

MUTITO SUB-COUNTY KCSE REVISION MOCK EXAMS 2015

**233/2
CHEMISTRY
PAPER 2
(THEORY)
TIME: 2 HOURS**

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NAME _____
SCHOOL _____

INDEX NO. _____
SIGNATURE _____
DATE _____

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MUTITO SUB-COUNTY FORM FOUR JOINT EVALUATION TEST, 2015
Kenya Certificate of Secondary Education (K.C.S.E)

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INSTRUCTIONS:

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

FOR EXAMINER'S USE ONLY

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

*This paper consists of 12 printed pages.
Candidates should check to ensure that all pages are printed as indicated and 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.

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-}	2.8.18.8	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 (2 marks)

T _____

V _____

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

- iii) Explain why:

- I. The atomic radius of S is smaller than that of V. (1 mark)

- II. The atomic radius of R is larger than its ionic radius. (1 mark)

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

- v) Describe how a mixture of V chloride and lead (II) chloride can be separated. (2 marks)

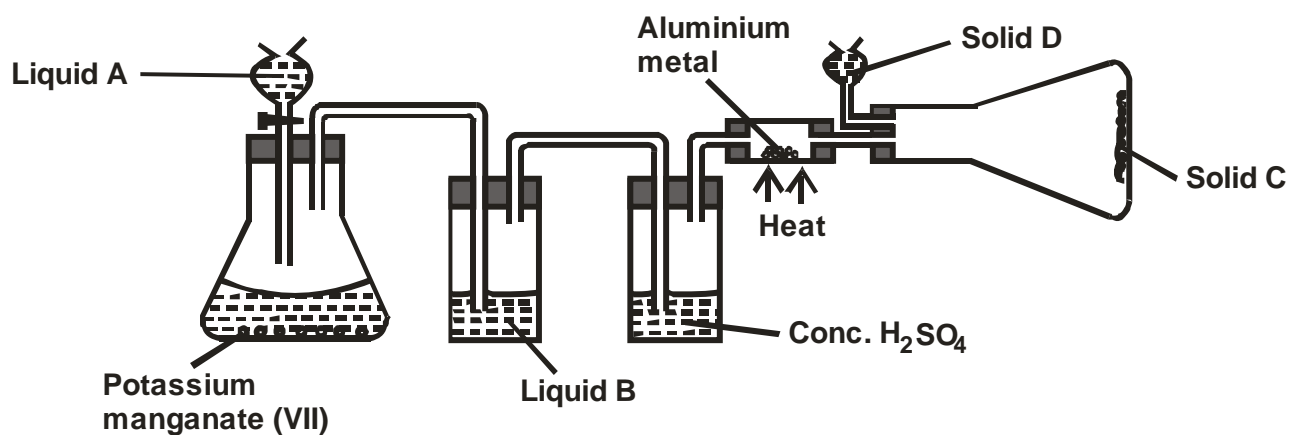
- b) Study the information given in the table below and answer the questions that follow.

Formula of compound	NaCl	MgCl ₂	AlCl ₃	SiCl ₄	PCl ₃	LiCl ₂
Boiling point (°C)	1470	1420	Sublimes	60	75	60
Melting point (°C)	800	710	at 180(°C)	-60	-90	-80

- i) Explain why the melting and boiling points of MgCl₂ are very high yet the melting and boiling points of PCl₃ are very low. (1 mark)

