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

CANDIDATE'S SIGNATURE……………………………DATE………………………

233/2
CHEMISTRY
THEORY
Paper 2
SEPT. 2017
Time: 2 Hrs

KIKUYU SUBCOUNTY JOINT KCSE TRIAL EXAMINATION SEPTEMBER 2017

INSTRUCTIONS TO CANDIDATES

- Write your Name and Index No. in the spaces provided.
- Sign and write the date of examination in the spaces provided.
- 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.

EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	13	
2	11	
3	13	
4	11	
5	12	
6	10	
7	10	
Total	80	

This paper consists of 10 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. The letters do not represent actual symbols.

						S	U	V
P	R					T		W
Q								

(a) Which of the elements has the highest atomic radius? Explain (2 marks)

……

……

(b) Identify the most reactive non-metal. Explain (2 marks)

……

……

(c) Give the electron configuration of: (2 marks)

(i) Element S

……

(ii) Element Q

……

(d) Compare the atomic radius of P and R. Explain (2 marks)

……

……

……

(e) Given that the atomic mass of W is 40. Write down the composition of its nucleus. (1 mark)

……

(f) Write the formula of the compounds formed between:

(i) Element P and S (1 mark)

……

(ii) Element R and T (1 mark)

……

(g) Give the formula of one stable ion with an electron arrangement of 2.8 which is:

(i) Negatively charged (1 mark)

……

(ii) Positively charged (1 mark)

……

2. (a) Aqueous potassium sulphate was electrolysed using platinum electrodes in a cell.
(i) Name the products formed at the anode and cathode with the help of an equation. (2 marks)

Anode………

Cathode……

(ii) Why would it not be advisable to electrolyze aqueous potassium sulphate using potassium metal electrode? (1 mark)

……

……

....

(b) Use the standard electrode potential for elements A, B, C, D and F given below to answer the questions that follow.

$E\theta$ (Volts)

$A^{2+}_{(Aq)} + 2e \rightleftharpoons A_{(s)}$ -2.90

$B^{2+}_{(Aq)} + 2e^- \rightleftharpoons B_{(s)}$ -2.38

$2C^+_{(Aq)} + 2e \rightleftharpoons C_{2(g)}$ 0.00

$D^{2+}_{(Aq)} + 2e^- \rightleftharpoons D_{(s)}$ +0.34

$\frac{1}{2}F_{2(g)} + e^- \rightleftharpoons F^-_{(aq)}$ +2.87

(i) Which element is likely to be hydrogen? Explain (1 mark)

....

....

....

(ii) What is the E^θ value of the strongest reducing agent? (1 mark)

....

....

(iii) In the space provided, draw a labelled diagram of the electrochemical cell that would be formed when half cells of elements B and D are combined. (3 marks)

....

....

....

....

....

(iv) Calculate the E^θ value of the electrochemical cell constructed in (iii) above (1 mark)

....

....

....

....

(c) During electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2 amperes was passed through the cell for 5 hours.

(i) Write an ionic equation for the reaction that took place at the anode (1 mark)

....

....

(ii) Determine the change in mass of the anode which occured as a result of electrolysis.(1 mark)
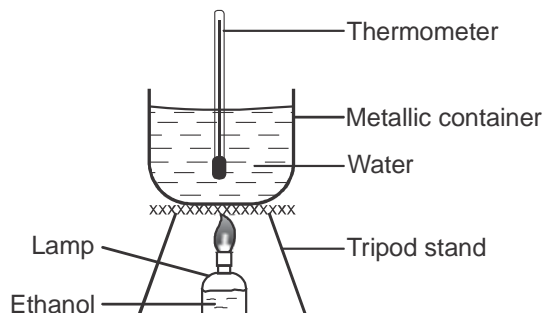(Cu = 63.5, 1 Faraday = 96500C)

....

....

....

....

3. a) State two reasons why wood charcoal is not the best fuel for cooking. (1 mark)

i.………

……

ii.………

………..

b) The diagram below represents a set up that was used to determine the molar heat of combustion of ethanol.

