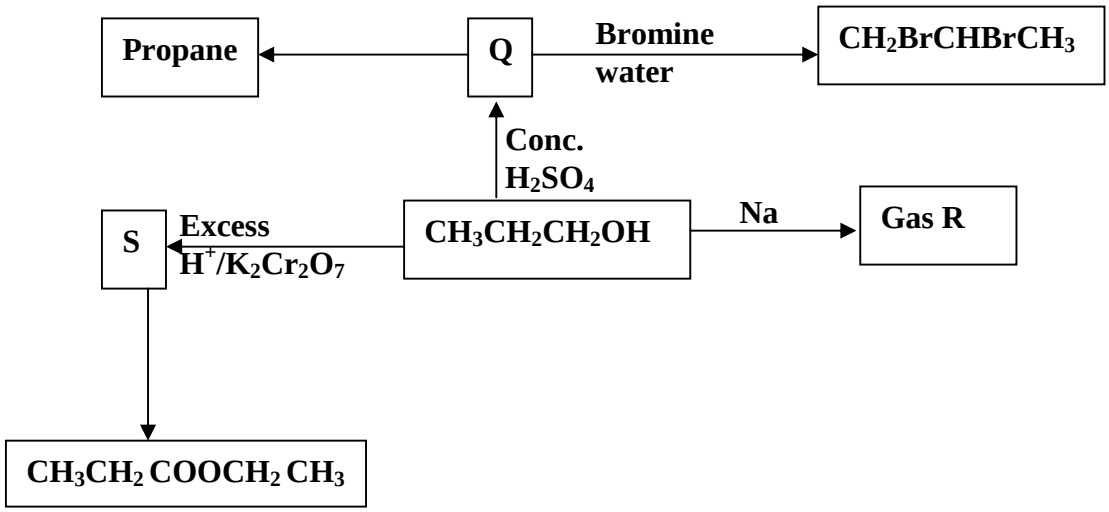
……..

ii) Using an ionic equation, explain how sodium carbonate removes permanent hardness of water. (1mk)

……..

……..

3. The scheme below shows several reactions starting with propanol. Study the scheme and answer the questions which follow.



a) Name gas **R**. (1mk)

……..

b) Name and draw the structural formula of compound **Q.** (2mks)

c) What conditions and reagents are necessary to convert **S** to $CH_3CH_2COOCH_2CH_3$ (2mks)

Reagents;

……..

Conditions;

……..

d) Write an equation for the reaction that takes place when equal volumes of chlorine gas react with propane. (1mk)

……..

e) The table below shows some properties of organic compounds **U**, **V**, and **W**. use the information to answer the questions that follow.

	W	**V**	**U**
Reaction with liquid bromine.	Decolourise bromine very fast	No reaction	Decolourises bromine liquid slowly
Combustion	Burns with yellow smoky flame	Burns with a blue flame leaving no residue	Burns with a yellow sooty flame
Reaction with conc. H_2SO_4	No reaction	It is dehydrated to form compound **U**.	Reacts to form **V**.

To which homologous series do the following compounds belong? (3mks)

U…….

V…….

W……

f) $CH_2{=}{=}CH - CH_3$ when heated under high temperatures and pressures forms a solid with large molecular mass.

i) Write the equation for the reaction which involves the formation of the solid. (1mk)

……..

……..

ii) Name the solid and give **one** use of the solid

Name (1mk)

……..

Use (1mk)

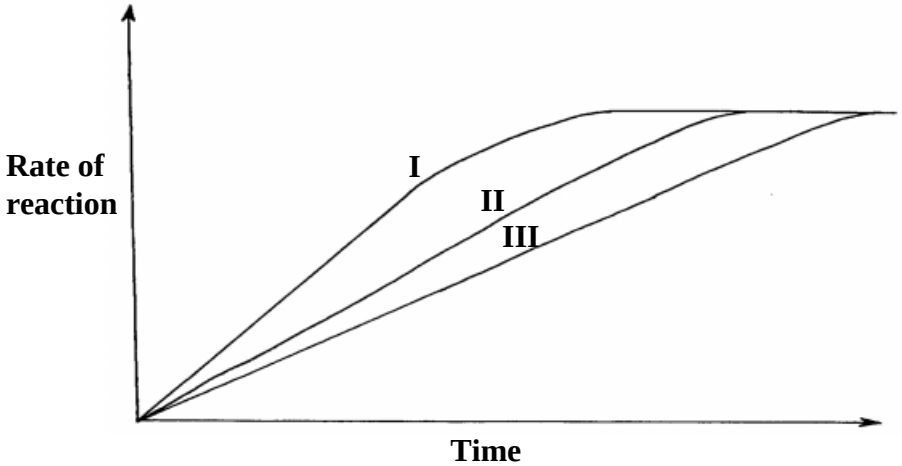
……..

g) State **two** uses of cracking. (2mks)

……..

