

NAME ..... DATE .....

INDEX NO. .... CANDIDATE'S SIGNATURE .....

233/2  
CHEMISTRY  
PAPER 2  
(THEORY)  
JULY/AUGUST, 2010  
TIME: 2 HOURS.

## MBOONI WEST DISTRICT JOINT EVALUATION TEST

Kenya Certificate of Secondary Education.

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

### INSTRUCTIONS TO CANDIDATES.

- Write your **NAME** and **INDEX NUMBER** in spaces provided above.
- Sign and write the date of exam in the spaces 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.

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1	12 marks	
2	11 marks	
3	12 marks	
4	10 marks	
5	12 marks	
6	10 marks	
7	13 marks	
TOTAL SCORE	80 marks	

*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. Below is a part of grid periodic table. The letters do represent elements but, not their real chemical symbols.

B	A							C
	D							
H	G				J			

- a. (i) Which type of elements are found in the shaded area? 1 mark
- .....
- (ii) Select an element with the lowest first ionisation energy. Give a reason for your answer. 1½ mark
- .....
- (iii) Explain how the atomic radii of H and J compare 1½ mark
- .....
- (iv) Name and explain the type of structure of the compound that would be formed when element J is reacted with element B 2 marks
- .....
- .....
- (v) Explain how the molar heat of fusion of element B. Compare with that of element C. 2½ marks
- .....
- .....
- .....
- .....
- b. During an experiment, ethane,  $C_2H_6$  gas was found to take 10.954 minutes to diffuse through a certain orifice. While another gas Q which exists as diatomic molecules took 12.000 minutes to diffuse through the same orifice under similar conditions
- i) Determine the atomic mass of gas Q. (H=1.000, C=12.000) 2 marks
- .....
- .....
- .....
- .....

- ii) Given that atoms of gas Q has 10 neutrons in their nucleus. Write electronic arrangement of atoms of gas Q 1 mark
- .....
- .....

- iii) Place element Q in its correct position in the grid periodic table above. 1 mark
- .....

2. (a) During an experiment a student added soap solution to separate samples of water until lather was formed.

Below is a table showing the volumes of soap solution that was required to form lather with  $100\text{cm}^3$  of each sample of water before and after boiling the samples.

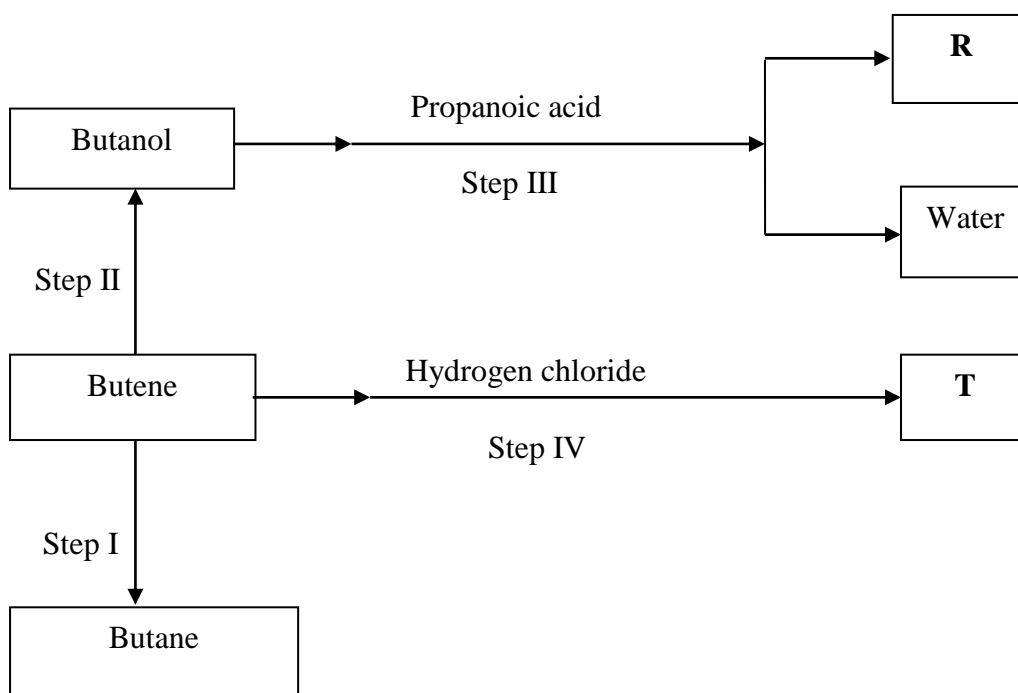
	<i>Volume (<math>\text{cm}^3</math>) of soap required by water sample</i>		
	X	Y	Z
<i>Before boiling</i>	4.5	19.5	22.5
<i>After boiling</i>	4.5	19.5	4.5

- i) State the most likely source of water sample X.  $\frac{1}{2}$  mark
- .....

