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

SCHOOL………………………………………………… CANDIDATE'S SIGNATURE………………

DATE………..………………….…………..

233/2
CHEMISTRY
(THEORY)
PAPER 2
JULY/AUGUST 2014
TIME: 2 HOURS

TRANS-NZOIA COUNTY JOINT EVALUATION EXAMINATION-2014
Kenya Certificate of Secondary Education

CHEMISTRY
PAPER 2
(THEORY)
TIME: 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.
- Mathematics tables and electronic calculators may be used.
- All working **mus**t be clearly shown where necessary.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	11	
2	10	
3	11	
4	11	
5	13	
6	11	
7	13	
Total Score	**80**	

*This paper consists of **12** printed pages.*
Candidates should check to ascertain that all the pages are printed
as indicated and that no questions are missing.

1. The grid **below** is part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbol of the element.

A									M
B	C			F		G	J	L	
	D		E			H	K		

(a) What name is given to the group of element n which **M** and **L** belong? (1 mark)

_____

(b) Element Y has the electronic structure 2, 8, 8, 4; on the gird above, indicate the position of element Y. (1 mark)

(c) Write an equation to show the effect of heat on the nitrate of **B**. (1 mark)

(d) When 300cm³ of chlorine gas was completely reacted with element C, 1875g of the produce was formed. Determine the relative atomic mass of element C. (Cl = 35.5, M.G.V = 24000cm³). (3 marks)

(e) Using dot (.) and crosses (x) to represent electron, show bonding in the compound formed between **C** and J. (2 marks)

(f) Compare the melting points of elements **D** and **E**. Explain. (2 marks)

_____

_____

_____

_____

(g) State **one** commercial use of element **G**. (1 mark)

_____

_____

2. The diagram **below** shows the process of manufacturing sodium carbonate using ammonia soda process. Study it and answer the questions that follow.
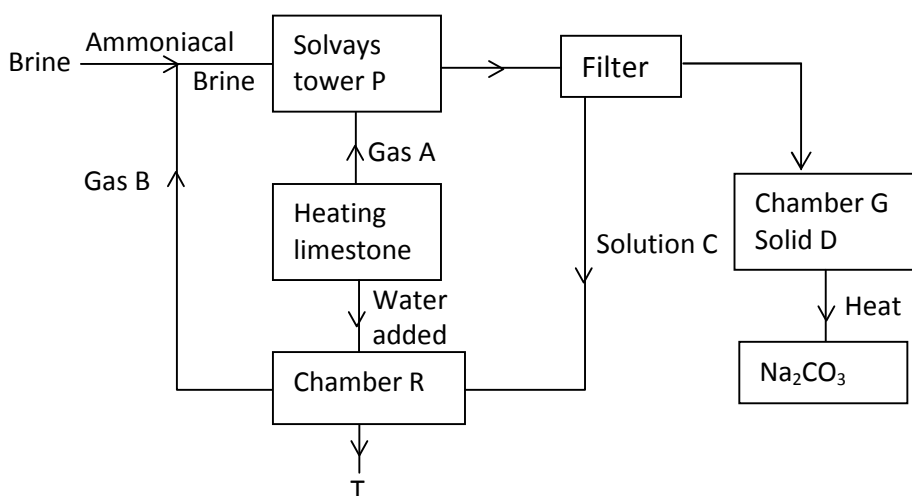
(a) Name gases **A** and **B**. (2 marks)

A _____

B _____

(b) Name liquid **C** and solid **D**. (2 marks)

C _____

**D** _____

(c) Write equations of the reactions in: (2 marks)
Tower **P**.

Chamber **R**.

(d)   Name the product **T** formed at chamber **R** and give one of its uses.   (2 marks)

_____

_____

_____

(e)   Explain using ionic equations how sodium carbonate is used to soften hard water.   (2 marks)