……..

4. a) Below is a graph that was obtained when different concentrations of hydrochloric acid was reacted with equal amount of calcium carbonate.



The concentrations of hydrochloric acid were 0.8M, 0.5M and 0.1M. The calcium carbonate was in powder form. Match the graphs with concentration.

Graph I (1mk)

……..

……..

Graph III (1mk)

……..

……..

b) A state of equilibrium between dichromate (VI) and chromate ions is established as shown in the equation below.

$$Cr_2O^{2-}_{7(aq)} + 2OH^-_{(aq)} \rightleftharpoons 2CrO^{2-}_{4(aq)} + H_2O_{(l)}$$

Orange Yellow

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

……..

……..

ii) State and explain observation made when a few pellets of potassium hydroxide are added to the equilibrium mixture. (2mks)

……..

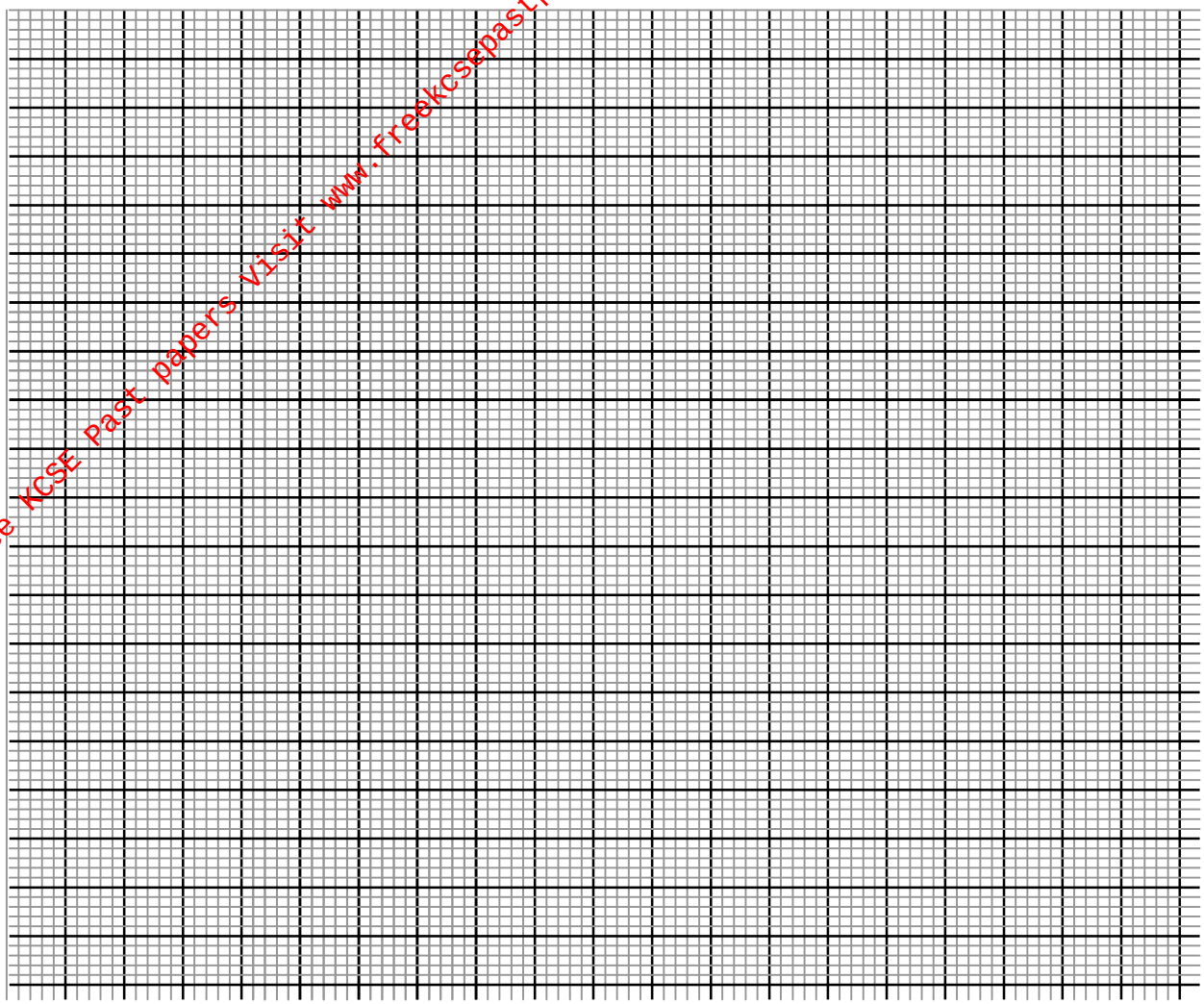
……..

c) An experiment was done using magnesium ribbon and dilute hydrochloric acid of different concentrations. The time needed to produce $50cm^3$ of the gas for every experiment was recorded in the table below.

