NAME.....INDEXNO.....ADM NO.....

SCHOOL.....SIGN.....DATE.....

ACK MASENO WEST JOINT EXAMINATION

KENYA CERTIFICATE OF SECONDARY EDUCATION

CHEMISTRY PAPER 2

(THEORY)

233/2

TIME: 2HRS

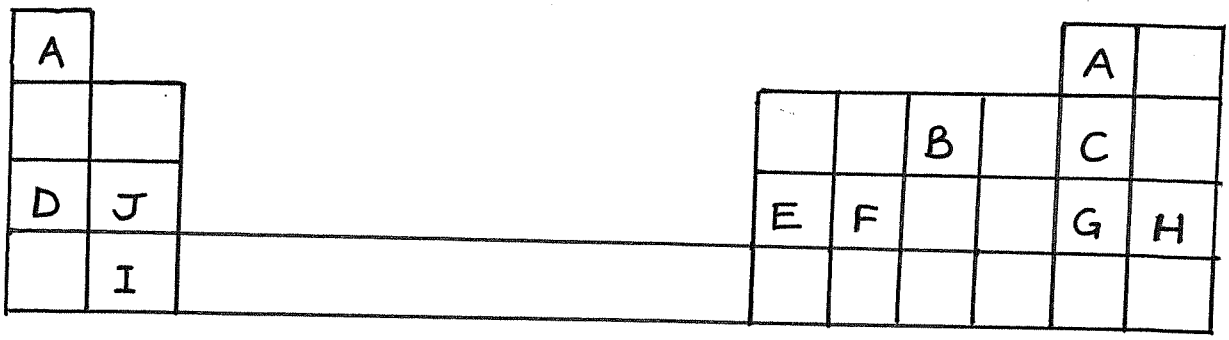
INSTRUCTIONS TO CANDIDATES

a.) Write your name and index number in the spaces provided
b.) Sign and write the date of the examination in the spaces provided
c.) All working must be clearly shown where necessary
d.) Attempt all the questions in the spaces provided
e.) Mathematical tables and electronic calculators may be used
f.) Answer the questions in English

Question	Max. score	Candidate's score
1	12	
2	9	
3	12	
4	12	
5	12	
6	11	
7	12	
TOTAL	80	

1.

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



i.) Explain why element A can be placed in the two positions as shown above (2mks)

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ii.) Identify an element that forms a divalent cation with an electron configuration of 2.8 .....(1mk)

iii.) The oxide of element E reacts with both dilute hydrochloric acid and potassium hydroxide solution to form a salt.

I. Name the property of this oxide .....(1mk)

II. Give the name of another element, other than E, whose hydroxide has the same property .....(1mk)

iv.) With a reason compare the atomic radius of element E with that of element G (2mks)

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b.) $60cm^3$ of gas B diffused through a porous pot in 50 seconds. How long would it take $60cm^3$ of Sulphur (IV) oxide to diffuse through the same pot under the same conditions? (B=14, S=32, O=16) (2mks)

c.) Use the information in the table below to answer the questions that follow:

Element	Atomic number	Melting point (°C)
Helium	2	-270.0
Neon	10	-249.0
Argon	18	-189.0
Krypton	36	-157.0
xenon	54	-112.0

(i.) Explain the trend in the melting point of the elements (2mks)

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(ii.) State one use of argon (1mk)

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2.

(a.)

(i.) Define a strong acid (1mk)

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(ii.) In an experiment to investigate a property of two acids, M and N, equal volumes of the two acids of the same concentration were each reacted with equal volumes of 2M potassium hydroxide. The results were recorded as shown in the table below:

Acid	Rise in temperature, ΔT (^oC)
M	4
N	2

Which of the following acids is likely to be a weak acid? Explain

.....(2mks)

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(iii.) On complete dissolution, 2g of ammonium nitrate caused the temperature of 100ml of water in a beaker to drop from 30°C to 28^0C. Determine the molar heat of solution of ammonium nitrate. (density of solution= 1g/cm^3, specific heat capacity of solution = 4,200J/kg.K, N=14, O=16, H=1)

(b.) The thermochemical equations for the formation of hydrogen peroxide under standard conditions are;

