(III)   What was the loss in mass in each experiment after 75 seconds?   (2marks)

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(IV)   A third experiment was done in which the same mass (in excess) of powdered marble was added to $30.0cm^3$ of 1.80M of hydrochloric acid was used. Sketch a third curve on the same axis to represent this experiment and label it as experiment III.   (1mark)

Name ……………………..………………….............…… Index No. ..…………………….

School ………………………………….............….. Candidates Sign: ….…………

Date ....

233/2
CHEMISTRY
Paper 2
(THEORY)
July/August 2015
Time: 2 Hours

NAROK SOUTH DISTRICT JOINT EVALUATION EXAMINATION
Kenya Certificate of Secondary Education (K.C.S.E)
CHEMISTRY
PAPER 2

INSTRUCTIONS TO CANDIDATES
- Write the name of your school, your name and index number in the 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 electronic calculators may be used.
- All workings must be clearly shown where necessary.
- All questions **MUST** be answered in English.

FOR EXAMINER'S USE ONLY

QUESTIONS	MAXIMUM SCORE	
1	13	
2	11	
3	14	
4	12	
5	10	
6	9	
7	11	
	80	

This paper consists of **12** printed pages.
Candidates should ensure that all pages are printed as indicated and no questions are missing.
Chemistry 233/2

1. The grid below represents part of the periodic table. Study the information in it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

A								A	
B	C					D		E	G	X
I	J				K	L			M	Y
									W	

a) Explain why element A appears in two different groups in the grid above (1mark)
   ………………………………………………………………………………………
   ………………………………………………………………………………………

b) State the name of the chemical family to which C and J belong (1mark)
   ………………………………………………………………………………………
   ………………………………………………………………………………………

c) Write the formula of the compound formed between C and W (1mark)
   ………………………………………………………………………………………
   ………………………………………………………………………………………

d) Compare the melting points of J and K .Explain (2 marks)
   ………………………………………………………………………………………
   ………………………………………………………………………………………
   ………………………………………………………………………………………

e) Identify an element whose oxide dissolves in both acid and alkalis (1mark)
   ………………………………………………………………………………………

f) Write the equation for burning of D in excess air (1mark)
   ………………………………………………………………………………………
   ………………………………………………………………………………………

g) State one use of element X (1mark)
   ………………………………………………………………………………………
   ………………………………………………………………………………………

7. a) A student used the apparatus shown below to find the loss in mass during the reaction between 20.0g of marble chips (in excess) and 30.0cm3 of 1.2M hydrochloric acid.
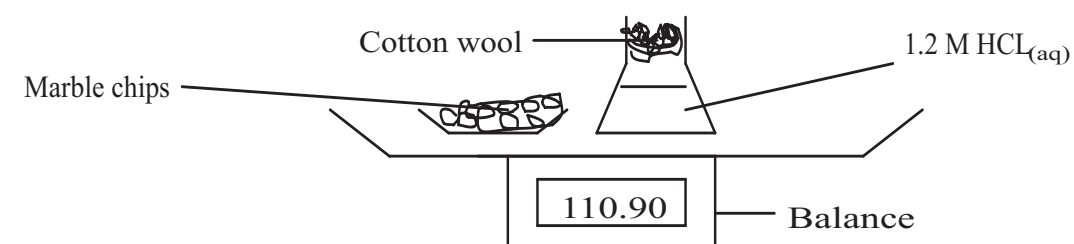
(i) Why was the mass at time O recorded with the marble chips separate from the conical flask? (1mark)
   …………………..……………………………………………………………………
   …………………..……………………………………………………………………

(ii) The marble chips were then added to the acid and the mass recorded every after 30 seconds. The experiment was repeated using the same mass of marble but finely powdered and also same volume of acid and concentration. The results of the two experiments were recorded on the table as shown below.