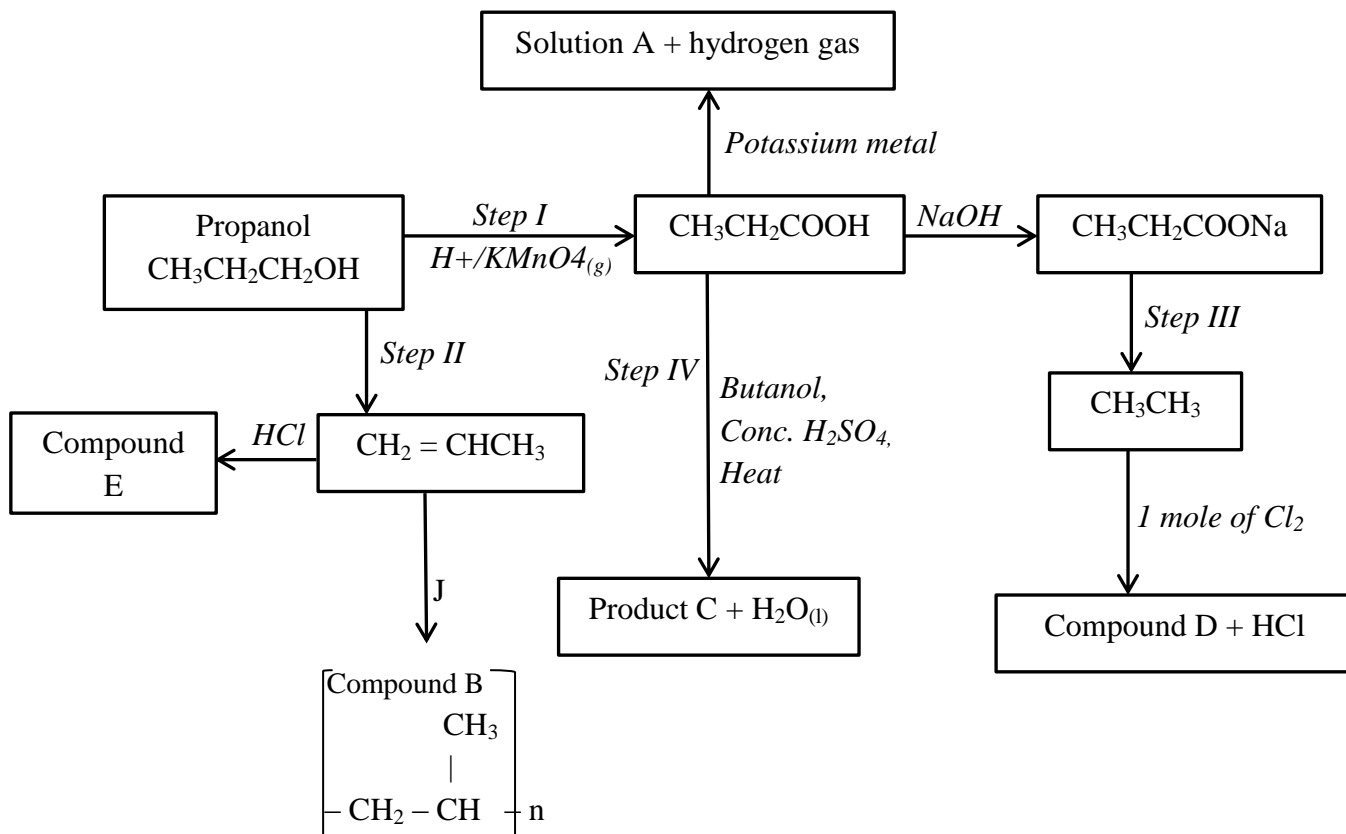
- ii) Explain by use of a chemical equation why a solution formed when AlCl₃ reacts with water has a pH of 3. (2 marks)

2. a) Study the diagram below and answer the questions that follow.



- i) Name liquids A and B
- A _____ (1 mark)
- B _____ (1 mark)
- ii) Suggest a suitable reagent that can be used as solid D. (1 mark)
- _____
- iii) State the role of solid D. (1 mark)
- _____

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



- a) Name the type of reaction in steps I and II. (1/2 mark)
- Step I _____ (1/2 mark)
- Step II _____ (1/2 mark)
- b) Write the equation for the reaction that takes place in step III. (1 mark)
- _____
- _____
- c) Name the substances labelled A, C, D and E. (2 marks)
- A _____
- C _____
- D _____
- E _____
- d) Draw the structural formula of product C (1 mark)
- _____
- e) Name the process in step IV (1 mark)
- _____

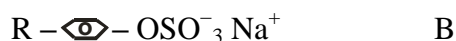
f) Name compound B and state the type of reaction involved in its formation.

