

Name: ..... Index No. ....

School: ..... Candidate's Sign. ....

Date: .....

233/2  
CHEMISTRY  
PAPER 2  
JULY/AUGUST 2011  
TIME: 2 HOURS

# RACHUONYO SOUTH DISTRICT JOINT EVALUATION TEST

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

Chemistry  
Paper 2

## INSTRUCTIONS TO THE CANDIDATES:

- Answer **all** the questions in the spaces provided.
- All working **must** be clearly shown where necessary.
- Mathematical tables and silent electronic calculators may be used.

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

*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 (a) the table below shows some properties and electronic arrangement of ions of elements represented by letters P to X. Study the information and answer the questions that follow. The letters are not the actual symbols of elements.

Element	Formula of ion	Electronic arrangement of ion	Atomic radius (nm)	Ionic radius (nm)
P	$P^{2+}$	2.8.8	0.174	0.097
Q	$Q^{-}$	2.8	0.072	0.136
R	$R^{+}$	2.8.8	0.203	0.133
S	$S^{3+}$	2.8	0.125	0.050
T	$T^{2+}$	2.818.8	0.191	0.113
U	$U^{2+}$	2.8	0.136	0.065
V	$V^{+}$	2.8	0.157	0.095
W	$W^{+}$	2	0.133	0.060
X	$X^{-}$	2.8.8	0.099	0.181

- (i) Give the atomic numbers of elements **T** and **V** (1mk)

**T**.....

**V**.....

- (ii) What is the name given to the family of elements to which **R**, **V** and **W** belong. (1mk)

.....

.....

- (iii) Explain why:

I The atomic radius of S is smaller than that of **V** (1mk)

.....

.....

II the atomic radius of R is larger than its ionic radius (1mk)

.....

.....

- (iv) Using dots (•) and crosses (x) to represent outermost electrons, show the bonding in the compound formed between U and X (2mks)

- (v) Describe how a mixture of V chlorine s Lead(II) chloride can be separated

- (b) Study the information given in the table below and answer the questions that follow.

formula of compound	NaCl	MgCl <sub>2</sub>	AlCl <sub>3</sub>	SiCl <sub>4</sub>	PCl <sub>3</sub>	LCI <sub>2</sub>
Boiling point (°C)	1470	1420	Sublimes at 180°C	60	75	60
Melting point (°C)	800	710		-60	-90	-80

- (i) Explain why the melting point and boiling points of MgCl<sub>2</sub> are very high yet melting point and boiling point of PCl<sub>3</sub> are very low. (2mks)

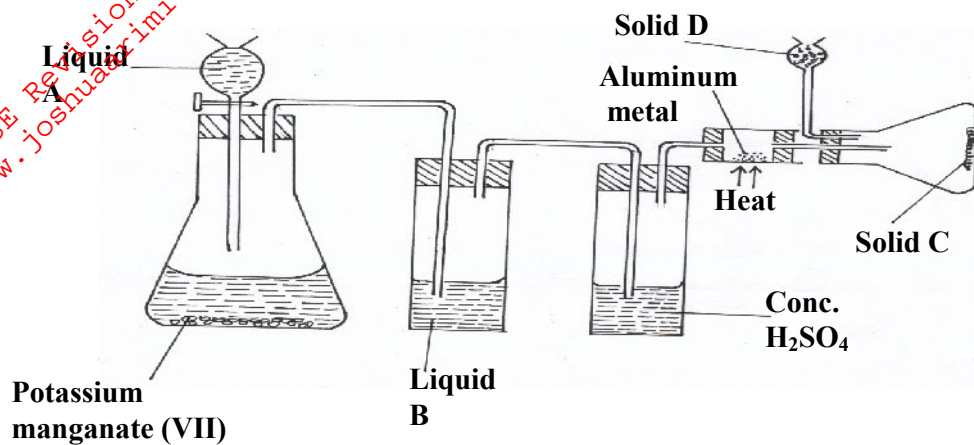
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(ii) Explain by use of a chemical equation why a solution when  $\text{AlCl}_3$  reacts with water has a pH of 3 (2mks)

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2. (a) Study the diagram below and use it to answer the questions that follow.



(i) Name liquids A and B

A..... (1mk)

B..... (1mk)

(ii) Suggest a suitable reagent that can be used as solid D (1mk)

.....

(iii) State the role of Solid D (1mk)

.....