During the experiment the data given below was recorded:
Volume of water = 450cm³
Initial temperature of water = 24.0°C
Final temperature of water = 45.5°C
Mass of ethanol + lamp before burning = 113.5g
Mass of ethanol + lamp after burning = 112.0g

I. Calculate the :
i)Heat evolved during the experiment (density of water = 1g/cm³, specific heat capacity of water =4.2Jg⁻¹K⁻¹)
(2 marks)

……

……

……........

ii)Molar heat of combustion of ethanol. (C = 12.0, O = 16.0, H = 1.0) (1½ marks)

……

……

……

……

……

II. Write the thermochemical equation for the complete combustion of ethanol. (1 mark)

……

……

……

III. The value of the molar heat of combustion of ethanol obtained in b(ii) above is lower than the theoretical value. State two reasons which lead to this. (2 marks)

……

……

……

……

……

IV. On the axis below, draw an energy level diagram for combustion of ethanol. (1½ marks)

c) In order to determine the molar enthalpy of neutralization of sodium hydroxide, 50cm³ of 2M sodium hydroxide and 50cm³of 2M hydrochloric acid both at the same initial temperature were mixed and stirred continuously with a thermometer. The temperature of the resulting solution was recorded after every 15 seconds until the highest temperature of the solution was attained. Thereafter the temperature of the solution was recorded for a further two minutes.
The sketch below was obtained when the temperature of the mixture were plotted against time. Study and answer the questions that follow.
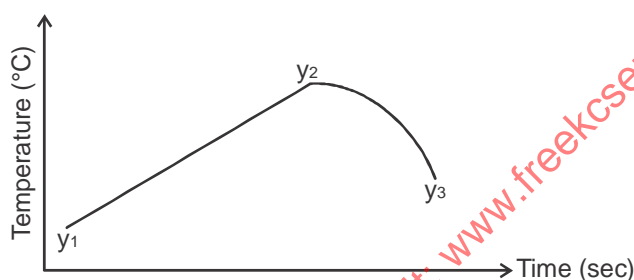
i) What is the significance of point y_2 (1 mark)

……
……

ii) Explain why there is a temperature change between points y_1 and y_2 (1 mark)

……
……
……

iii) Explain how the value of temperature rise obtained in this experiment would compare with the one that would be obtained if the experiment was repeated using 50cm³ of 2M methanoic acid instead of hydrochloric acid.
(2 marks)

……
……
……
……
……

4. Study the following reaction scheme for the extraction of zinc metal and then answer the questions that follow.
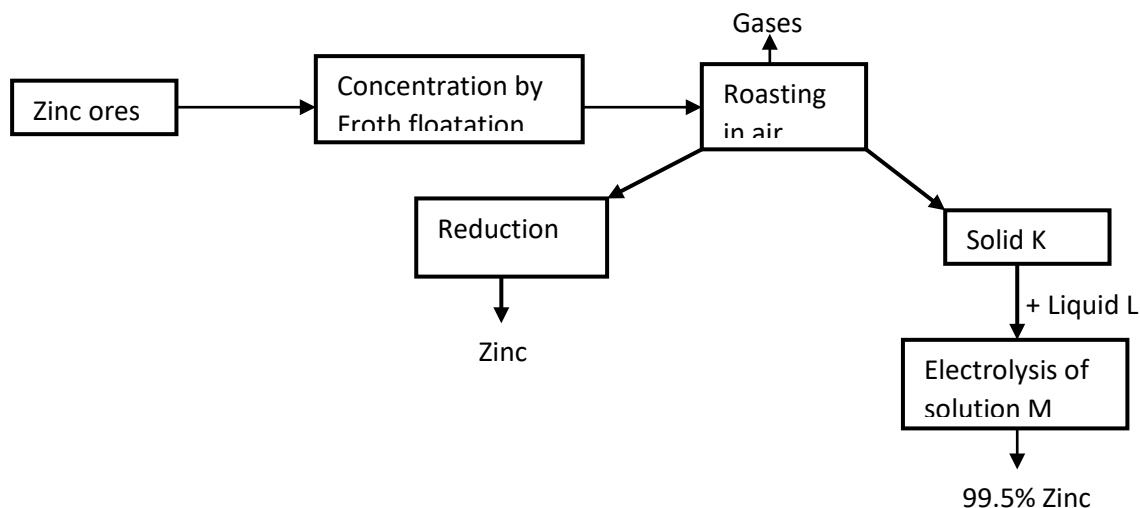
(a) (i) Name two chief ores from which zinc can be extracted (2 marks)

………………………………………………………………………………………………………

………………………………………………………………………………………………

(ii) Write the equations for the reaction that take place at the roasting chamber. (2 marks)

………………………………………………………………………………………………………

………………………………………………………………………………………………

(b) (i) Name the reducing agents used in the reduction chamber. (1 mark)

………………………………………………………………………………………………………

(ii) Write the equations for the reduction process to obtain zinc (2 marks)

………………………………………………………………………………………………………

………………………………………………………………………………………………………

(c) Identify the following: (3 marks)

Solid   K

……..