Name of compound B. _____ (½ mark)

Type of reaction J _____ (½ mark)

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

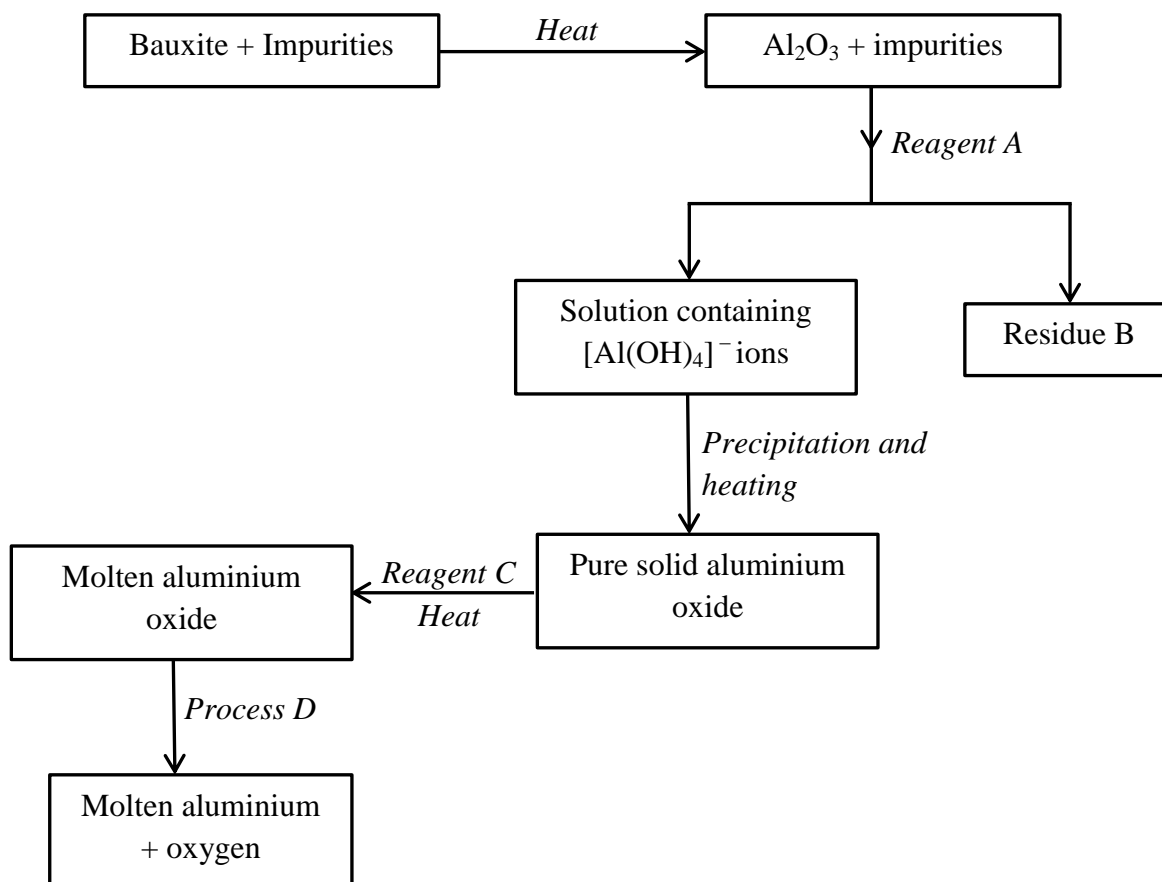
h) Below are structures of two cleaning agents.



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

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

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. (1 mark)

b) Name reagents A and C

Reagent A _____ (1 mark)

Reagent C _____ (1 mark)

c) Name residue B. Give a reason. (2 marks)

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 into 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) (4 marks)

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

5. a) State the particles responsible for conductivity of an electric current in:

i) Solution _____ (1 mark)

ii) A metal _____ (1 mark)

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

Half-cell	E^θ/V
$\text{U}^+_{(\text{aq})} + \text{e}^- \rightarrow \text{U}_{(\text{s})}$	-3.02
$\text{V}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{V}_{(\text{s})}$	-2.87
$\text{W}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{W}_{(\text{s})}$	+0.34

I. Calculate the e.m.f of the cell made by U and V. (1 mark)

II. Identify the strongest oxidising agent.

(1 mark)

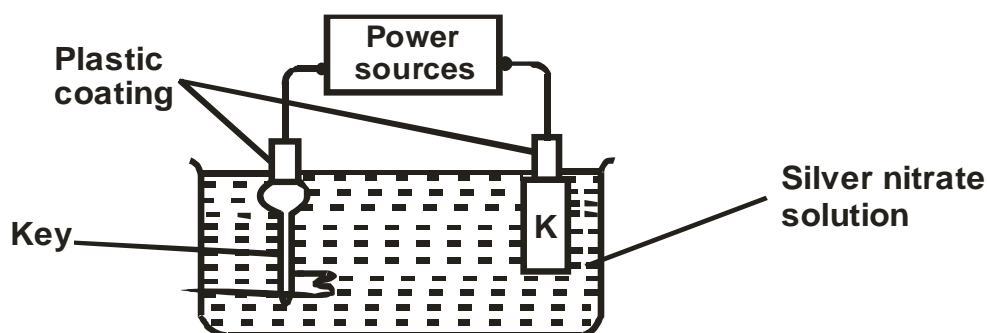
III. Determine the equation of the cell reaction made of U and W.