(iv) Write a balanced chemical equation for the reaction in the conical flask (1mk)

(v) Explain why solid C collects further away from the heated aluminium metals. (1mk)

.....  
 .....

(vi) In the combustion tube above, 0.675g of aluminium metal reacted completely with  $1800\text{cm}^3$  of chlorine gas at room temperature. Determine the molecular formula of Solid C, given that its relative formula mass is 267 (Al= 27.0, Cl= 35.5 molar gas volume at r.t.p = 24.0 litres) (3mks)

(b) The reaction between hot concentrated sodium hydroxide and chlorine gas produces Sodium Chlorate (V) as one of the products

(i) Write the equation for the reaction. (1mk)

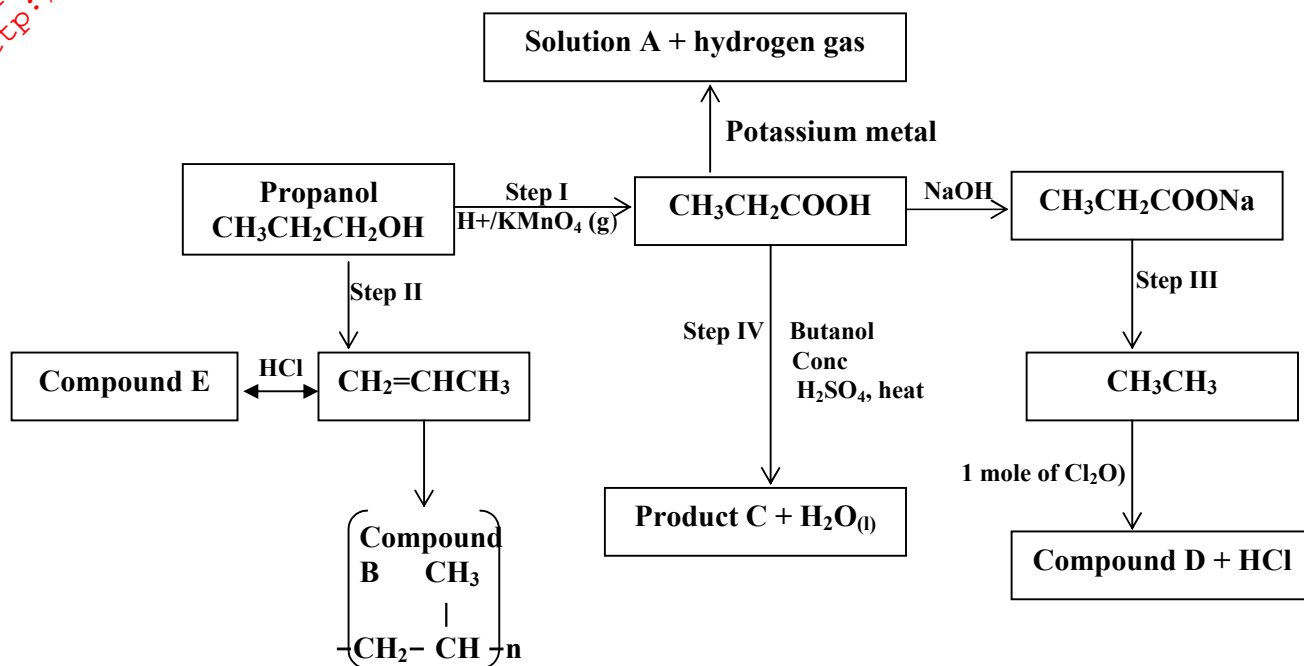
(ii) Give **one** use of sodium chlorate.(V)  
(1mk)

.....

(c) Explain the difference between bleaching by chlorine and bleaching by sulphuric (IV)oxide gases. (2mks)

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.....

3. The scheme below shows a series of reactions starting with Propanol. Study it and answer the questions that follow.



(a)(i) Name the type of reaction in steps I and II  
Step I..... ( ½ mk)

Step II..... ( ½ mk)

(b) Write the equation for the reaction that takes place in Step III ( 1mk)

(c) Name substances labeled A,C,D and E (2mks)

A.....

C.....

D.....

E.....

(d) Draw the structural formula of product C . (1mk)

(e) Name the process in Step (IV). (1mk)

.....