- ii) Name a salt most likely to be present in water sample Y cooled.  $\frac{1}{2}$  mark
- .....

- iii) Write an equation for the reaction that may have occurred in water sample Z when it was being boiled. 1 mark
- .....
- .....

- b. Study the flow chart below and answer the questions that follow.



i) Name the types of reaction that occurs in steps 1 and II

1. Step 1

½ mark

2. Step II

½ mark

ii) What conditions are necessary for the reaction you have named in (ii) 1 above?

1½ mark

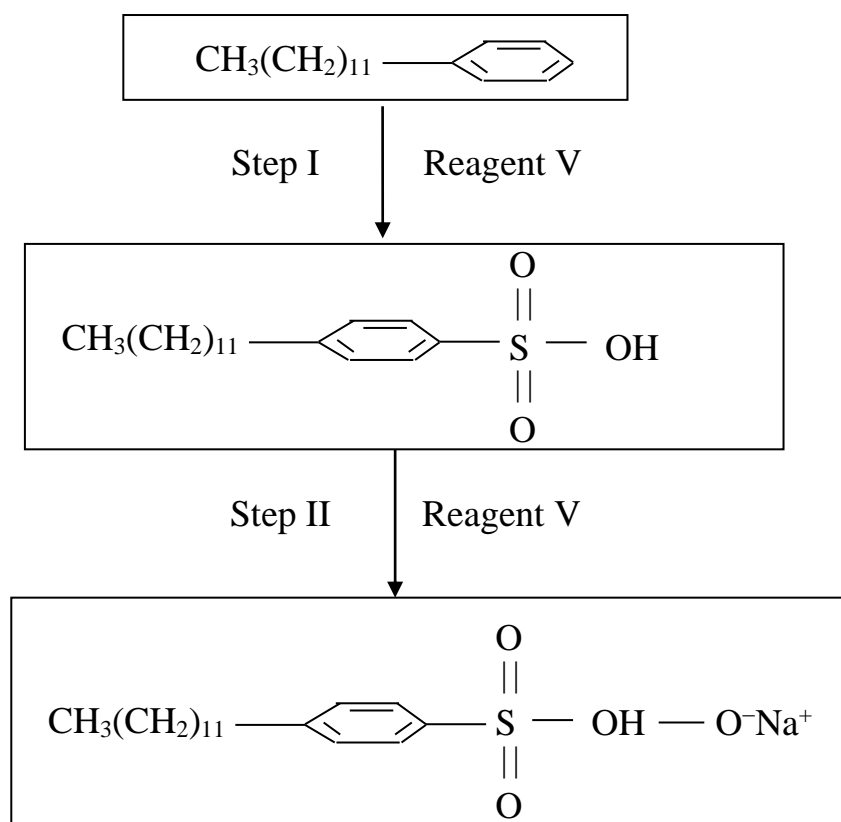
iii) Write a chemical equation for the reaction that takes place in step IV

1 mark

iv) Why is substance R used in some soaps?

1 mark

c. The flow diagram below shows some of the steps followed during the industrial manufacture of a detergent.



i) What is a detergent?

1 mark

ii) Identify reagents V and W

1. Reagent V

.....

2. Reagent W

.....

iii) Write an equation for the reaction that may occur when the detergent is added to water containing magnesium ions. 1 mark

.....

.....

iv) State one advantage of using the above detergent 1 mark

.....

.....

3. The diagram below represents a set up that was used to prepare a dry sample of sulphur (IV) oxide in a laboratory.

a. i) Name solid P ½ mark

.....

i) Complete the diagram to show how a sample of the gas was collected. 1½ mark

ii) Write the equation for the reaction that took place in flask F. 1 mark

.....

.....

iii) During the experiment exactly  $150\text{cm}^3$  of the acid was placed into flask F, to which excess solid P had been added.

Calculate the volume of sulphur (IV) oxide that is likely to have been produced.