3.   The set-up **below** was used to prepare and collect gas **X.** During the experiment cleaned magnesium
        ribbon was strongly heated before heating the wet glass wool.
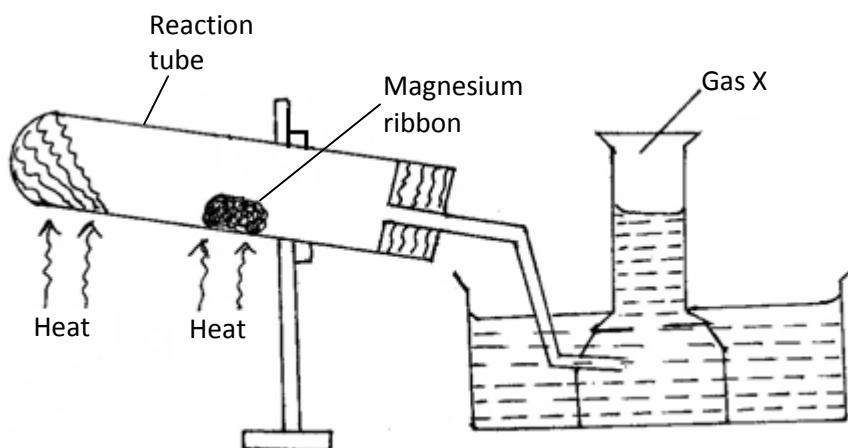
(a)   Name gas **X** _____   (1 mark)

(b)   Why is magnesium ribbon cleaned before it is used?   (1 mark)

_____

_____

_____

(c)   State **one** observation that would be noted in the reaction tube.   (1 mark)

_____

_____

(d)   Write the equation for the reaction in the reaction tube.   (1 mark)

Chemistry Paper 2   4

(e) State **one** industrial use of the solid product formed in the reaction tube. (1 mark)

_____

_____

(f) What precaution should be taken at the end of experiment? Explain. (2 marks)

_____

_____

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_____

(g) At the end of the experiment 96.0cm³ of gas X were collected at 10°C and 1 atmosphere
pressure. (Mg = 24, M.G.V = 22.4, T = O°C at stp, P = 1 atmosphere at stp).
(i) Determine the volume gas X would occupy at s.t.p? (2 marks)

(ii) Calculate the mass of magnesium ribbon used Mg = 24. (2 marks)

4. The flow chart **below** shows the large-scale manufacture of nitric (V) acid. Study it and answer
the questions **below**.
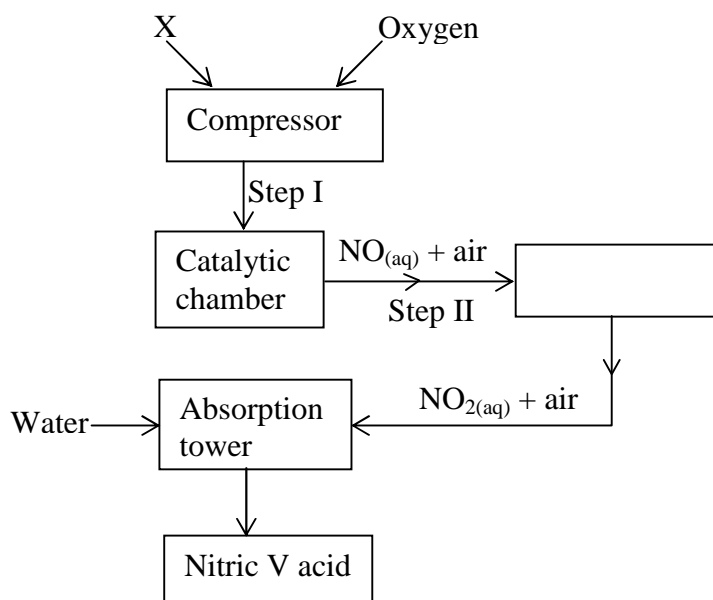
(a) Name substance **X**. _____ (1 mark)

(b) Identify one source of **X** in this process. (1 mark)

_____

(c) Write a balanced equation for the reaction which take place.
(i) At Step II. (1 mark)

(ii) In the absorption tower. (1 mark)

(d) Name the catalyst used in this process. (1 mark)

_____

(e) Why is it not advisable to store nitric (V) acid in a transparent bottle? (1 mark)

_____

_____

_____

(f) The apparatus **below** was arranged to investigate the properties of nitric (V) acid.
Study the set-up and answer the questions that follow:

