NAME……INDEX No……..
CANDIDATE'S SIGNATURE……
DATE……

23351

CHEMISTRY
PAPER 1
THEORY

JULY/AUGUST 2011
TIME 2 HRS

THIKA PROVINCIAL SCHOOLS JOINT EXAMINATIONS 2011

INSTRUCTIONS TO CANDIDATES

- **ANSWER ALL THE QUESTIONS IN THE SPACES PROVIDED**
- **ALL WORKIGN MUST BE CLEARLY SHOWN**
- **MATHEMATICAL TABLES AND ELECTRONIC CALCULATE MAY BE USED.**

FOR EXAMINERS USE ONLY

QUESTIONS	MAXIMUM	CANDIDATES SCORE
	SCORE	
1-29	80	

1. State two functions of sodium carbonate in a town's water purification plant

(2mks)

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2. Use the information in the table to answer the questions that follow (The letters do not represent the actual symbols of the element)

Element	**P**	**Q**	**R**	**S**	**T**
Atomic number	20	8	18	8	19
Mass Number	40	16	40	18	39

(a) Which two letters represent the same element. Give a reason.

(2mks)

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(b) Give the number of neutrons in an atom of element T.

(1mk)

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3. Explain how you would separate a mixture of nitrogen and oxygen gases given that their boiling points are -196^{o}C and -183^{o}C respectively.

(3mks)

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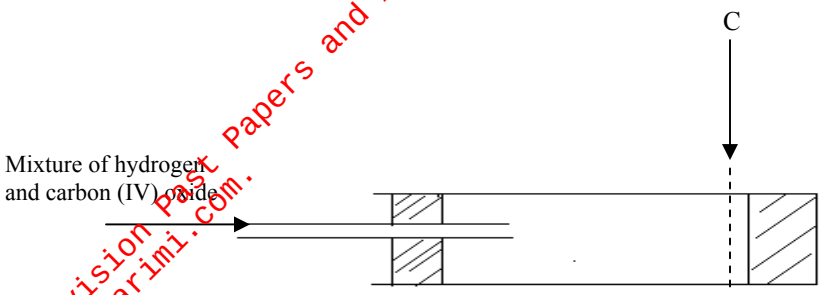
4. A mixture containing equal volumes of hydrogen and carbon (IV) oxide was introduced at one end of a tube as shown below.



Which gas would be detected at point C first? Explain. (2mks)

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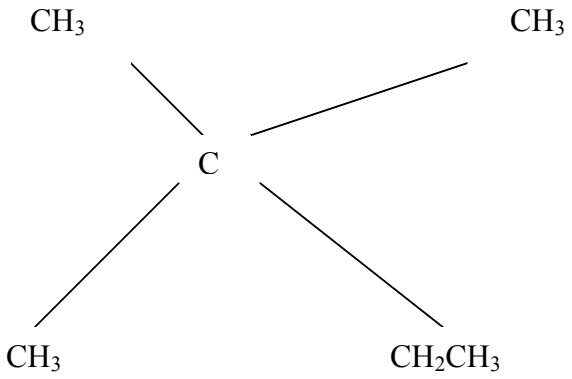
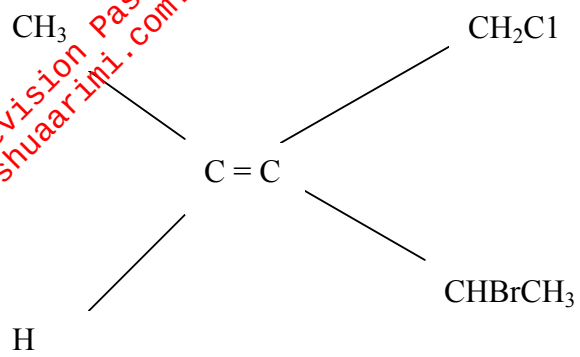
5. State the IUPAC names of the following organic compounds. (2mks)

(a)



(b)



6. Consider the equation below.

$$H_2O_2(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + HO^-_2(aq)$$

State and explain the species acting as a.