(Molar gas volume =  $24000\text{cm}^3$ ) 2 marks

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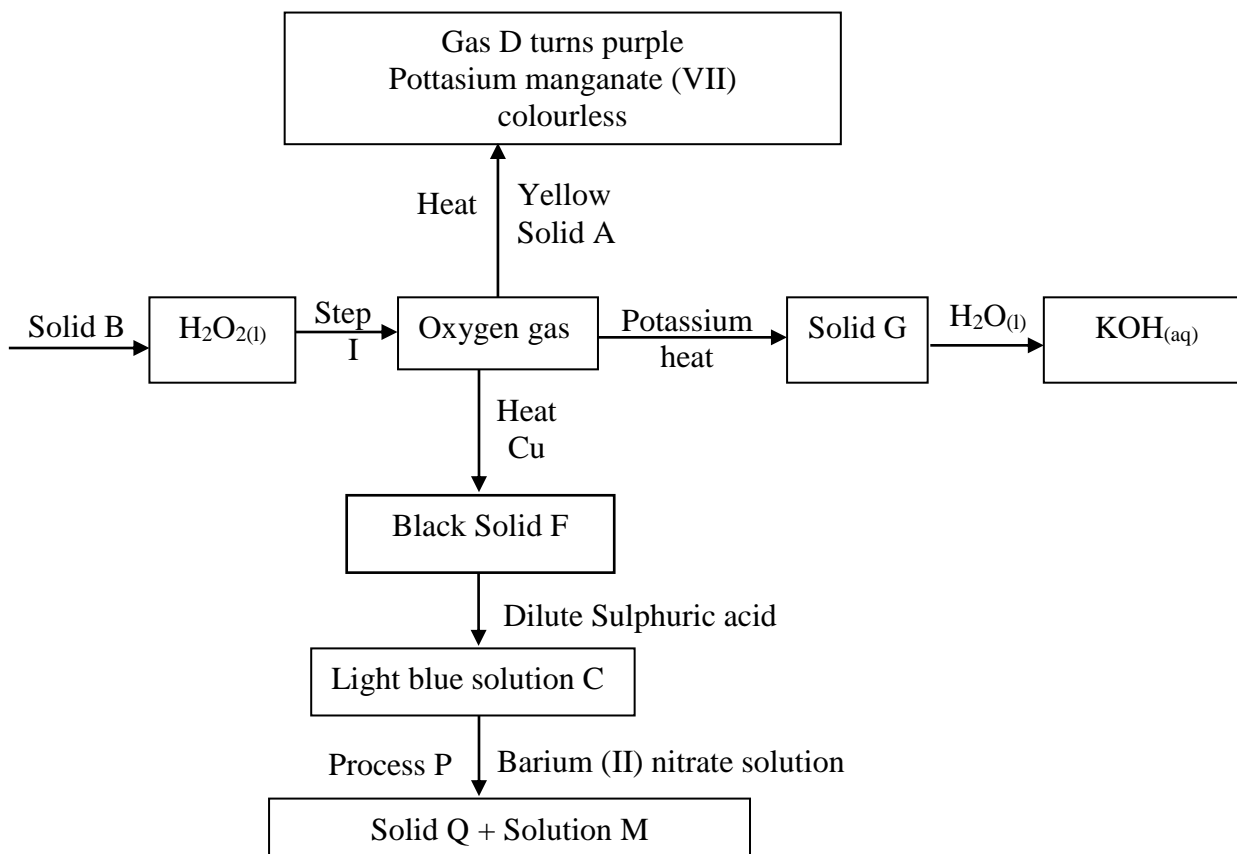
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- b. The flow chart below represents preparation and properties of oxygen gas. Study it and answer the question that follow.



- (i) Identify the following substances 2 marks
- a. Solid A .....
- b. Gas D .....
- c. Solid Q .....
- d. Solution M .....
- (ii) Write a chemical equation for the reaction in step I. 1 mark
- .....
- .....
- (iii) Write chemical equations for the formation of the following compounds 1½ marks
- a. Solid G .....
- b. Gas D .....
- c. Light blue solution C .....
- (iv) State the confirmatory test for oxygen gas ½ mark
- .....
- (v) Write the ionic equation to present process P 1 mark
- .....
- (vi) State one use of oxygen 1 mark
- .....