Liquid   L

………

Solution
  M……

(d) State two uses of zinc metal. (1 mark)

………………………………………………………………………………………………………

………………………………………………………………………………………………………

………………………………………………………………………………………………………

5.(a) Give the systematic names of the following organic compounds:

(i) $CH_3CH_2CH_2CCH_2$ (1mark)
                |
              CH_3

…………………………………………………………………………………………..
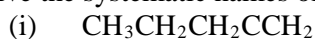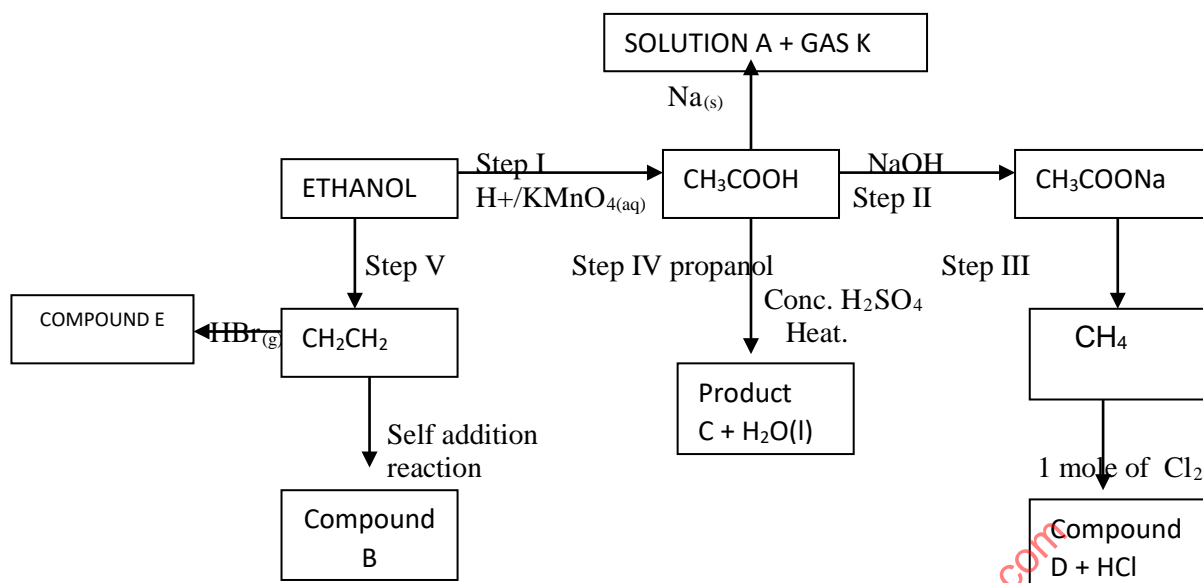
(ii) CH_2BrCCH ………………………………………………………………………… (1mark)

(b) The scheme below shows a series of reactions starting with ethanol. Study it and answer the questions that follow.

(i) Name the type of reaction in steps I and IV.

Step I:……………………………………………………………… (1mark)

Step IV:……………………………………………………………... (1mark)

(ii) Write the equation for the reaction in step III. (1mark)

………………………………………………………………………………………………………

………………………………………………………………………………………………………

(iii) Name the substances labelled:

B:……………………………………………………………………………….. (1mark)

C:……………………………………………………………………………….. (1mark)

D:……………………………………………………………………………….. (½mark)

E:……………………………………………………………………………….. (½mark)

(iv) Draw the structural formula of product C. (1mark)

………………………………………………………………………………………………………

………………………………………………………………………………………………………

………………………………………………………………………………………………………

(c) The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.
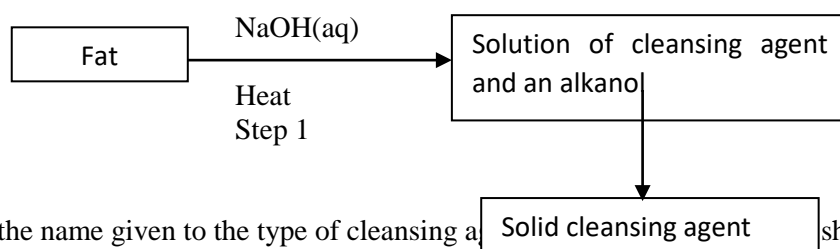
(i) What is the name given to the type of cleansing agent shown above? (1mark)

………………………………………………………………………………………………………

………………………………………………………………………………………………………

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

(ii) Explain how an aqueous solution of the cleansing agent works. (2marks)

……

……

……

……

6.Excess 0.1M sulphuric (iv) acid was reacted with 1g of zinc granules and the results tabulated in the table as shown below.