(f) Name compound **B** and state the type of reaction involved in its formation

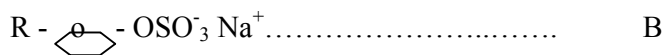
Name of compound **B**..... (½ mk)

Type of reaction..... (½ mk)

(g) If the relative molecular mass of B is 35,700 determine the value of n (2mks)

.....  
 .....  
 .....

(h) Below are structures of two cleaning agents



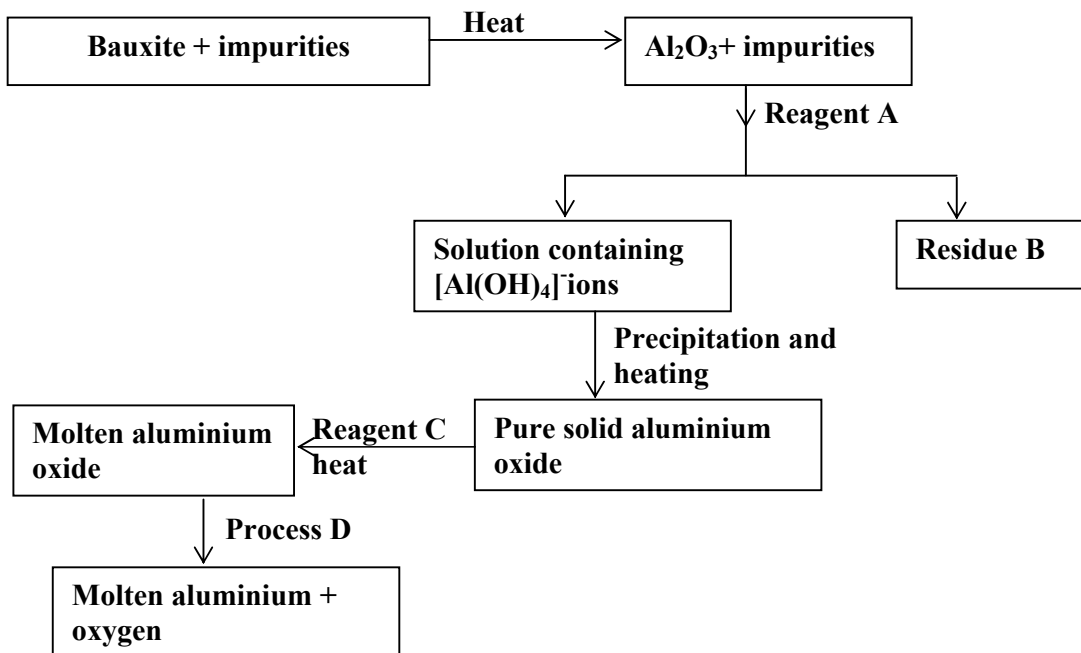
(i) Identify the cleaning agent suitable to be used in water containing magnesium chloride. (1mk)

.....  
 .....

(ii) State **one** advantage of using cleaning agent B (1mk)

.....

4. The flow chart below shows industrial extraction of aluminium metal. Study it and answer the questions that follow.



(a) Name **two** main impurities found in bauxite (1mk)

.....  
.....

(b) Name reagents **A** and **C**

Reagent **A**..... (1mk)

Reagent **C**..... (1mk)

(c) Name residue **B**. Give a reason (2mks)

Name.....

Reason.....

(d) When 3.12g of hydrated aluminium oxide ( $\text{Al}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ ) was heated to a constant mass, 2.06g of aluminium oxide was obtained. Determine the value of  $n$  in hydrated aluminium oxide.

(Al=27.0, O=16.0 H=1.0) (3mks)

(e) Explain why it is necessary to heat aluminium oxide in the presence of reagent **C** before process **D** is Carried out . (1mk)

.....  
.....

5. (a) State the particles responsible for conductivity of an electric current in (2mks)

(i) Solution.....

(ii) A metal.....

(b) Study the standard electrode potentials for the half-cells given below. The letter do not represent the actual symbols of the elements .

<u>half cell</u>	<u><math>E^\circ\text{V}</math></u>
$\text{U}^+_{(\text{aq})} + \text{e}^- \longrightarrow \text{U}_{(\text{s})}$	-3.02
$\text{V}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{V}_{(\text{s})}$	-2.87
$\text{W}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{W}_{(\text{s})}$	+0.34

(i) Calculate the e.m.f of a cell made by (1mk)

**I U and V**

II Identify the Strongest oxidizing agent.