Conc. Of HCl in mol/Litre	2.0	1.75	1.50	1.25	1.00	0.75	0.50	0.25
Time in Sec (s)	8.8	10.0	11.7	13.5	17.5	22.7	35.5	70.0
$^1/_t$ Sec $^{-1}$								

i) Complete the table above. (2mks)

ii) Plot a graph of rate (^{1}/time) against concentration. (3mks)



iii) Determine from your graph the concentration needed to produce 50cm^3 of hydrogen gas, when time is 15 seconds. (1mk)

5. Use the table below to answer the questions that follow. (The letters are not actual symbols of the elements)

Element	**Atomic number**	**M.P (^{0}C)**
A	11	97.8
B	13	660
C	14	1410
D	17	-101
E	19	63.7

a) Write the electronic arrangement for the ions formed by the elements **B** and **D** (2mks)

……..

……..

b) Select an element which is

i) A poor conductor of electricity. (1mk)

……..

ii) The most reactive non-metal. (1mk)

……..

c) To which period of the periodic table does element **E** belong? (1mk)

……..

d) Element **E** losses its outermost electron more readily than **A**. Explain. (2mks)

……..

e) Use dots (•) and crosses (x) to represent the valence electrons and show the bonding in the compound formed between element **C** and **D.** (2mks)

f) Explain why the melting point of element **B** is higher than that of element **A.** (2mks)

……..

……..

g) Write an equation for the reaction that takes place between element **A** and water. (1mk)

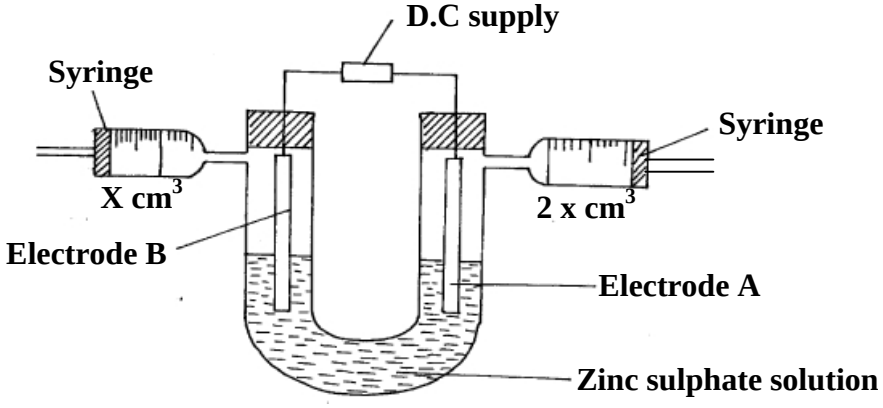
……..

h) Describe how a solid mixture of the sulphate of element **E** and lead (ii) sulphate can be separated into solid samples. (3mks)

……..

……..

6. An aqueous solution of zinc sulphate is electrolysed using platinum electrodes as shown in the set up below.



a) i) Write a half equation for the reaction taking place at electrode **A.** (1mk)

……..

ii) Identify electrode **B** (1mk)

……..

iii) Explain observation at electrode **B** if copper plate was used instead of platinum electrode. (2mks)

……..

……..

b) 0.22g of metal **Q** is deposited by electrolysis when a current of 0.06A flows for 99 minutes.
(RAM of **Q** = 184, 1F = 96500c)

i) Find the number of moles of **Q** deposited. (1mk)

……..

ii) Determine the value of n in the metallic ion $\mathbf{Q^{n+}}$ (3mks)

……..

……..

……..

c) Determine oxidation number of chlorine in ClO^-_3 (1mk)

……..

……..

d) An iron spoon is to be electroplated with silver. Draw a labelled diagram to represent the set-up that could be used to carryout this process. (2mks)

7. In an experiment to determine the molar heat of reaction when magnesium displaces copper

a) 0.36g of magnesium powder were added to $25cm^3$ of 1M copper (II) chloride solution, the temperature of solution increased by 43^0C.
(Cu = 63.5 Mg = 24.0 specific heat capacity = 4.2J/g/K)

i) Other than increase in temperature, state and explain the other observation made. (2mks)

……..

……..

ii) Determine the molar heat of displacement of copper. (3mks)

b) Given the following reactions

$2C_{(s)} + O_{2(g)} \longrightarrow 2CO_{(g)}$ $\Delta H = -220kJ$

$2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$ $\Delta H = -566kJ$

i) Using an energy cycle diagram, calculate the molar heat of formation of carbon (IV) oxide (3mks)