(1 mark)

IV. Show the overall cell representation for the cell reaction in b (ii) above.

(1 mark)

c) One use of electrolysis is electroplating as shown below.



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

(1 mark)

ii) Name the most suitable material for electrode K.

(1 mark)

iii) Write the:

(1 mark)

I. Anode reaction.

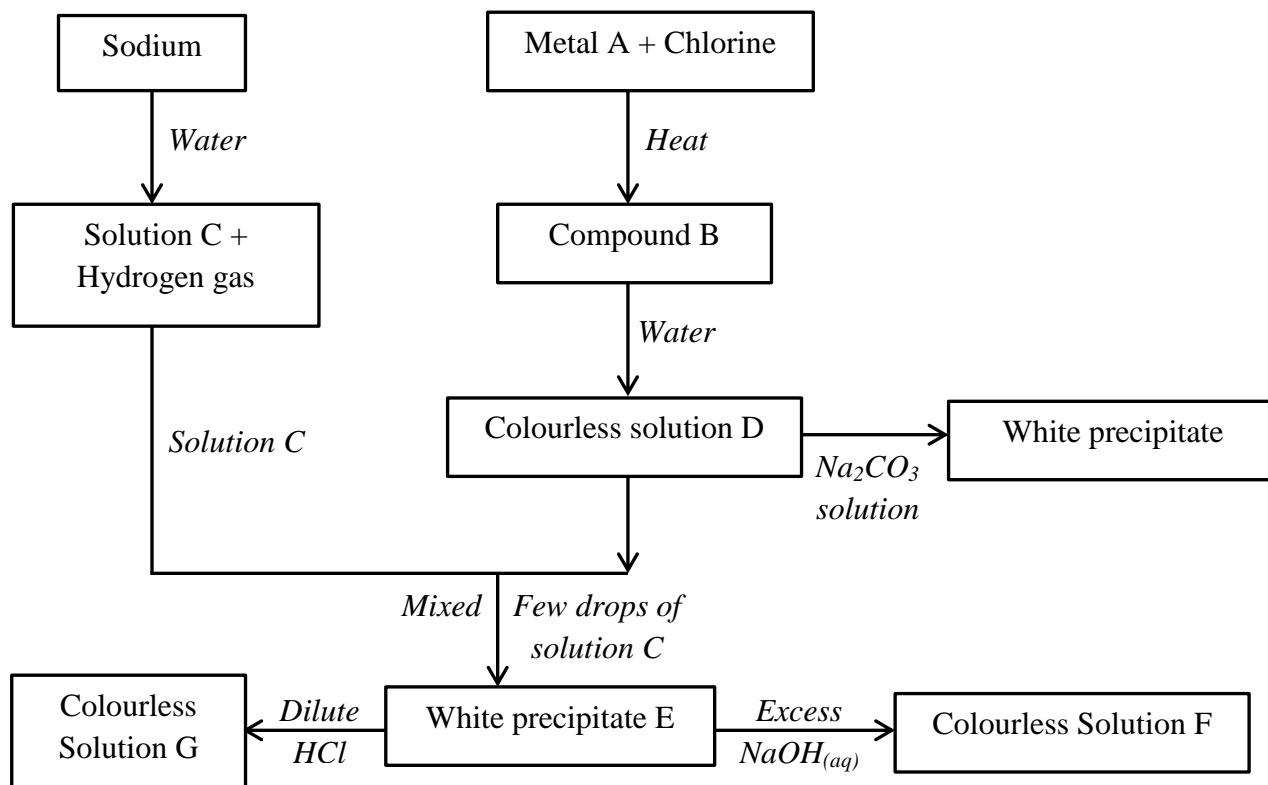
II. Cathode reaction.

iv) If 3A power source was used for five hours, calculate the increase in mass of the key.

($A_g = 108$, $1F = 96500C$).