(1mk)

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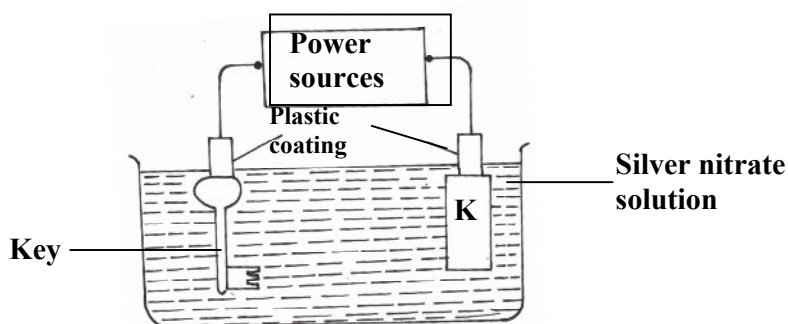
(ii) Determine the equation of the cell reaction made of U and W.

(1mk)

(iii) Show the conventional cell representation for the cell reaction in b(ii) above.

(1mk)

(e) One use of electrolysis is electroplating as shown below.



(i) To what terminal of the power source is the key connected?

(1mk)

.....

(ii) Name the most suitable material for electrode K

(1mk)

.....

(iii) Write the

I Anode reaction

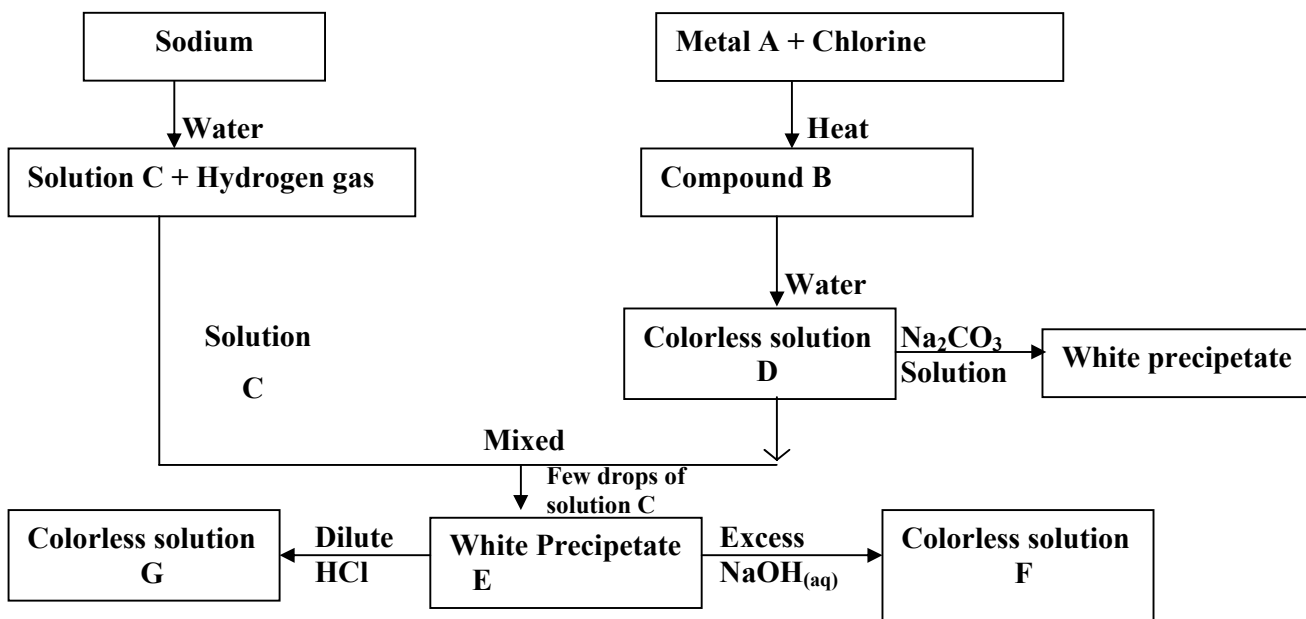
II Cathode reaction

(iv) If 3A power source was used for 5 hours, calculate the increase in mass of the Key.

( $Ag = 108, 1 Fa = 96500C$ )

(3mks)

6. Study the flow diagram below and use it to answer the questions that follow.



(a) Give the name and formula of the following.