Charcoal powder
+ conc. nitric V acid

Water

Lime water
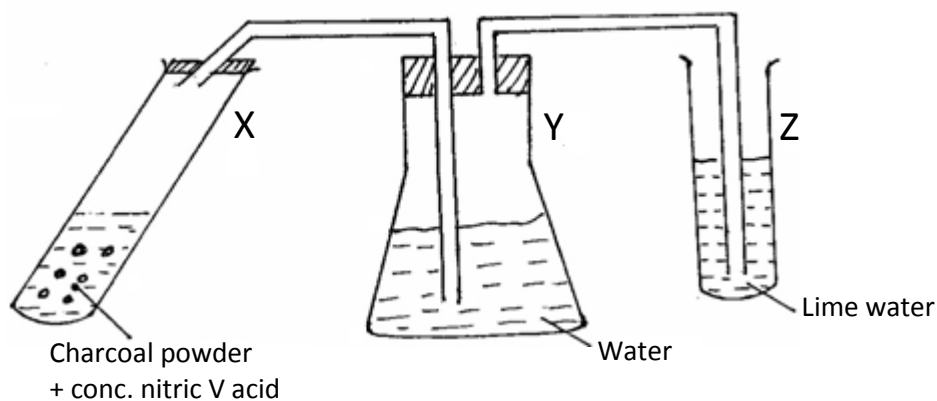
(i) Explain what would be observed when blue and red litmus paper is dropped into flask **Y** after the experiment. (2 marks)

_____

_____

_____

_____

(ii) Write an equation for the reaction in test tube **X** above. (1 mark)

(iii)   What gaseous products would be expected if concentrated sulphuric (VI) acid was used in place of conc. nitric (V) acid? (1 mark)

5.   The standard reduction potentials for five half cells are shown in the table **below**. Study it and answer the questions that follow. (The letters do not represent the actual symbol of elements).

Elements					E^{θ} (Volts)
(i)	$A_{2(aq)}$	$+\ 2e^-$	$\rightarrow$	$2A^-_{(aq)}$	$+1.09$
(ii)	$Q^{2+}_{(aq)}$	$+\ 2e^-$	$\rightarrow$	$Q_{(s)}$	-0.13
(iii)	$R^{2+}_{(aq)}$	$+\ 2e^-$	$\rightarrow$	$R_{(s)}$	-2.37
(iv)	$Y^{2+}_{(aq)}$	$+\ 2e^-$	$\rightarrow$	$Y_{(s)}$	$+0.34$
(v)	$2S^+_{(aq)}$	$+\ 2e^-$	$\rightarrow$	$S_{2(s)}$	0.00

I   (a)   With a reason, identify the strongest reducing agent. (1 mark)

_____

_____

_____

(b)   Which half cell is likely to be hydrogen? (1 mark)

(c)   Write an equation for the reaction between two half cells in (ii) and (IV).   (1 mark)

(d)   Calculate the e.m.f of the cell in (c) above. (1 mark)

_____

_____

_____

(e)   Explain why you should not use concentrate sulphuric (VI) acid in lead acid accumulators. (1 mark)

_____

_____

_____

II   The diagram **below** represents a mercury cell that can be used in the industrial manufacture of sodium hydroxide. Study it and answer the questions that follow:-
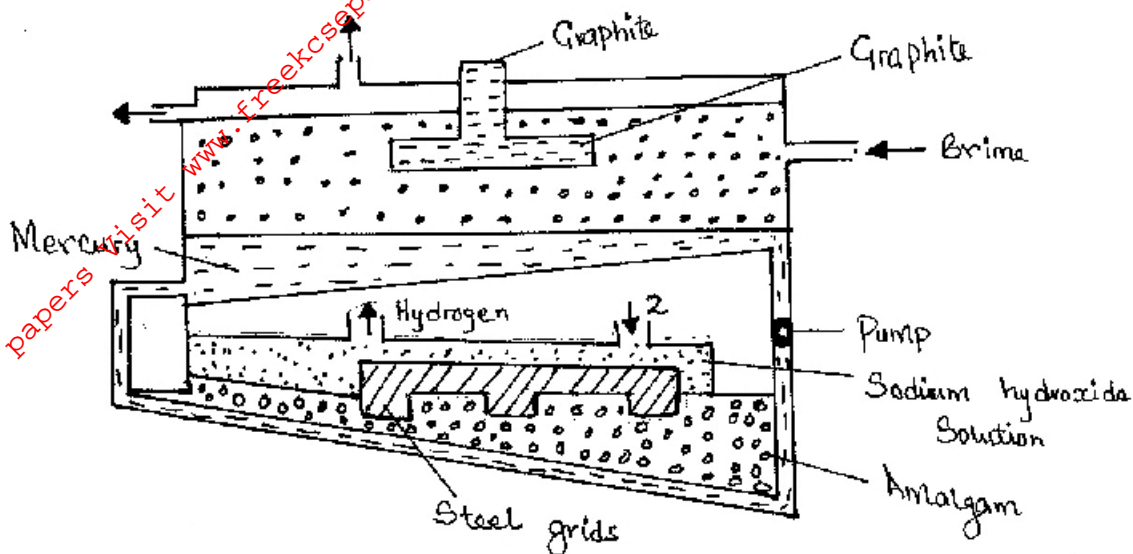
(a)   Name:
   (i)   Raw material introduced at **2**.   (½ mark)