TIME (SECS)	EXPERIMENT I		EXPERIMENT II	
	Mass (g)	Loss in mass (g)	Mass (g)	Loss in mass (g)
0	110.90	0.00	110.90	0.00
30	110.62	0.28	110.42	0.48
60	110.42	0.48	110.23	0.67
90	110.27		110.14	
120	110.17		110.10	
150	110.10		110.10	
180	110.10	0.80	110.10	0.80

(I) Complete the table by filling the missing values. (3 marks)
(II) On the same axis, plot the graphs of loss in mass against time for experiment I and II. (4 marks)

b) Write a chemical equation for the reaction in a) above. (1mark)

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c) In an experiment to determine the proportion of oxygen in air, copper turnings were packed in excess in a long combustion tube connected to two syringes of $110cm^3$ each in volume. Syringe R contained
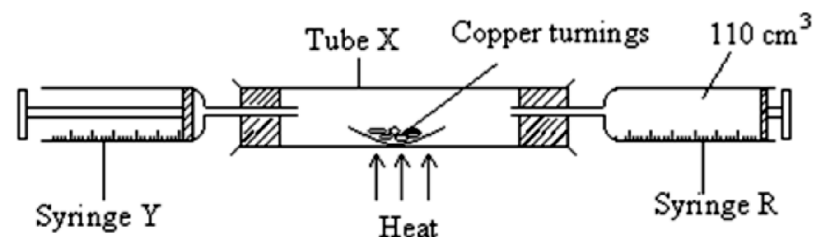
Air was passed over heated copper turnings slowly and repeatedly until there was no further change in volume. $87.5cm^3$ of air remained in syringe R.

i) Why was copper packed in excess? (1mark)

…………………………………………………………………………………

ii) Why was air passed over heated copper slowly? (1mark)

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iii) State one observation made in the combustion tube during the experiment. (1mark)

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iv) Write an equation for the reaction that took place in the combustion tube. (1mark)

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v) Determine the percentage of oxygen used up during the experiment. (2marks)

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vi) Give one commercial use of oxygen. (1mark)

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II. The number of protons, neutrons and electrons in atoms F to F_6 are given in the table below. The letters do not represent the actual symbols of elements:-

Atoms	Protons	Neutrons	Electrons
F_1	3	4	2
F_2	9	10	10
F_3	12	12	12
F_4	17	18	17
F_5	17	20	17
F_6	18	22	18

Choose from the table the atoms that represent

i. An atom of a metal (1mark)

………………………………………………………………………………………

ii. A neutral atom of non- metal (1mark)

………………………………………………………………………………………

iii. A pair of isotopes (1mark)

………………………………………………………………………………………

iv. An atom of noble gas (1mark)

………………………………………………………………………………………

v. Anion (1mark)

………………………………………………………………………………………

2. The following table gives some information about the physical properties of substances S, T, U, and V. Use the information to answer the questions that follow

Substance	M.P(^{0}C)	Hardness	Electrical conductivity in solid state	Electrical conductivity in molten state
S	High	Hard/brittle	Good	Good
T	High	Hard/brittle	Poor	Poor
U	High	Hard/brittle	Poor	Good
V	Low	Soft	Poor	Poor

a) Which of these substances exists as a:

i. Giant covalent structure (1mark)

………………………………………………………………………………………

ii)   Giant metallic structure   (1mark)

……………………………………………………………………………………………

(iii) Giant ionic structure   (1mark)

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b)   (i)   Why is the melting point of V low?   (2marks)

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(ii)   Why is U a good electrical conductor when in molten state and poor when in solid
state?   (2marks)

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c)   (i)   Which substance would you recommend for making the cooking pan? Explain

(2marks)

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(ii)   Study the structure below and answer the questions that follow

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        ┌─────  H ──────┐  +
        │         ↑      │
        │    ←──  A      │
   H ── N ── H          │
        │               │
        │    ←──  B      │
        └─────  H ──────┘
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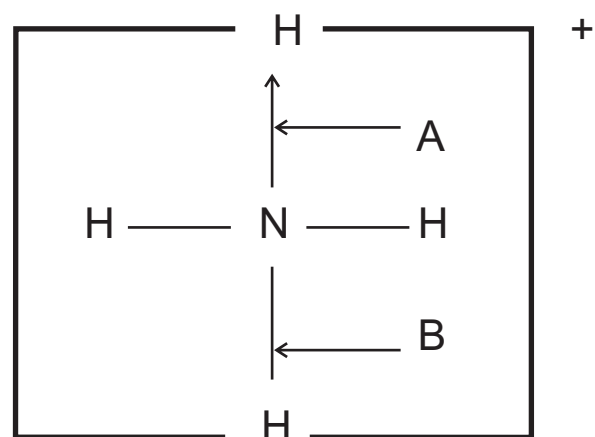
Name the bond represented by   (2marks)

A   ……………………………………………………………………………

B   …………………………………………………………………………

(c)   (i)   Write the thermo chemical equation for the combustion of methanol.   (1mark)

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(ii)   Draw an energy level diagram for reaction in (c)(i) above.   (2marks)

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(d)   The value of molar heat of combustion of methanol in (b) above obtained is less than
the theoretical value. State one source of the error in the experiment   (1mark)

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(e)   State and explain the observations which would be made during the reaction between
Copper (II) sulphate solution and Zinc powder   (2marks)

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6.   a)   Name the solution and catalyst used in the preparation of oxygen in the laboratory.