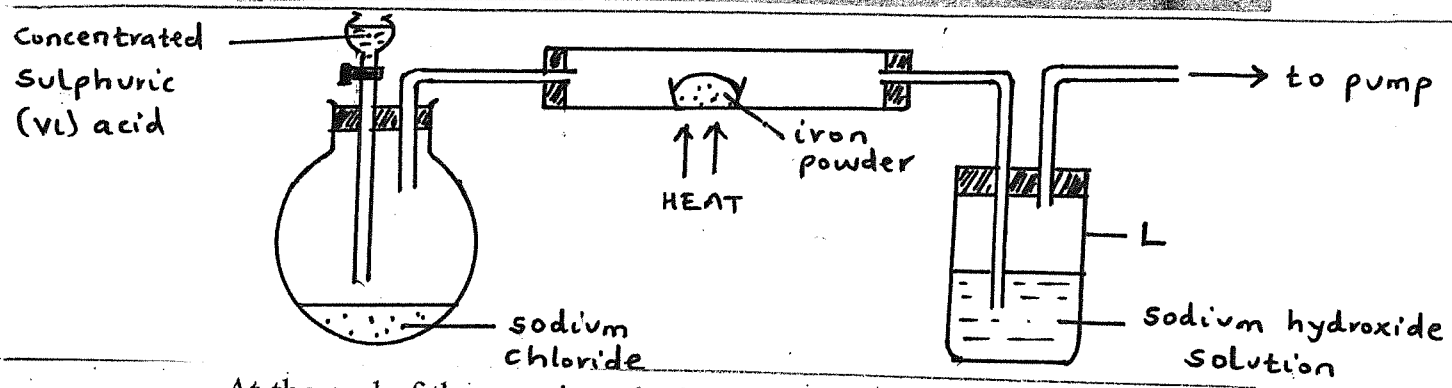
$H_{2(g)} + O_{2(g)} \longrightarrow H_2O_{2(g)}$; $\Delta H_f^{\emptyset} = -133kJ/mol$

$H_{2(g)} + O_{2(g)} \longrightarrow H_2O_{2(l)}$; $\Delta H_f^{\emptyset} = -188kJ/mol$

Determine the molar heat of vaporization of hydrogen peroxide (3mks)

3.

(a.) The setup below was used to prepare hydrogen chloride gas and react it with iron powder. Study it and answer the questions that follows:



At the end of the reaction, the iron powder turned into a light green solid.

i.) Identify the light green solid .....(1mk

ii.) At the beginning of the experiment, the pH of the solution in container L was about 14.0. at the end the pH was found to be 2.0. explain (2mks

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iii.) State the property of concentrated sulphuric (VI) acid that makes the reaction possible (1mk)

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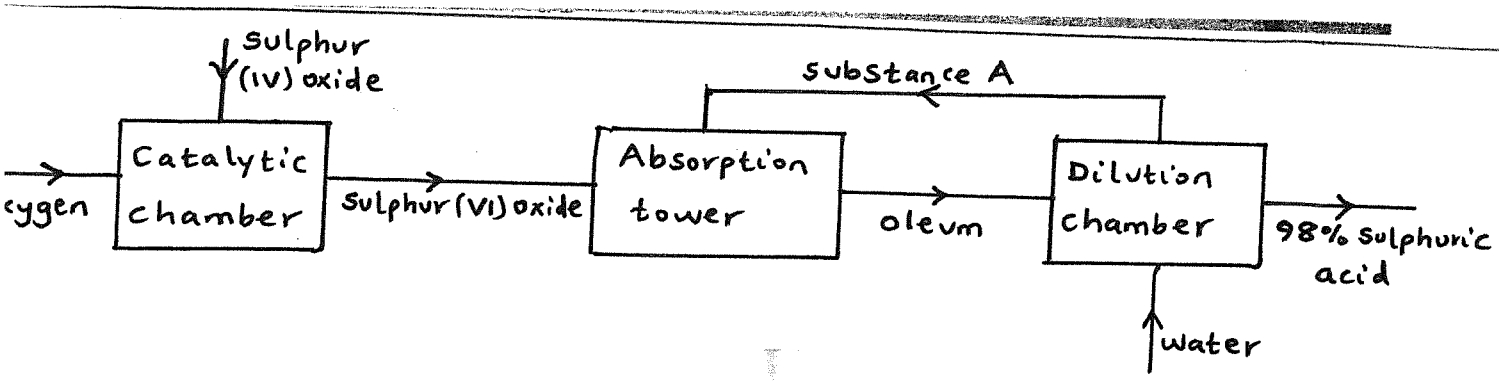
(b.) The flowchart below shows some of the processes involved in large scale production of sulphuric (VI) acid. Use it to answer the questions that follows:



(i.) Describe how oxygen is obtained from air on a large scale (3mks)

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(ii.)

