NAME ………………………..……………….. **DATE** …………………………

INDEX NO. ……….……………………...……..… **SIGNATURE** …………..…………..

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

MBOONI EAST SUB - COUNTY JOINT EVALUATION TEST

Kenya Certificate of Secondary Education.

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

INSTRUCTIONS TO CANDIDATES.

o   Write your name and index number in the spaces provided above.
o   Sign and write the date of exam in the spaces provided above.
o   Answer **ALL** the questions in the spaces provided.
o   Mathematical tables and silent electronic calculators may be used.
o   All working **MUST** be clearly shown where necessary.
o   This paper consists of 12 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

FOR EXAMINER'S USE ONLY.

Questions	Maximum score	Candidates score
1	13	
2	12	
3	13	
4	10	
5	10	
6	12	
7	10	
Total score	**80**	

1. The grid below shows a section of the periodic table. The letters do not represent the actual symbols for elements. Study it and answer the questions that follow.

X								
				Y		C	W	
	Z			R			A	
E						D		B

(a) Compare the atomic radii of elements:
  (i) A and R. Explain   (2 marks)

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  (ii) C and D. Explain   (2 marks)

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(b) Give the name of the family in which elements W and A belong   (½ mk)

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(c) Identify the element which is
  (i) Most electronegative   (½ mark)

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  (ii) Strongest reducing agent.   (½ mark)

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(d) Write the formula of the oxide of X   (½ Mark)

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(e) (i) What type of bond exists in the chloride of R   (1 Mark)

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  (ii) Draw the structure of the molecule of chloride of R in gaseous state   (1 Mark)

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  (iii) Write an equation for the reaction between element A and water.   (1 Mark)

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(f) The table below shows the melting points of some period 3 oxides.

Oxide	SiO_2	P_4O_6	SO_2
M.P ^{0}C	1610	23.6	-72.7

Explain the difference in melting points of SiO_2 and P_4O_6. (1 Mark)

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(g) Excess hydrogen gas is reacted with 4.5g of heated oxide of metal Q. 3.6g of Q is finally left in the reaction vessel. Given that O = 16, Q has a valency of 2.

(i) Write the equation for the reaction taking. (1 Mark)

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(ii) Calculate the relative atomic mass of Q. (2 Marks)

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2. (a) Give the names of the following compounds.

(i) $CH_3CH_2CH_2CH_2CH_2OH$ (1 Mark)

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(ii) CH_3CH_2COOH (1 Mark)

……...

(iii)   H - C-O-CH_2-CH_3 (1 Mark)

  with O double bonded to C

……...

(b) Describe a chemical test that can be used to distinguish between substances (i) and (ii) above (a) (1 Mark)

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(c) Study the information in the table below and answer the questions that follow.

Number of carbon atoms per molecule	Relative molecular mass of hydrocarbon
2	28
3	42
4	56

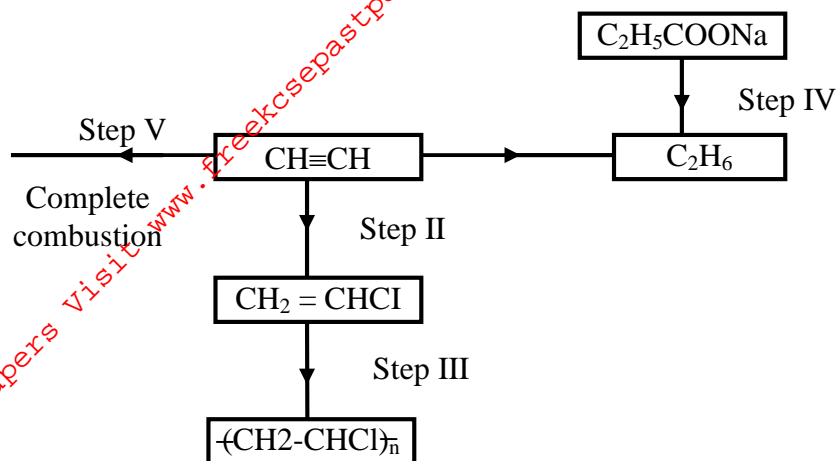(i) Write the general formular of the hydrocarbons in the table. (½ Mark)

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(ii) Predict the relative molecular mass of the hydrocarbon with 5 carbons. (1 Mark)

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(iii) Determine the molecular formular of the hydrocarbon in (ii) above and draw its structural formular (H = 1, C = 12) (2 Marks)

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(d) Study the scheme below and answer the questions that follow.