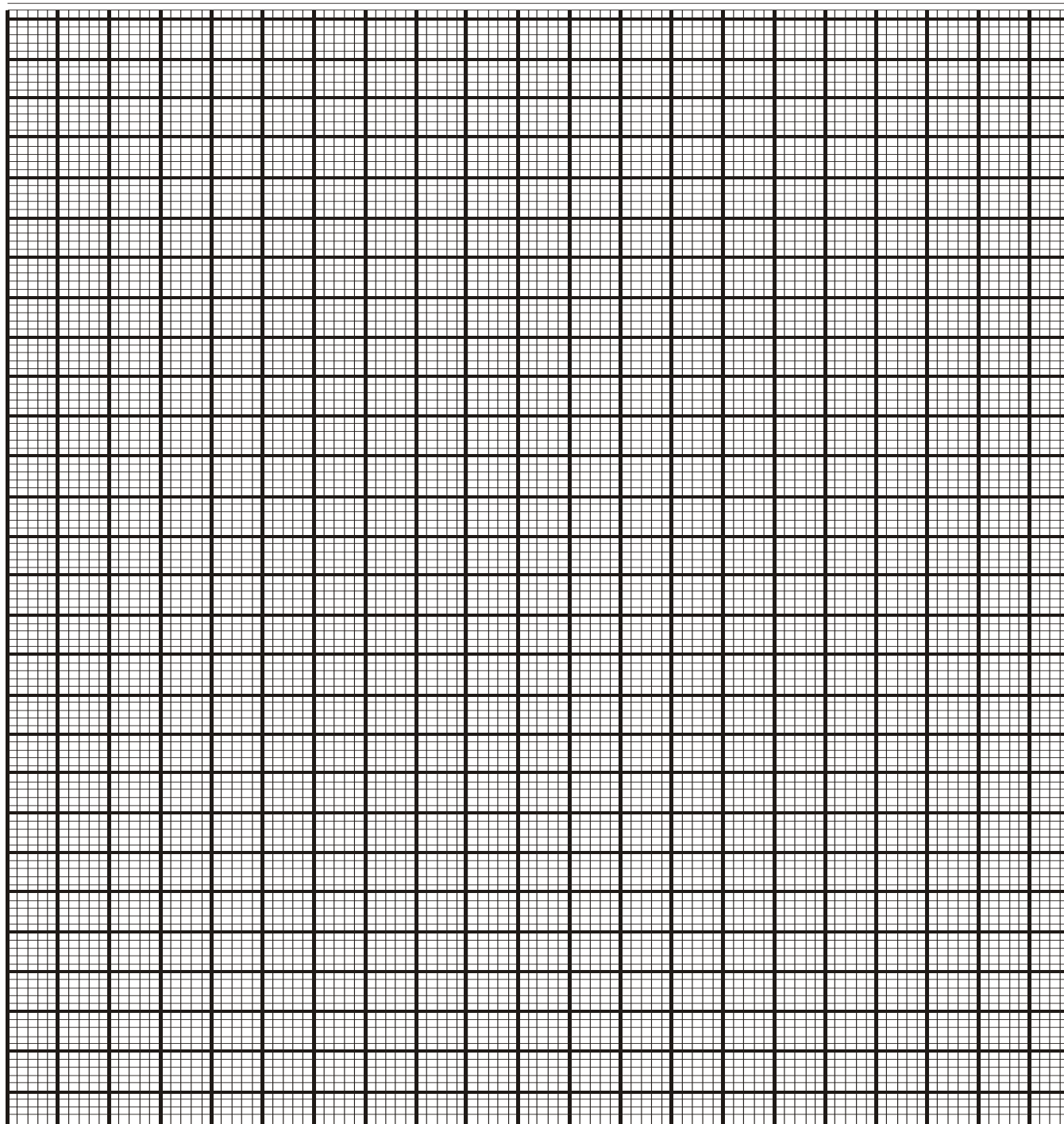
4.

- a. A student carried out an experiment in order to find out the effect of varying the molarity of Sodium thiosulphate, on the time it took to react fully with hydrochloric acid. She carried out the experiment at a temperature of  $26.0^{\circ}\text{C}$ . using  $50.0\text{cm}^3$  portions of sodium thiosulphate in each case. Results obtained were tabulated as shown below.

Molarity of the Sodium thiosulphate portions used	1.2	1.0	0.8	0.6	0.4	0.2
Time (seconds) taken for the reaction to be completed	16	22	33	51	76	170

- i) State one observation likely to have been noted in the set up during this experiment 1 mark
- .....
- .....