(i) White precipitate E

Name..... ( ½ mk)

Formula..... ( ½ mk)

(ii) Colourless solution F

Name ..... ( 1mk)

Formula..... (1mk)

(b) What property is exhibited by white precipitate E when it reacts with Sodium hydroxide and HCl acid. (1mk)

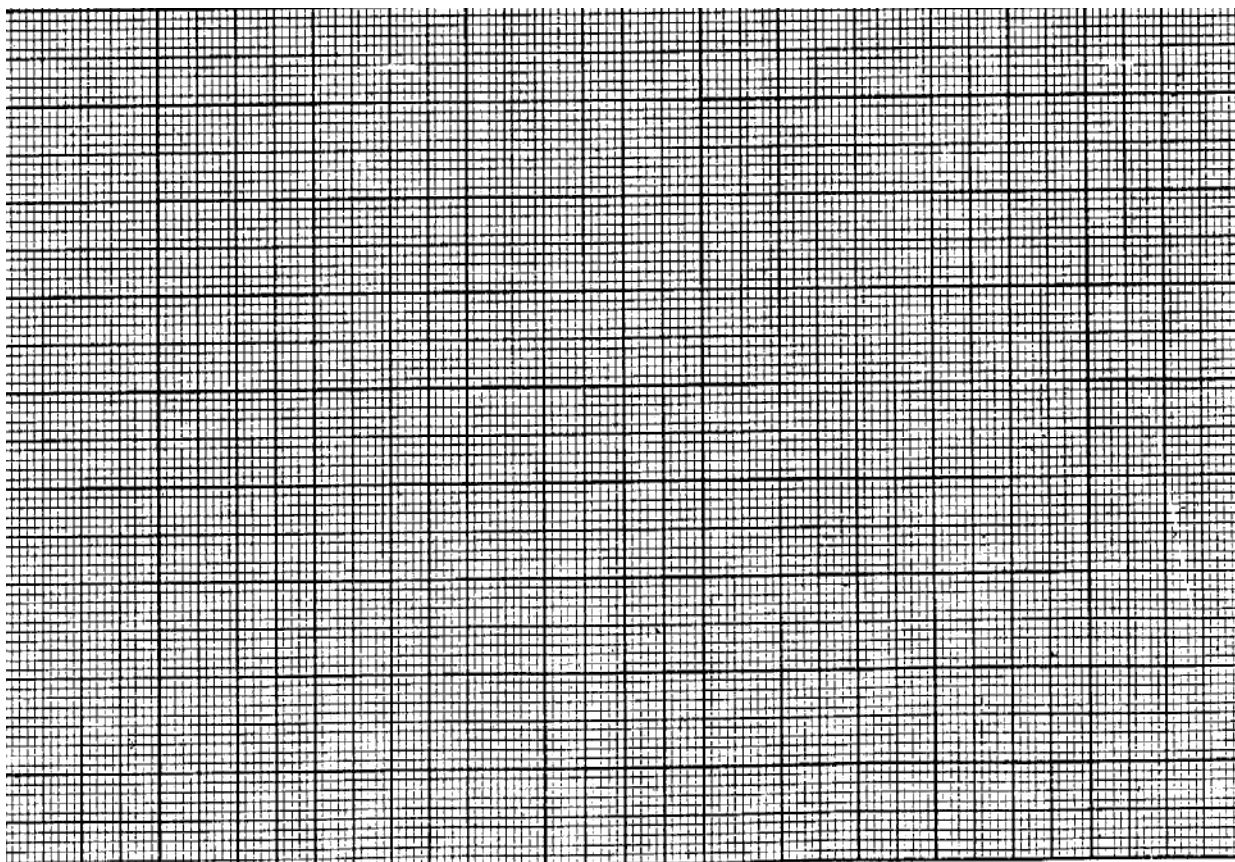


(c) Write an ionic equation for the reaction between white precipitate E and excess sodium hydroxide solution. (1mk)

(d) The information below gives the solubilities ( In g/100g of water) of substances X and Y at various temperatures

Temperature		0	20	40	60	80	100
Solubility g/100g of water	X	10	15	26	40	63	100
	Y	30	34	37	40	44	48

(i) Plot a graph of solubility against temperature for the two salts X and y on the same axis. (4mks)