(i) Name the reagents used in

Step I ………………………………………….. (½ Mark)

Step II ………………………………………….. (½ Mark)

Step IV …………………………………………. (½ Mark)

(ii) Write an equation for the complete combustion of $CH\equiv CH$ (1 Mark)

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(iii) Explain one disadvantage of the continued use of items made from the compound formed in Step III.

(2 Marks)

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3. Fractional distillation of liquid air usually produces Nitrogen and Oxygen as the major products.

(a) (i) Name one substance used to remove carbon (IV) Oxide from air before it is changed into liquid.

(1 Mark)

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(ii) Describe how nitrogen is obtained from liquid air.

(Boiling point of Nitrogen = -196^0C, Oxygen = -183^0C) (3 Marks)

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(b) Study the flow diagram below and answer the questions that follow:-
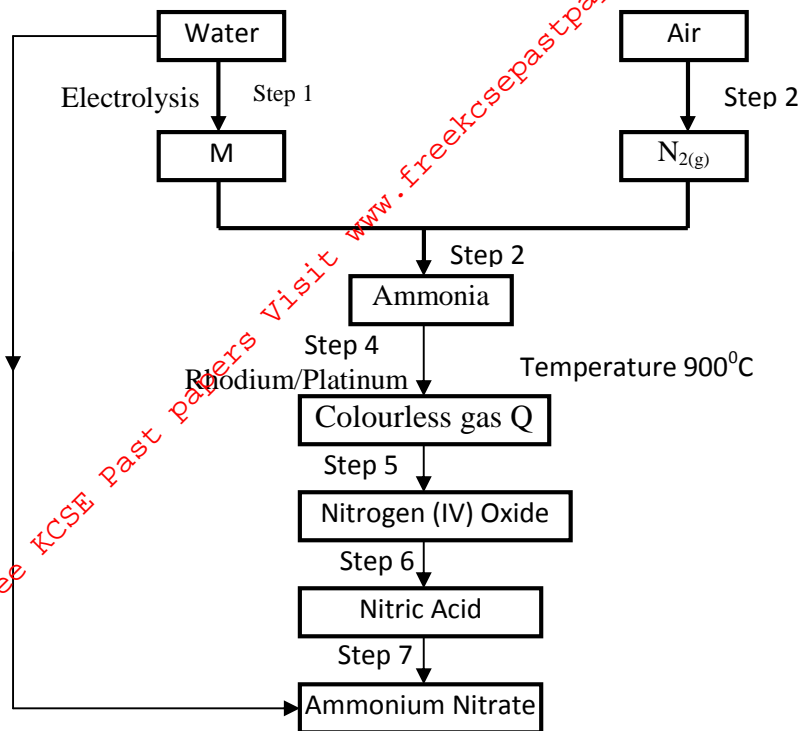
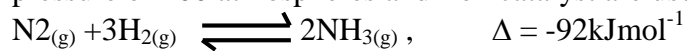(i) Name the element M   (1 Mark)

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(ii) Why is it necessary to use excess air in step 4   (1 Mark)

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(iii) Write an equation for the reaction in step 7   (1 Mark)

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(iv) In the harber process, the optimum yield of ammonia obtained is when a temperature of 450^0C a pressure of 200 atmospheres and iron catalyst are used.

$N2_{(g)} +3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, $\Delta = -92kJmol^{-1}$

(I) How would the yield of ammonia be affected if the temperature is raised to 600^0C. Explain
                                                                                      (2 Marks)

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(II) State two uses of ammonia gas   (2 Marks)

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(c) State and explain the observations made if a sample of sulphur is heated in concentrated Nitric(V) Acid (2 Marks)

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4. 1g of magnesium ribbon was reacted with hydrochloric acid at room temperature in order to investigate how the rate of reaction varies with time. The results obtained were recorded as shown below.