(1marks)

…………………………………………………………………………………………

5.   The diagram below shows a set-up that was used to determine the molar heat of combustion of methanol.

- Thermometer
- Tin
- Water
- Stand
- Screen
- Methanol
- Lamp
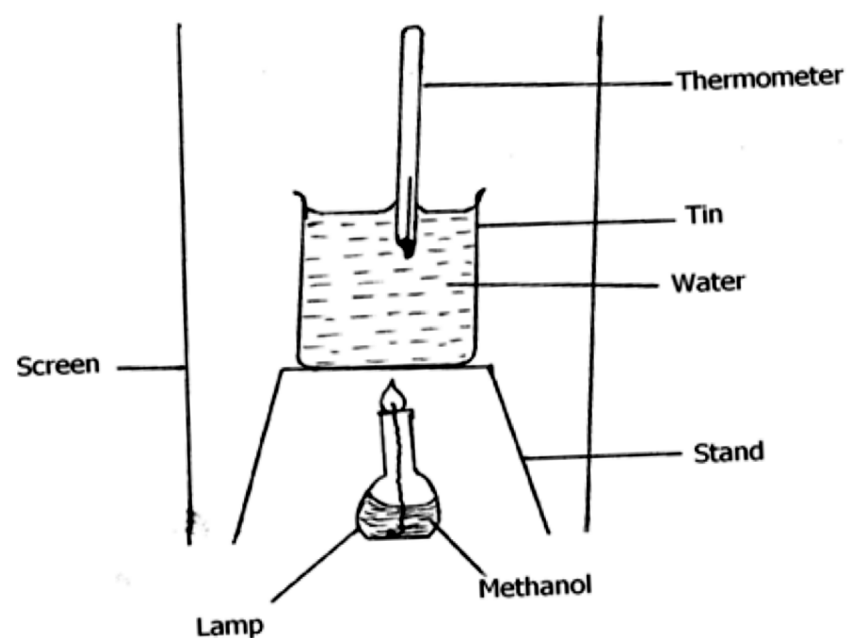
During the experiment, the information below was recorded.

Volume of water	$300cm^3$
Initial temperature of water	24.0^0C
Final temperature of water	47.5^0C
Mass of methanol + lamp before burning -	142.8g
Mass of methanol + lamp after burning -	141.3g

Calculate the:

(a) Heat evolved.(Density of water=1g/cm^3, specific heat capacity of water=4.2Jg-1k-1)

(2marks)

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(b) Molar heat of combustion of methanol.(Molar mass of methanol = 32g)   (2marks)

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………….……………………………………………………………………...................