I. Identify substance A .....(1mk)

II. Write an equation for the reaction that takes place in the absorption tower (1mk)

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(iii.) Vanadium (V) oxide is the commonly used catalyst in the contact process

I. Name another catalyst which can be used in the process

.....(1mk)

II. Give two commercial uses of sulphuric (VI) acid (1mk)

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Intermediate Y - .....

(ii.) Name the process which leads to the formation of substance Z from the intermediate Y .....(1mk)

(iii.) Identify the reagent and the condition for step I

I. Reagent .....(1mk)

II. Condition .....(1mk)

(iv.) State one disadvantage of continued use of items made from compound formed on step I (1mk)

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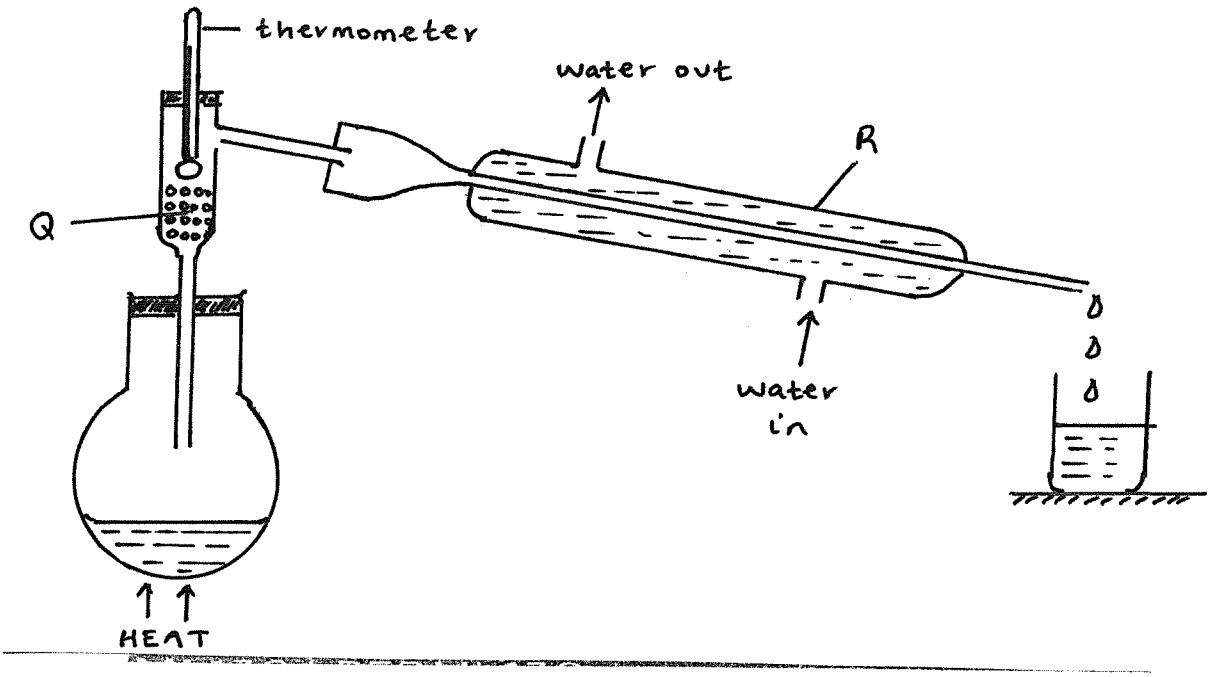
5.

(a.) The setup below was used to separate a mixture of methanol and propanol. Study it and answer the question that follow:



(i.) Name apparatus R .....(1mk)

(ii.) State the function of part Q .....(1mk)

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4.