Time (seconds)	0	20	40	60	80	100	120	140	160	180
Volume of gas produced (cm^3)	0	10	20	26	32	35	38	39	40	40

(a) (i) On the graph provided, plot a graph of volume of gas produced against time taken. Label the graph K. (3 Marks)
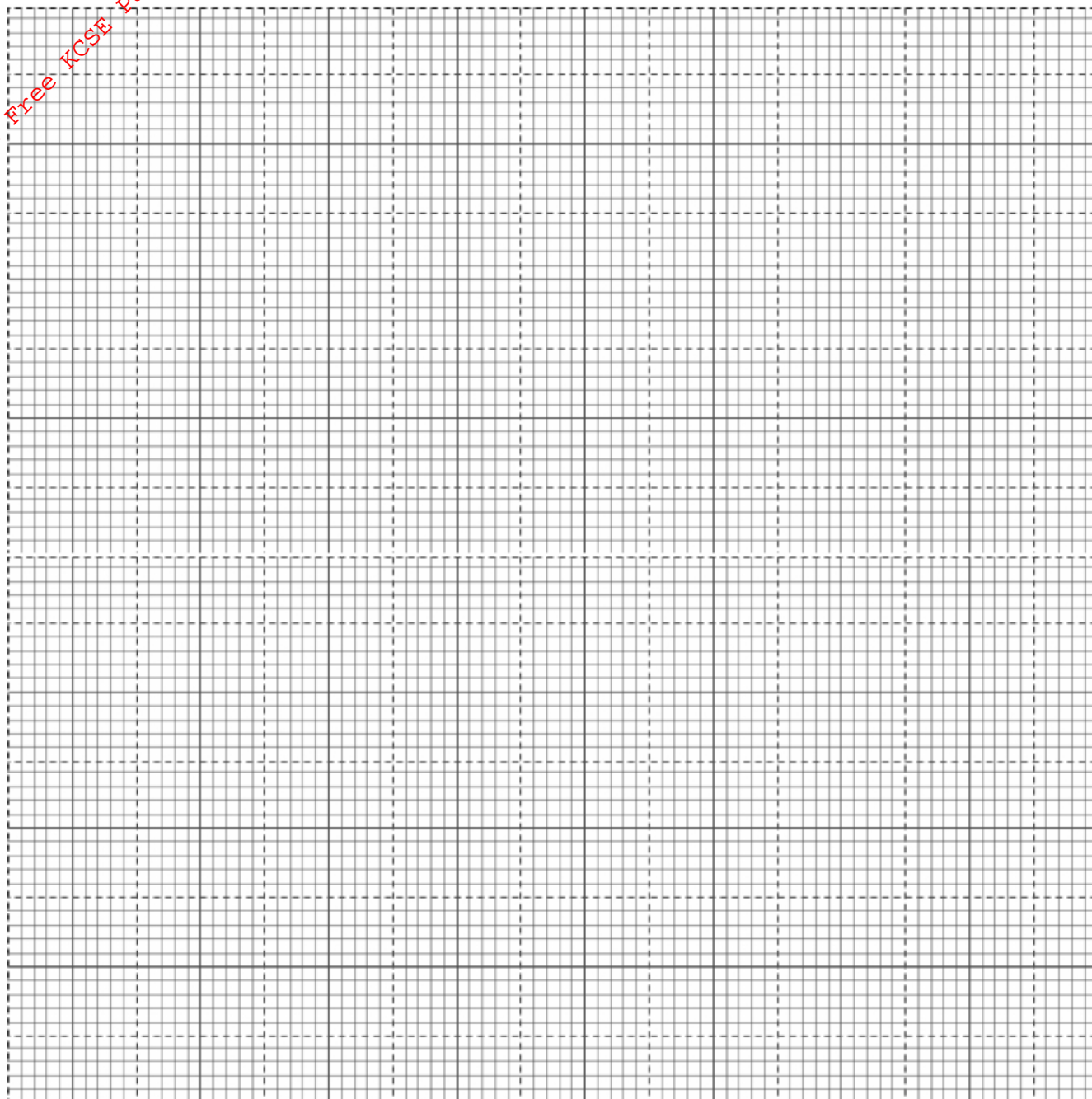
(ii) From the graph determine the rate of production of the gas at 110 seconds.   (2 Marks)

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(b) On the same axis sketch the graph you would expect to obtain if:-

    (i) The same mass of powdered magnesium was used instead of magnesium ribbon. Label the graph Y.   (1 Mark)

    (ii) If the temperature of the solution mixture was reduced from 25^0C to 15^0C. Label the graph Z.   (1 Mark)