(3 marks)

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

(1 mark)

Name

Formula

ii) Colourless solution F

(2 marks)

Name

Formula

b) What property is exhibited by white precipitate E when it reacts with sodium hydroxide and hydrochloric acid?

(1 mark)

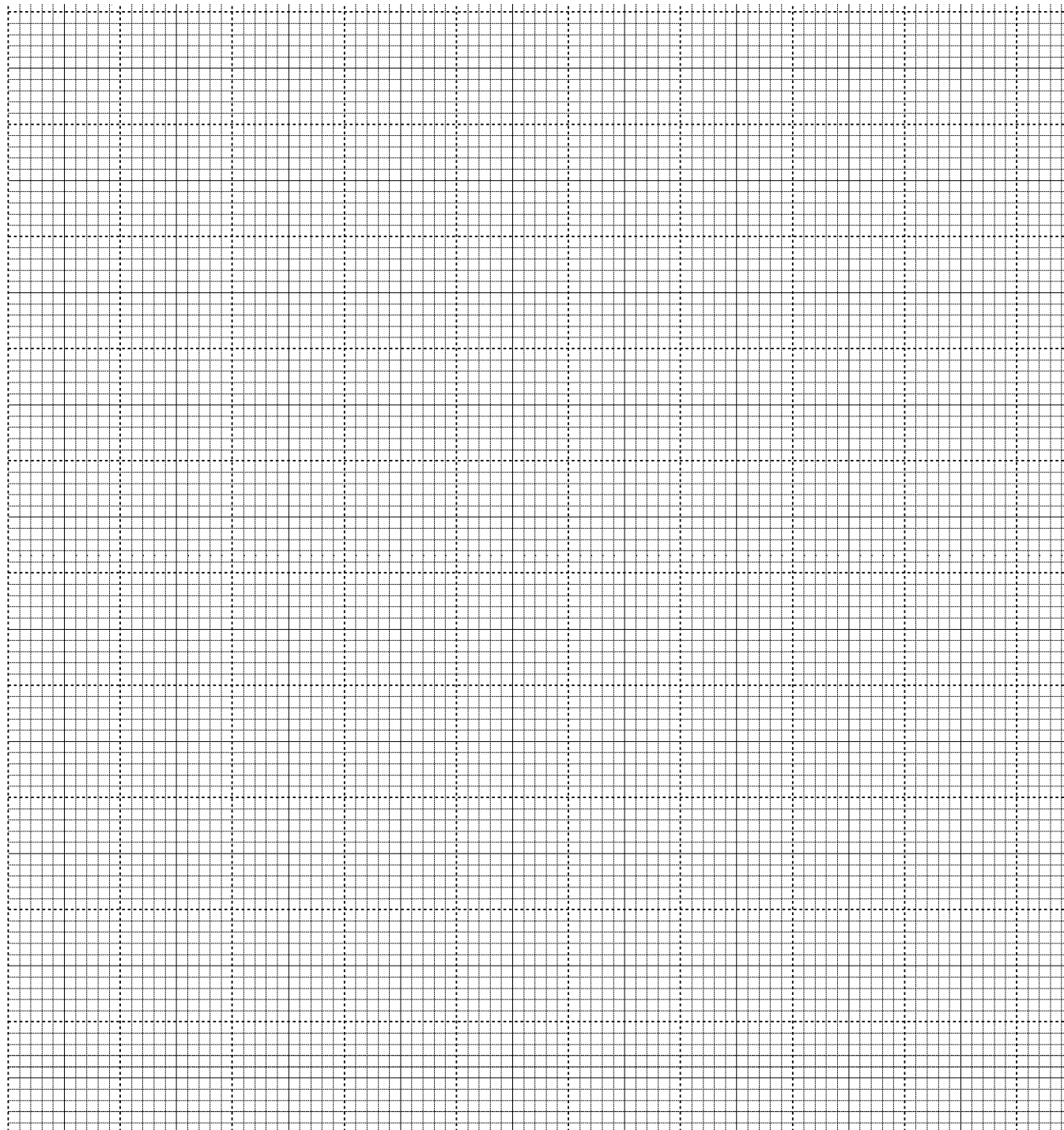
c) Write an ionic equation for the reaction between white precipitate E and excess sodium hydroxide solution.