   _____

   (ii)   Another substance that can be used in the cell instead of graphite.   (½ mark)

   _____

(b)   Identify the by-product that comes out at **I**.   (1 mark)

   _____

(c)   Write an equation for the reaction:-
   (i)   That occurred at the anode.   (1 mark)

   (ii)   In which sodium hydroxide was produced.   (1 mark)

   _____

(d)   Give **two** reasons why mercury is recycled.   (2 marks)

   _____

   _____

   _____

III   Draw a diagram to show how an aluminium spoon can be electroplated with copper. (2 marks)

6.   In an experiment to determine the molar heat of combustion of ethanol (C_2H_5OH), the set-up **below** was used.
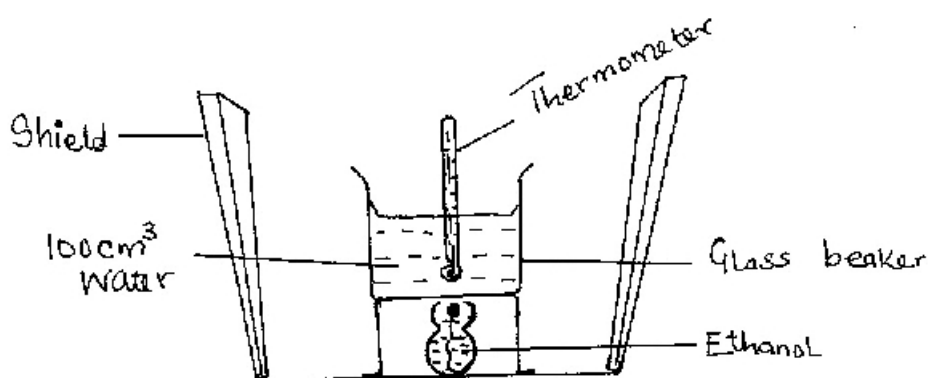
(i)   Initial temperature of water 23°C.
(ii)   Final temperature of water 37°C.
(iii)   Initial mass of lamp and contents 26.08g.
(iv)   Final mass of lamp and its content 25.83g
        (Density of water = 1g/cm³, specific heat capacity 4.2KJ/Kg/K C = 12, O = 16, H = 1)
        (a)   What is the use of the shield?   (1 mark)

        _____

        _____

        (b)   Write an equation for the combustion of ethanol?   (1 mark)

        (c)   Calculate:
                (i)   the number of moles of ethanol used in the experiment.   (2 marks)

                _____

                _____

                _____

                _____

(ii) the heat change in the experiment. (1 mark)

_____

_____

_____

(iii) the molar heat of heat combustion of ethanol. (2 marks)

_____

_____

_____

_____

(d) The above value in c(iii) is different from the theoretical value. How can the experiment be improved to get a closer value to the theoretical value. (2 marks)

_____

_____

_____

_____

(e) Draw an energy level diagram to show molar heat of combustion of ethanol. (2 marks)

7. (a) Define the term solubility. (1 mark)

_____

_____

_____

(b) The table **below** shows the solubility of substances A and B against temperature.

Temperature	15	25	35	45	55	65	75
Solubility of A in 100g of H_2O	26	38	53	72	98	124	155
Solubility of B in 100g of H_2O	35.8	36.2	36.6	37.0	37.4	38	38

(i) On the same axis, plot a graph of solubility of substance **A** and **B** against temperature.