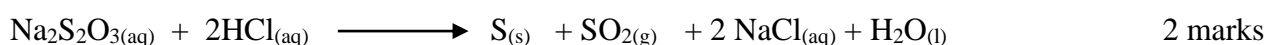
- ii) On the grid provided below draw a graph of the results (Molarity of thiosulphate on X-axis) 3 marks



- iii) State and explain the effect of varying the molarity of sodium thiosulphate on time taken to complete reaction 2 marks

- iv) I. Using the graph to determine the molarity of sodium thiosulphate whose reaction with the acid would take 42 seconds to be completed 1 mark

- II. Determine the number of moles of hydrochloric acid required to react fully with sodium thiosulphate of the above molarity in (iv), I.



- v) On the same grid above sketch a curve that is likely to be obtained. If the experiment was repeated using the same reagents but whose temperature is at 30°C. Label this curve as “curve X” 2 marks

- b. Below is an equilibrium that is normally established in the Haber process



- i) Explain what would happen to the position of equilibrium if some water was introduced into the equilibrium mixture 2 marks

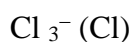
- ii) Give one major use of the product of haber process in agrochemical industry. 1 mark

5. (a)

- (i) Explain the meaning of the following terms 2 marks  
I. Reduction

II. Oxidation number

- (ii) Determine the oxidation number of the atom in bracket 1 mark





(iii) The table below shows some electrode potentials of some selected half cells with  $\text{Cu(s)} / \text{Cu}^{2+}_{(\text{aq})}$  half cell

Metal / Metal ion	Overall e.m.f
$\text{Mg(s)} / \text{Mg}^{2+}_{(\text{aq})}$	+2.04
$\text{Ag(s)} / \text{Ag}^{+}_{(\text{aq})}$	+0.46
$\text{Fe(s)} / \text{Fe}^{2+}_{(\text{aq})}$	+0.78

Write cell diagrams developed when with  $\text{Cu(s)} / \text{Cu}^{2+}_{(\text{aq})}$  is combined with

I.  $\text{Fe(s)} / \text{Fe}^{2+}_{(\text{aq})}$  1 mark

II.  $\text{Ag(s)} / \text{Ag}^{+}_{(\text{aq})}$  1 mark

(i) During electrolysis of aqueous copper (II) sulphate solution in a cell 144750 C of electricity were produced. Find the mass of copper metal deposited on the cathode.

( $\text{Cu} = 64$ ,  $\text{IF} = 96500\text{C}$ ) 2 marks

(ii) State one application of electrolysis. ½ mark

b. An electrochemical cell was made by connecting two half cells of elements D and G whose  $E^\ominus$  values were -2.38V and -2.87V respectively.

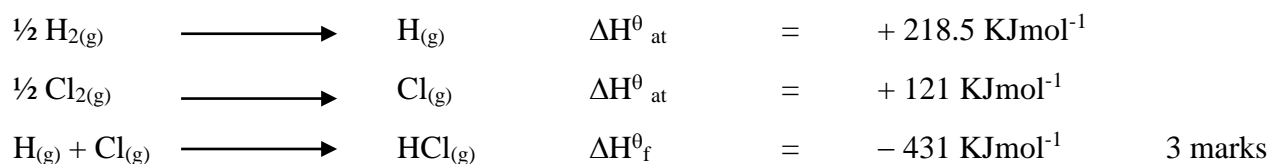
i) Draw a labelled diagram of the cell that was formed 2½ mark

ii) Using an arrow show the direction of electron flow in the cell (above) 1 mark

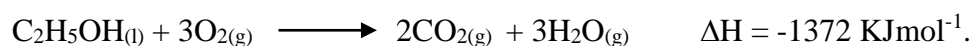
iii) Determine the  $E^\ominus$  value of the cell formed 1 mark

6. (a) State Hess's Law 2 marks

(b) Use the thermo-chemical cycle to determine the heat of formation of hydrogen chloride given that:



(c) The equation for the combustion of ethanol is



10g of ethanol is completely burnt in oxygen.

(i) How many moles of ethanol were burnt 1 mark

(ii) Determine the quantity of energy that was released

1 mark

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(iii) If this energy is used to warm  $1500\text{cm}^3$  of water at  $25^\circ\text{C}$ , what would be the final temperature of water? ( specific heat capacity =  $4.2\text{ KJKg}^{-1}\text{K}^{-1}$ )

3 marks

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7. The figure below shows the industrial extraction of sodium metal

i) (a) Name the industrial process represented above

$\frac{1}{2}$  mark

.....

(b) State one major source of sodium chloride used in the process

$\frac{1}{2}$  mark

.....