(c) Determine the mass of magnesium ribbon that remained unreated in this experiment (Mg = 24, Molar gas volume = 24dm3 at r.t.p)   (3 Marks)
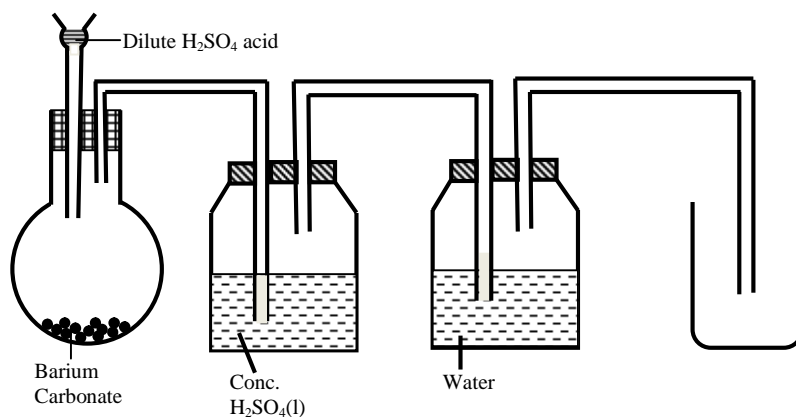
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5. A student set up the apparatus shown below to prepare and collect dry carbon (IV) oxide gas.

Dilute H_2SO_4 acid

Barium Carbonate

Conc. $H_2SO_4(l)$

Water

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

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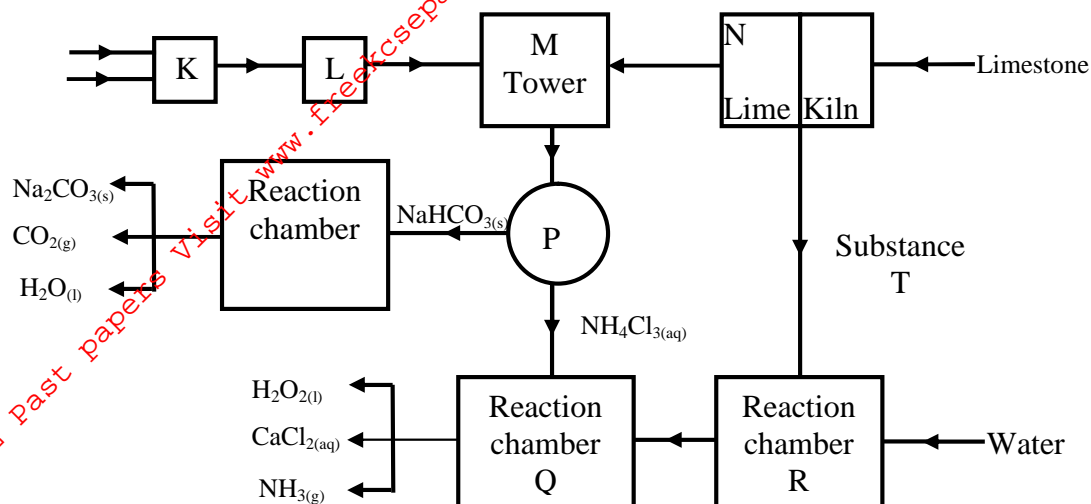
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(b) 30cm^3 of carbon (II) oxide gas were reacted with 10cm3 of oxygen gas. The resulting mixture of gases was bubbled through an alkali. Determine the volume of the residual gas.   (3 Marks)

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(c) The flow chart below is for the manufacture of Sodium Carbonate by the solvay process. Use it to answer the questions that follow.

(i) Name substance T   (1 Mark)

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(ii) Explain the use of water in chamber R   (1 Mark)

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(iii) Name the two raw materials required in the manufacture of Sodium Carbonate.   (1 Mark)

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(iv) Write an equation for the reaction taking place in chamber M.   (1 Mark)

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6. Use the standard electrode potentials given below to answer the questions that follow.