(a.) Hydrocarbons are grouped into three homologous families of the following hydrocarbons

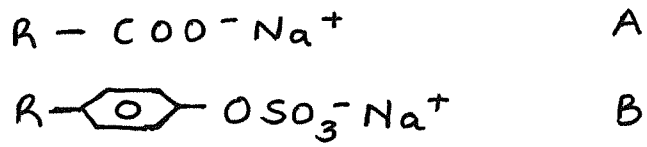
(i.) CH_3CCCH_3 .....(1mk)

(ii.) $CH_3CH_2CH_2CH_3$ .....(1mk)

(b.) Give the systematic name of the following organic compound; (1mk)

$CH_3COOCH_2CH_2CH_3$ .....

(c.) Below are structures of two cleansing agents



(i.) Identify the cleansing agent suitable to be used in water containing calcium chloride .....(1mk)

(ii.) State one advantage of using cleansing agent A (1mk)

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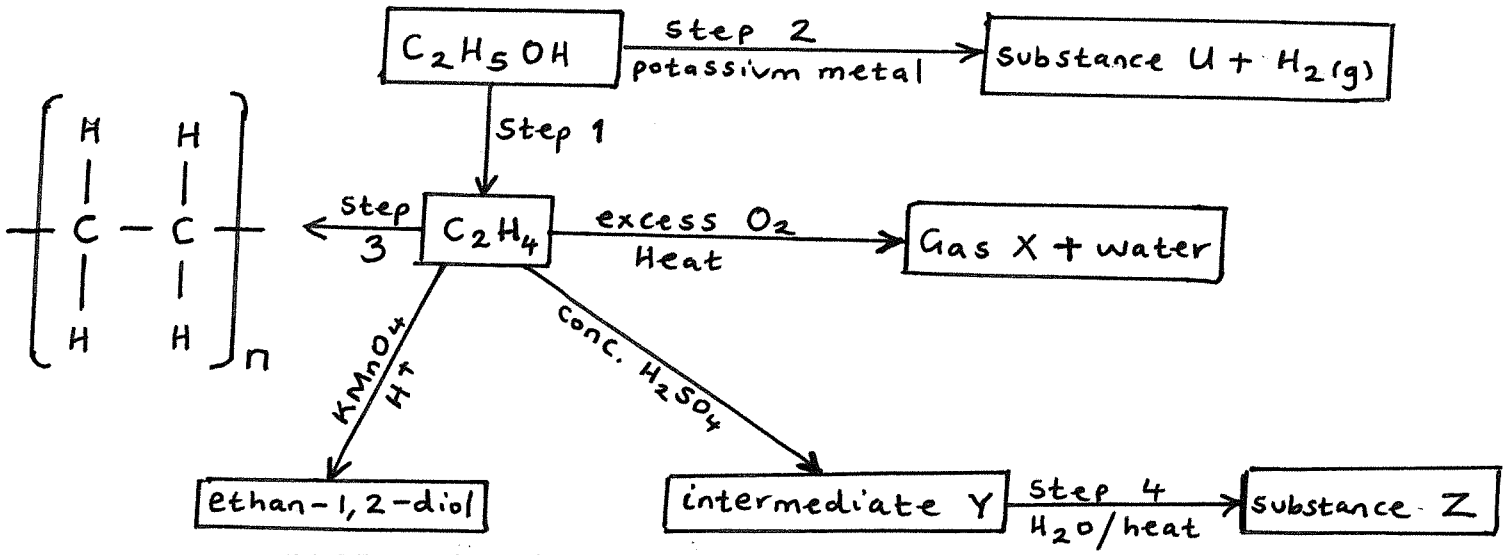
(d.) Study the flow diagram below and use it to answer the questions that follow.



(i.) Name the compounds: (3mks)

U - .....

Gas X - .....

(c.) Explain how calcium Hydrogen carbonate can end up in bore-hole water causing temporary water hardness (2mks)

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6.