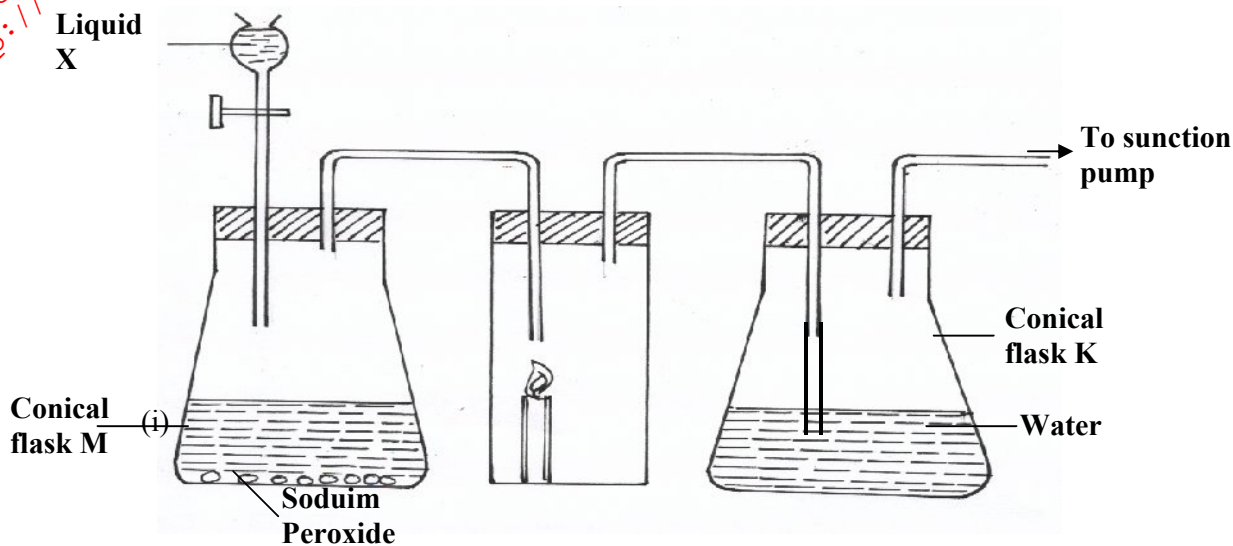


(i) From the graph state:  
I The solubility of X at 50°C (1mk)

II The temperature at which solubility of Y is 36g/100g of water. (1mk)

III Calculate the mass of crystals of substance X which will deposit when a solution containing 50g of X in 100g of water initially at 80°C is cooled to a temperature of 30°C (1mk)

7. The diagram below shows a set – up that was used to prepare oxygen gas and passing it over a burning candle. The experiment was allowed to run for some time.



(i) Name liquid X (1mk)

(ii) Suggest the PH of the solution in conical flask K. (1mk)

(iii) Write an equation for the reaction taking place in the conical flask M. (1mk)

(b) State and explain the two observation made when hydrogen sulphide is bubbled in to the solution containing Iron (III) chloride. (2mks)

(c) (i) Describe a simple chemical test that can be used to distinguish carbon (IV) oxide and

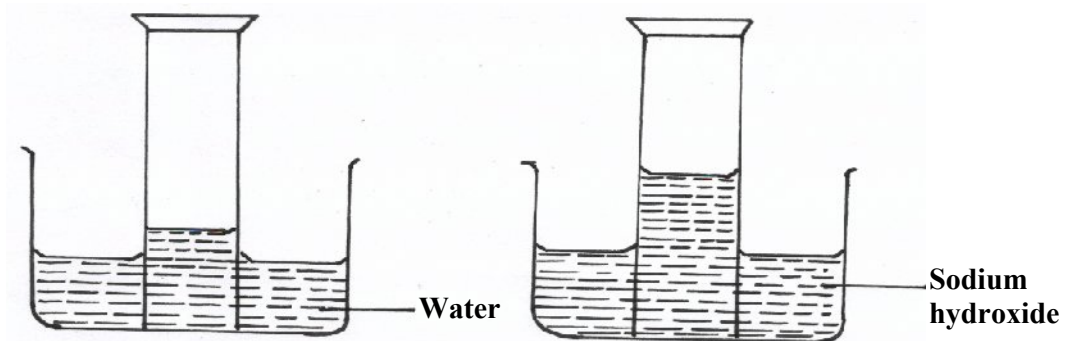
Carbon(II) oxide gases.

(1mk)

(ii) Give **one** use of carbon (II) Oxide

(1mk)

(d) A form two student inverted a gas jar full of carbon(IV) oxide over water and sodium hydroxide solution separately as shown below



Explain the observations made.

(2mks)