(6 marks)
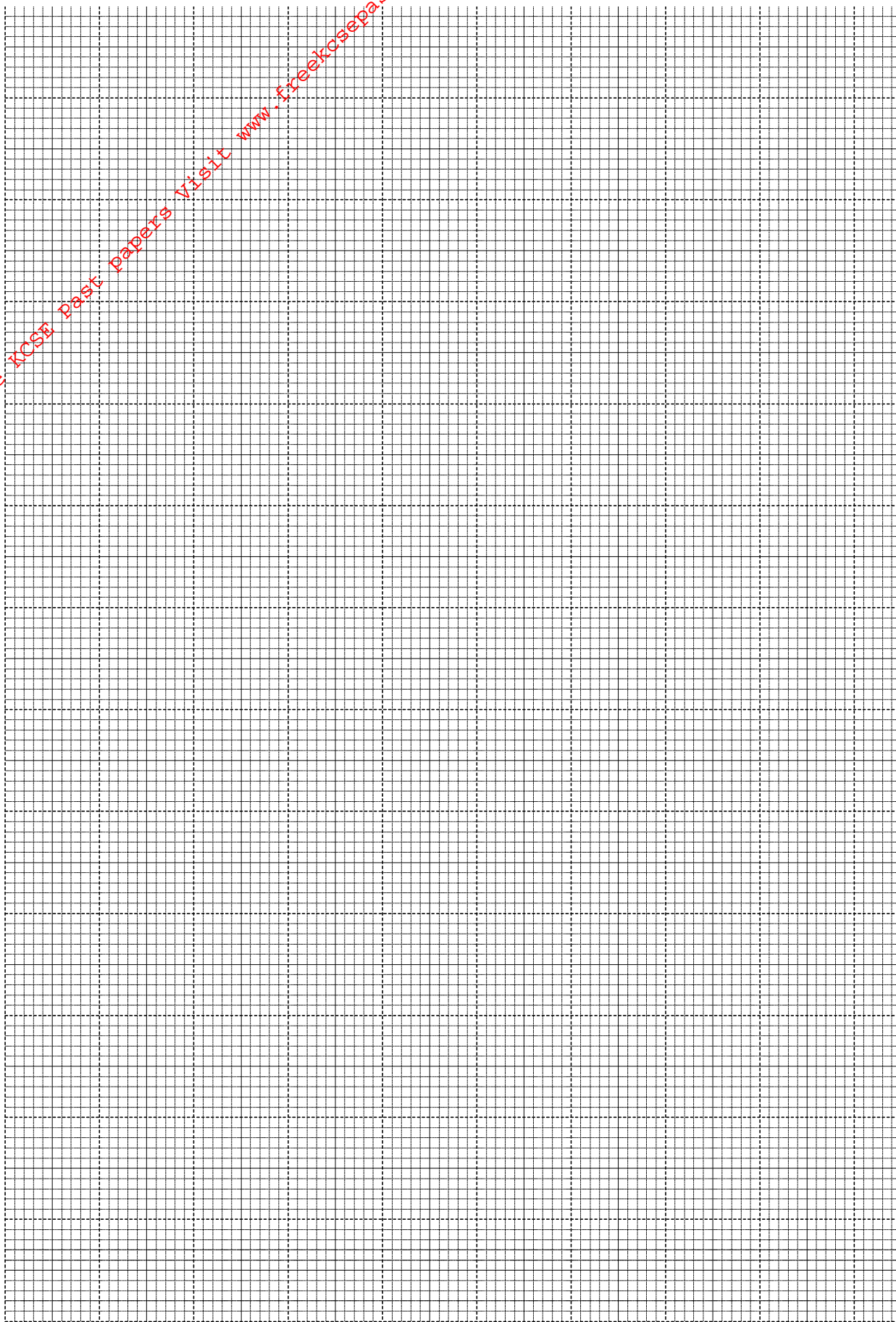
(ii) At what temperature are the solubilities of **A** and **B** the same? (1 mark)

(iii)   What mass of substance B is necessary to saturate 35g of water at 50°C.   (1 mark)

_____

_____

_____

_____

(iv)   40g of A solution saturated at 50°C are cooled to 15°C. What mass of solid B will
separate out?   (2 marks)

_____

_____

_____

_____

(v)   Name the method of separating mixture which would be used to obtain pure sample of
A from a mixture of **A** and **B**.   (1 mark)

_____