(a.) The following are standard reduction potentials of some elements (the letters are not the actual symbols of the elements):

$M^{2+}_{(aq)} + 2e^- \longrightarrow M_{(s)}$; $E^\theta = -0.76V$

$N^{2+}_{(aq)} + 2e^- \longrightarrow N_{(s)}$; $E^\theta = +2.37V$

$P^{+}_{(aq)} + e^- \longrightarrow P_{(s)}$; $E^\theta = +0.80V$

$Q^{2+}_{(aq)} + 2e^- \longrightarrow Q_{(s)}$; $E^\theta = -0.14V$

i.) Draw a well labelled diagram of an M-P galvanic cell (3mks)

ii.) Determine the electromotive force (e.m.f) of the M-P galvanic cell drawn in 6 (a.) i.) above (2mks)

(iii.) Give the reason why the method can be used to separate the mixture .....(1mk)

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(iv.) Which liquid will be obtained first as the distillate? Explain .....(2mks)

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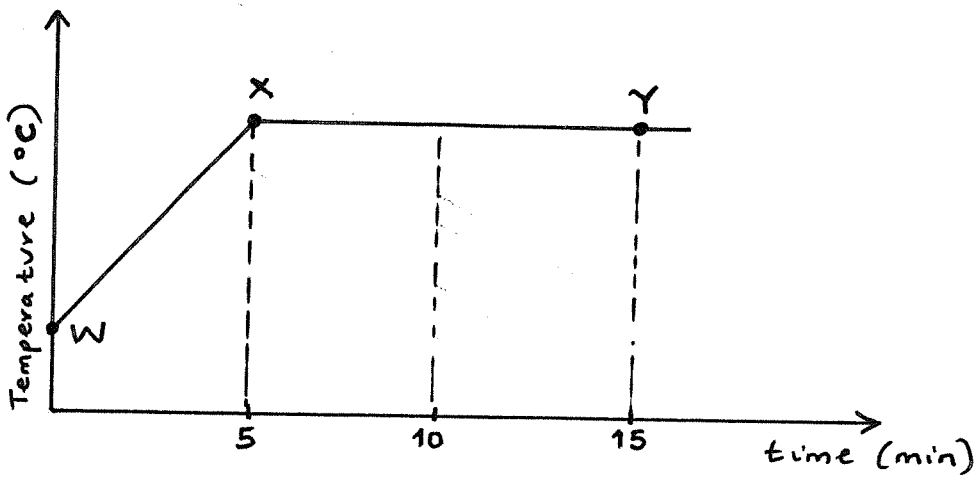
(b.) The graph below shows a curve obtained when a sample of water at 20°C was heated for 10 minutes



(i.) With a reason state whether the sample is pure or not (2mks)

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(ii.) State what happens to the water molecules between points W and X .....(1mk)

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(iii.) Explain the shape of part XY on the graph (2mks)

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iii.) The standard reduction potential of iron is -0.44V select the element that would best protect iron from rusting (1mk)

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iv.) Determine whether or not a solution of a nitrate metal of Q can be stored in a container made of metal N (2mks)

(b.) Aluminium metal can be extracted from the molten ore aluminium oxide. 1800 Kg of aluminium was obtained after electrolysis process (Al=27)

(i.) Write a half equation of the reaction that forms aluminium metal .....(1mk)

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(ii.) Calculate the quantity of electricity passed in faradays (2mks)

7.

(a.) Excess zinc carbonate was put in a beaker containing $100cm^3$ of dilute hydrochloric acid. The beaker was then placed on a balance and the total loss in mass recorded after every two minutes as shown in the table below

Time (mins)	0	2	4	6	8	10
Total loss in mass(g)	0	1.8	2.45	2.95	3.2	3.3

i.) Explain why there was a loss in mass (1mk)