(1 mark)

- 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. (4 marks)



- ii) From the graph state:

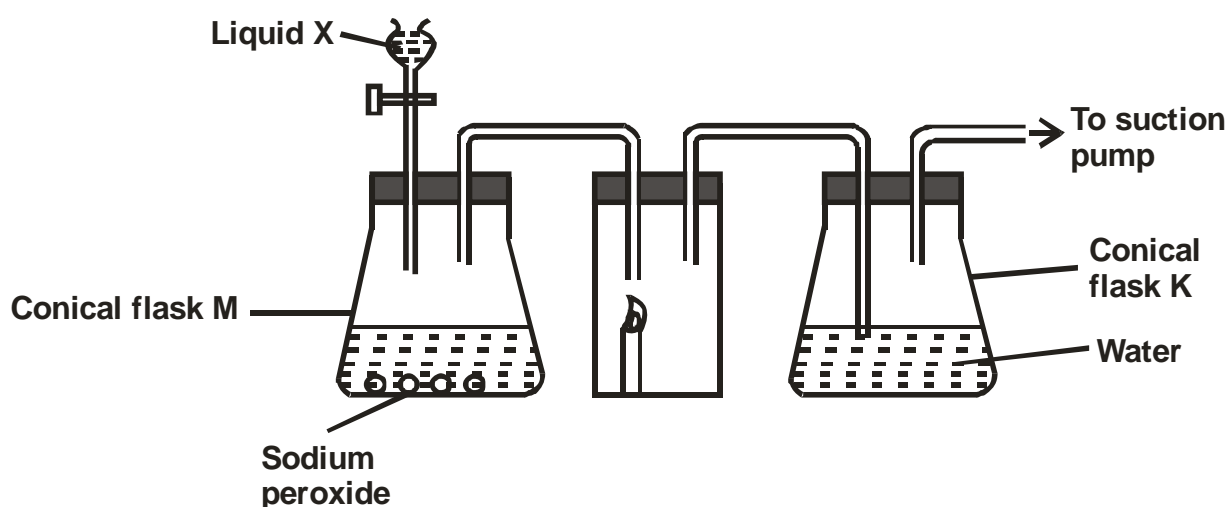
I The solubility of X at 50°C.

(1 mark)

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

III Calculate the mass of crystals of substance X which will deposit when a solution containing 50g of X in 100g of water at 80°C is cooled to a temperature of 30°C. (2 marks)

7. a) The diagram below shows a setup 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 (1 mark)

ii) Suggest the pH of the solution in conical flask K. (1 mark)

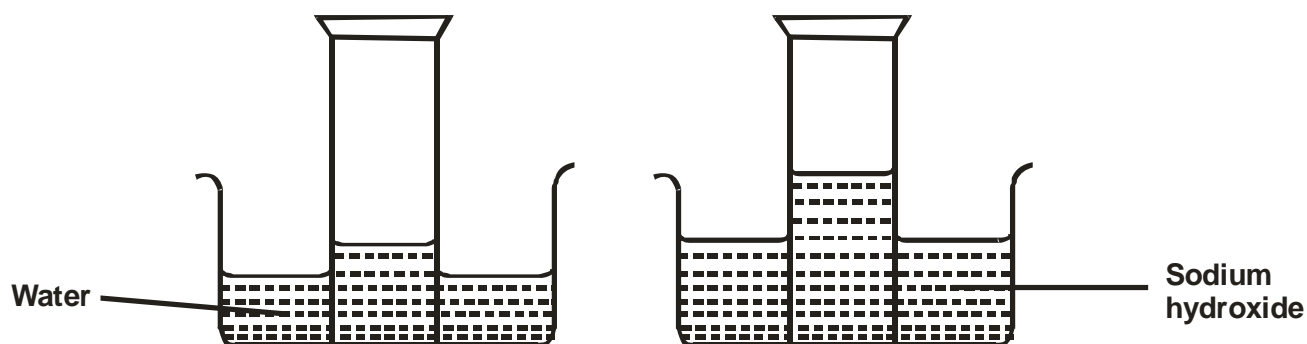
iii) Write an equation for the reaction taking place in the conical flask M. (1 mark)

b) State and explain the two observations made when hydrogen sulphide is bubbled into the solution containing iron (III) chloride. (2 marks)

- c) i) Describe a simple chemical test that can be used to distinguish between carbon (IV) oxide and carbon (II) oxide gases. (3 marks)

- ii) Give **one** use of carbon (II) oxide (1 mark)

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



- Explain the observations made. (2 marks)