3.   Study the reaction below and answer the questions that follow

A

Step I
Br_2

$CH_3CH_2CH_2CH_3$ Step II $CH_3CH_2CH = CH_2$ Step III

$\begin{pmatrix} CH_2 - \\ | \\ CH_2 \\ | \\ CH_3 \end{pmatrix}_n$

Step IV

$CH_3CH_2 CH_2 CH_2OH$ Step V   Substance
                         H^+ /KMnO$_4$

Add Na
Step VII

Step VI

$CH_3 CH_2 CH_2COOC_2H_5$

$CH_3CH_2CH_2COONa$

Step VIII

$CH_3CH_2CH_3$

Step IX

$CH_3 CH_2CH_2 Br$
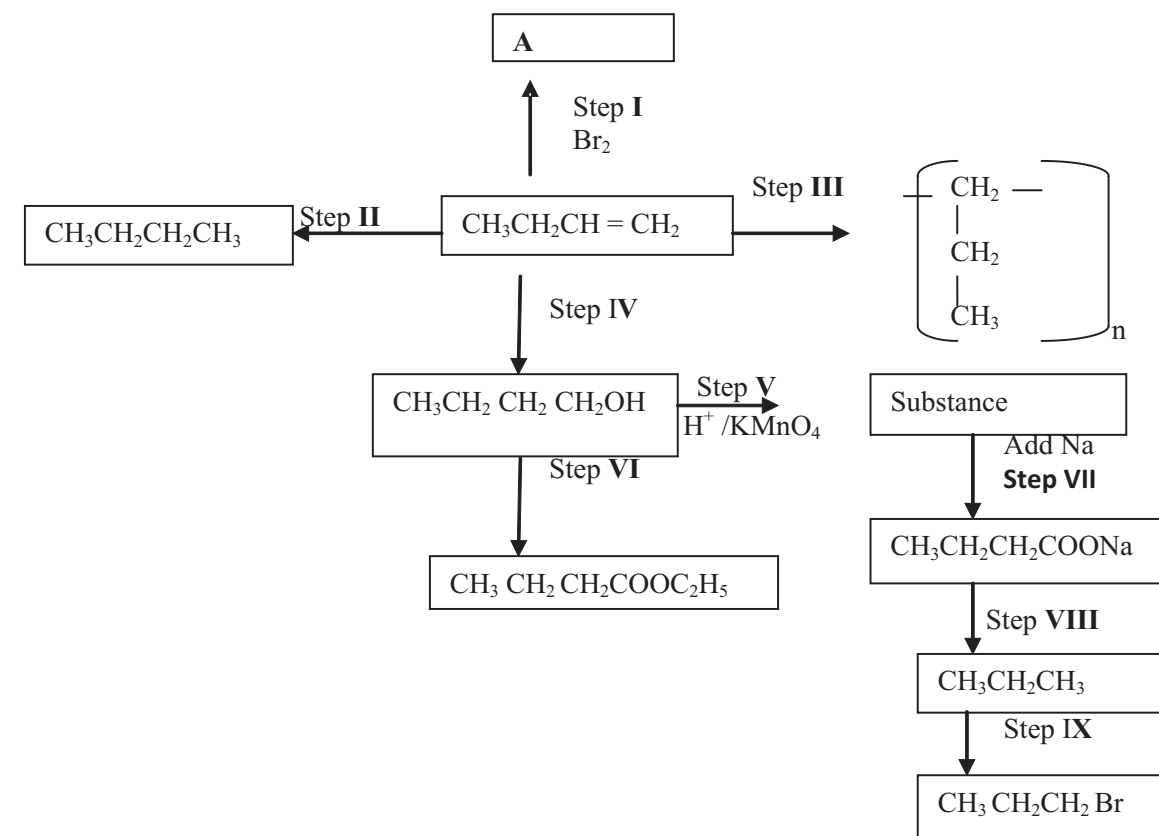
(a)   Complete the table below by filling in the name of the process, reagents and conditions necessary for the steps marked II,IV, VI, and IX   (8marks)

STEP	PROCESS NAME	REAGENT	CONDITION
II			
IV			
VI			
IX			

(b) Write down the equation for each of the reactions in steps:- (3 marks)

I ....

V ....

VII ....

(c) (i) What is the specific name for reaction in step IX. (1 mark)

....

(ii) What is the economic importance of product formed in step III. (1mark)

....

(d) State one industrial application of the process in step IV. (1mark)

....

(e) Name compound A. (1mk)

....

4. Explain the meaning of the following terms (2marks)

I Reduction

....

II Oxidation number

....

(b) Determine the oxidation number of the atom in bracket in the compound $NaClO_3(Cl)$

(1mark)

....

(c) The table below shows some electrode potentials of some selected half cells with Cu(s)

/Cu2+(aq) half cell

Metal / Metal ion	Overall e.m.f
Mg(s) / Mg2+(aq)	+2.04
Ag(s) / Ag+(aq)	+0.46
Fe(s) / Fe2+(aq)	+0.78

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

(1mark)

....

(d) During electrolysis of aqueous copper (II) sulphate solution in a cell 144750 C of electricity wire produced .Find the mass of copper metal deposited on the cathode. (Cu = 64, IF = 96500C) (3marks)

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e) State one application of electrolysis (1mark)

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(f) An electrochemical cell was made by connecting two half cells of elements D and G whose, E° values were -2.38V and -2.87V respectively

(i) Draw and labelled diagram of the cell that was formed. (2 ½marks)

(ii) Using an arrow show the direction of election flow in the cell (above). (½mark)

(iii) Determine the Evalue of the cell formed (1mark)

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