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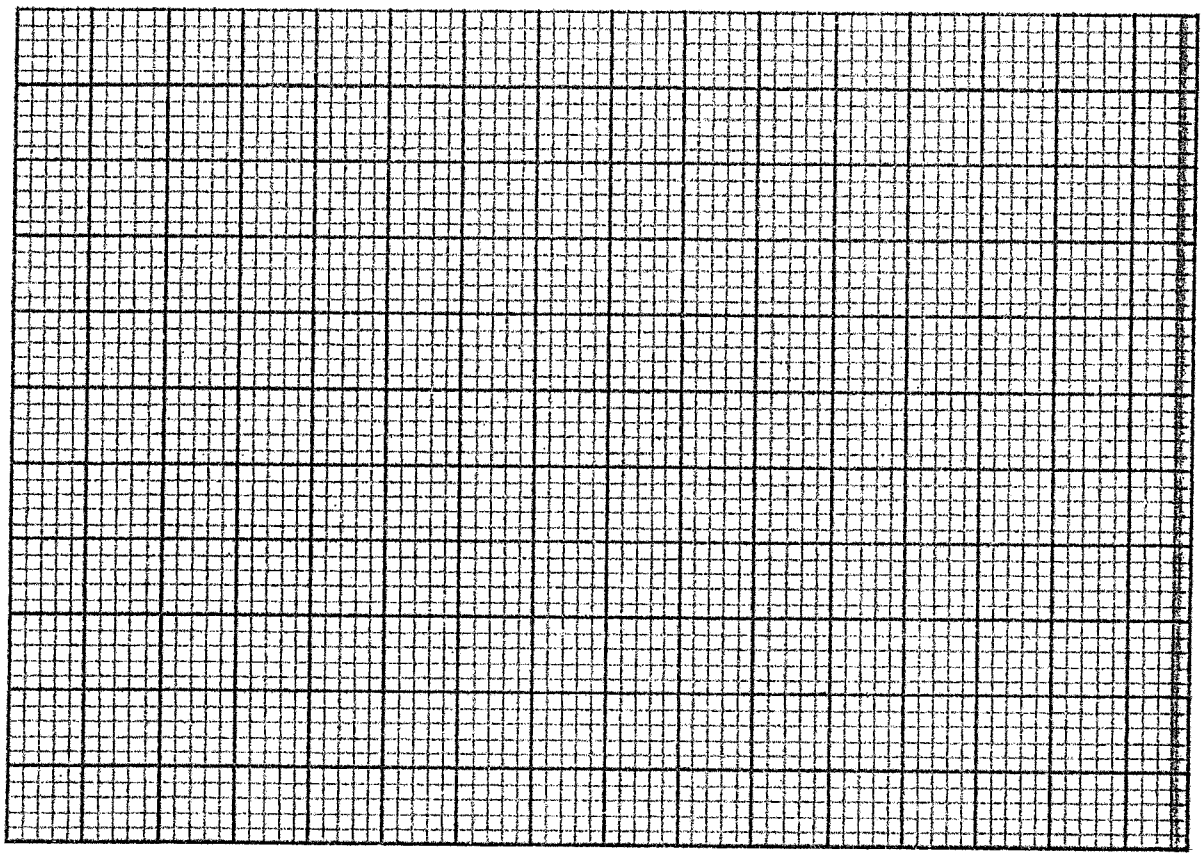
ii.) Plot a graph of total loss in mass against time (3mks)



iii.) From the graph calculate the average rate of change of mass between:

(I.) 0 and 2 minutes (1mk)

(II.) 6 and 8 minutes (1mk)

iv.) Explain the difference in the average rates of change in mass in iii.)(I) and (II) (2mks)

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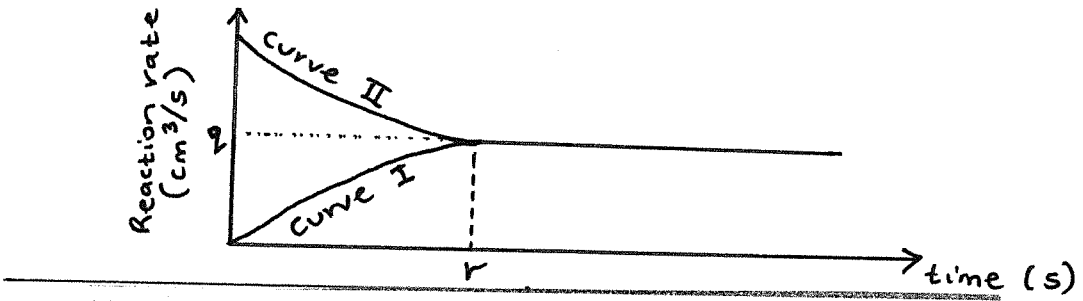
(b.) A dynamic equilibrium is represented by the following general equation:

$$A_{(g)} + B_{(g)} \rightleftharpoons 2C_{(g)} + D_{(g)}$$

The sketch below shows how the rate of the above reaction varies with time :



i.) Which of the two curves represents the reverse reaction. Give a reason for your answer (2mks)

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ii.) What the significance of points 'q' and 'r' on the graph? (2mks)

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