Time (min)	0	1	2	3	5	7	10	13	14	16
Volume (cm^3)	0	10	17.5	26	42	55.5	67	72	72	72

(a) (i) In the grid below, draw a graph of volume of Hydrogen gas produced against time. (3marks)

(ii) From the graph, determine the time at which half of the volume of hydrogen gas is produced. (1mark)

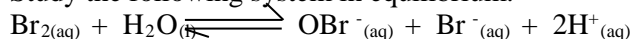……….

……

……

(iii) State why the volume of Hydrogen produced is constant at the 14th, 16th and 20th minute. (1mark)

……

……

(iv) On the same axes, sketch an approximate curve that would be obtained if the 5g of the zinc powder were reacted with excess 0.1M sulphuric (VI) acid. (1mark)

(b) Study the following system in equilibrium.
$$Br_{2(aq)} + H_2O_{(l)} \rightleftharpoons OBr^-_{(aq)} + Br^-_{(aq)} + 2H^+_{(aq)}$$

State and explain the observation noted when potassium hydroxide is added to these systems. (2marks)

……
……
……
……

(c) When concentrated nitric (v) acid was reacted with copper turnings a dark brown gas is collected. With the aid of a chemical equation, state and explain the observation made when the gas collected is cooled in cold water. (2marks)
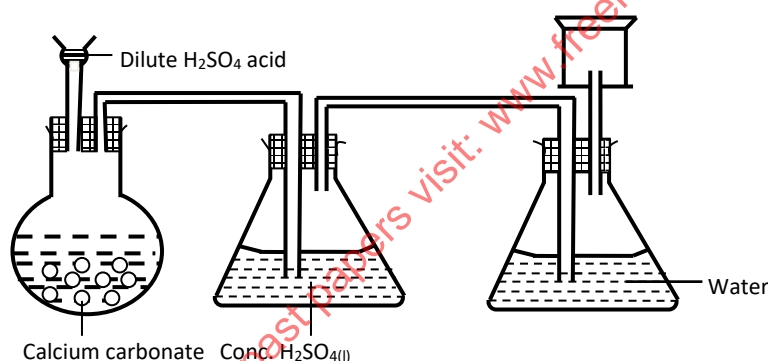
……
……
……
……
………

7.A student set up the apparatus shown below to prepare and collect dry carbon (IV) oxide gas.

Dilute H₂SO₄ acid

Water

Calcium carbonate   Conc. H₂SO₄(l)

(a) State a correction for three mistakes in the set up above (3 marks)

………
………
………
………

(b) Give two reasons why carbon (IV) oxide is used as a fire extinguisher (1 mark)

………
………
………

(c) The flow chart below is for the manufacture of sodium carbonate by the Solvay process. Use it to answer the questions that follow.

Brine   Ammoniacal   Tower P   Filter

Gas Q

Gas M   Heating limestone   Solution F   Chamber G Solid X
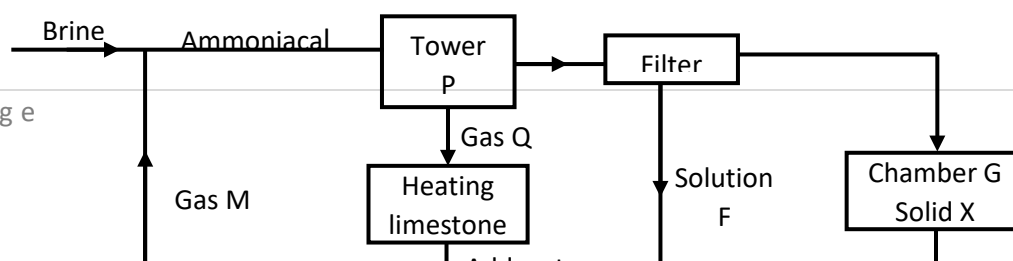
(i) Name gas M………………………………and Q……………………………………………………(1 mark)

(ii) Name solution F………………………… and solid X……………………………………………(1 mark)

(iii) Name the product L ………………………………………………………………………………..(1 mark)

(iV) give one uses of L……………………………………………………………………………….(1 mark)

(v) Write equations of the reactions in Tower Chamber K (1mark)

………

………

(v) Name the two raw materials required in the manufacture of sodium carbonate   (1 mark)

………

………

………

This is the last printed page