$E^\theta V$

$Ag^+_{(aq)} + e^- \longrightarrow Ag_{(s)}$ +0.80

$CU^{2+}_{(aq)} + 2e^- \longrightarrow Cu_{(s)}$ +0.34

$Pb^{2+}_{(aq)} + 2e^- \longrightarrow Pb_{(s)}$ -0.13

$Zn^{2+}_{(aq)} + 2e^- \longrightarrow Zn_{(s)}$ -0.76

(a) Select two half-cells which when combined give the lowest workable cell voltage. (Lowest e.m.f)

(1 Mark)

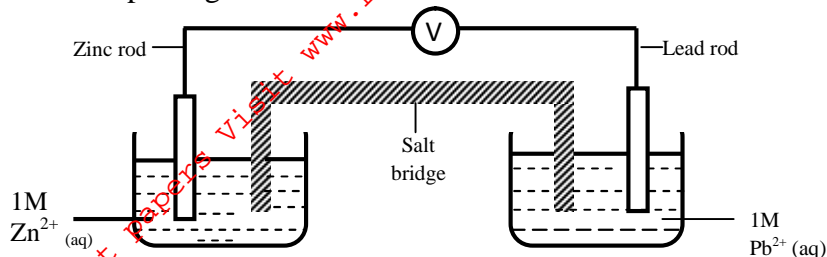……...

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(b) calculate the e.m.f of the cell formed by combining the two half – cells in a) above   (1 Mark)

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c) (i) Select the strongest oxidizing agent.   (½ Mark)

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    (ii) Select the strongest reducing agent.   (½ Mark)

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(d) A cell was set up using lead and zinc electrodes as shown below.

(i) Write the half cell equation for the half – cell in which oxidation occurs.   (1 Mark)

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(ii) Write the overall cell equation.   (1 Mark)

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(iii) What is the role of the salt bridge?   (1 Mark)

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(e) An iron cup was electroplated using chromium. The chromium electrode and the iron cup was thoroughly cleaned and weighed before being dipped into the electrolyte.
    (i) Why was it necessary to clean the metals before dipping them into the electrolyte.   (1 Mark)

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    (ii) A current of 0.75A was passed through the solution for one hour and four minutes. The mass of chromium deposited on the cup was 0.52g. (1F = 96500C, Cr = 52)
    (I) Calculate the quantity of electricity passed   (1 Mark)

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    (II) How many moles of chromium were deposited   (1 Mark)

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    (III) Calculate the quantity of electricity required to deposit one mole of chromium.   (1 Mark)

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    (IV) Calculate the number of Faradays required to deposit one mole of chromium and hence deduce the charge on the ion.   (2 Marks)

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7. (a) The diagram below shows spots of pure substances A, B and C on a chromatography paper. Spot D is that of a mixture.
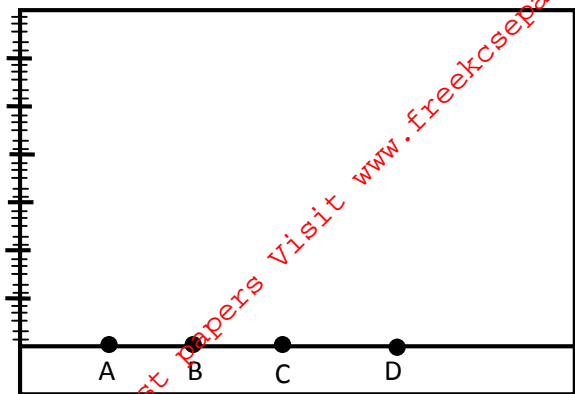
After development A, B and C were found to have moved 7cm, 3cm and 5cm respectively. D had separated into two spots which moved 5cm and 7cm.
(i) On the diagram
   (I) Label the baseline   (1 Marks)
   (II) Show the position of the all the spots after development   (2 Marks)
(ii) Identify the substances present in mixture D.   (1 Mark)
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(b) Describe how solid ammonium chloride can be separated from a solid mixture of ammonium chloride and sodium chloride.   (2 Marks)
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(c) The table below shows liquids that are miscible and those that are immiscible.

Liquid	Y	Z
W	Miscible	miscible
X	Miscible	Immiscible

Use the above information to answer the questions that follow.
(i) Name the method that can be used to separate W and Y of a mixture of the two   (½ Mark)
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(ii) Describe how a mixture of X and Z can be separated.   (2 Marks)
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(d) Crude oil is a source of many compounds that contain carbon and hydrogen only.
   (i) Name the processes used to separate components of crude oil.   (½ Mark)
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   (ii) On what physical property of the above components does the separation depend?   (1 Mark)
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