(i) A base in the backward direction. (1mk)

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(ii) An acid in the forward reaction

(1mk)

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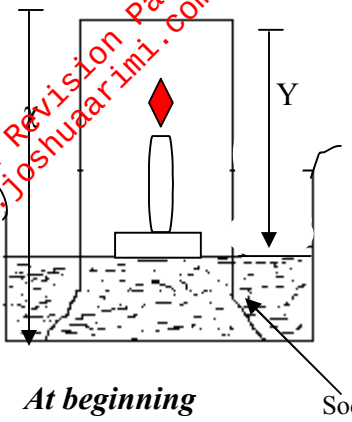
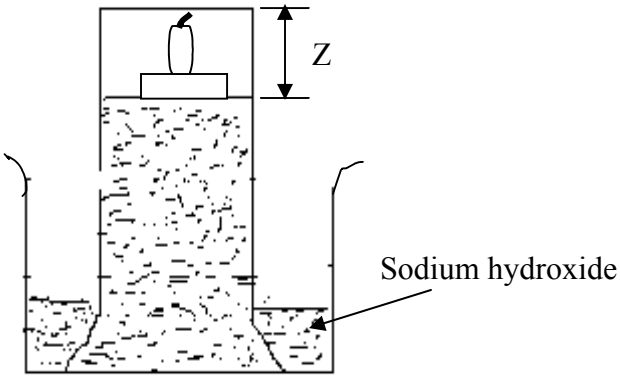
7. A form one student set up the following apparatus to investigate the percentage of oxygen in the air.



At beginning



After sometime

(a) Write an expression to show how the percentage can be calculated. (1mk)

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(b) Why is sodium hydroxide preferred to water in the above experiment? (1mk)

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(c) Instead of candle wax, list any other substance that can be used to give the same result. (1mk)

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8. A gaseous compound consists of 86% carbon and 14% hydrogen by mass. At s.t.p. 3.2dm^3 of the compound had a mass of 6g. Calculate

(a) Its empirical formula (C=12, H=1, molar gas volume at s.t.p = 22.4dm^3) (2mks)

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(b) Its molecular formula. (2mks)

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9. Give the names of the energies required to carry out the following processes. In each case, indicate whether the process is exothermic or endothermic.

(a) Change of solid to liquid at constant temperature. (1mk)

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(b) Breaking crystal of an ionic compound into gaseous ions. (1mk)

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(c) Convert gaseous ions into aqueous ions. (1mk)

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10. Describe how the following reagents can be used to prepare Barium sulphate:
Solid potassium sulphate, solid Barium carbonate, dilute nitric (v) acid and distilled water. 3mks)

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11. A piece of phosphorus was burnt in air. The product obtained was shaken with a small amount of hot water to make a solution.

(a) Write an equation for the burning of phosphorous in air. (1mk)

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(b) The solution obtained in the above reaction was found to have a PH of 2. Give a reason for this observation. (2mks)

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12.100g of a radioactive substance was reduced to 12.5g in 15.6 years. Calculate the half life of the substance. (2mks)

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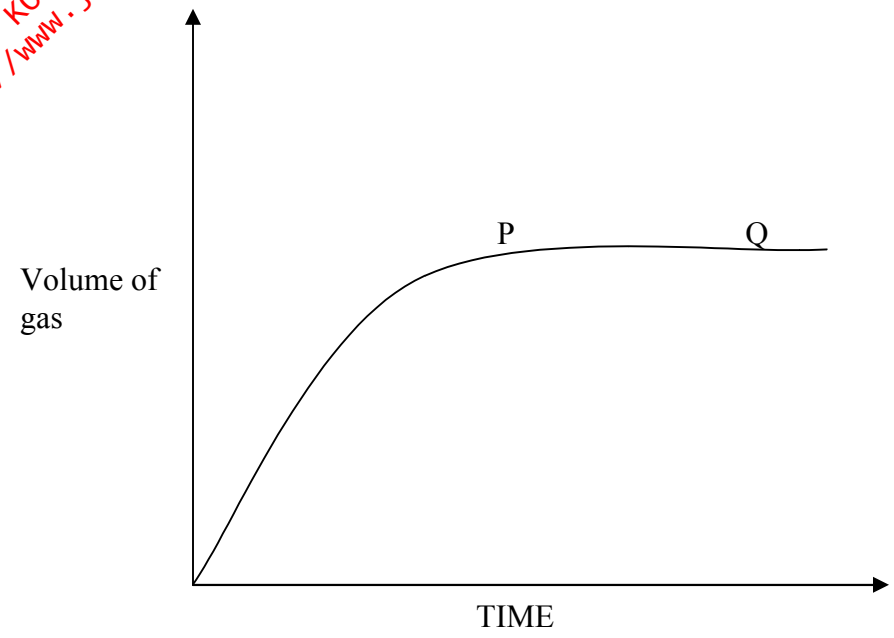
13. 10g of Zinc granules were reacted with $25cm^3$ of 4M hydrochloric acid. The graph below shows the relationship between the volume for gas evolved and time.



(i) What is the significance of region PQ? (1mk)

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(ii) Show by calculation the reagent that is in excess (Zn = 65, H = 1, Cl = 35.5) (2mks)

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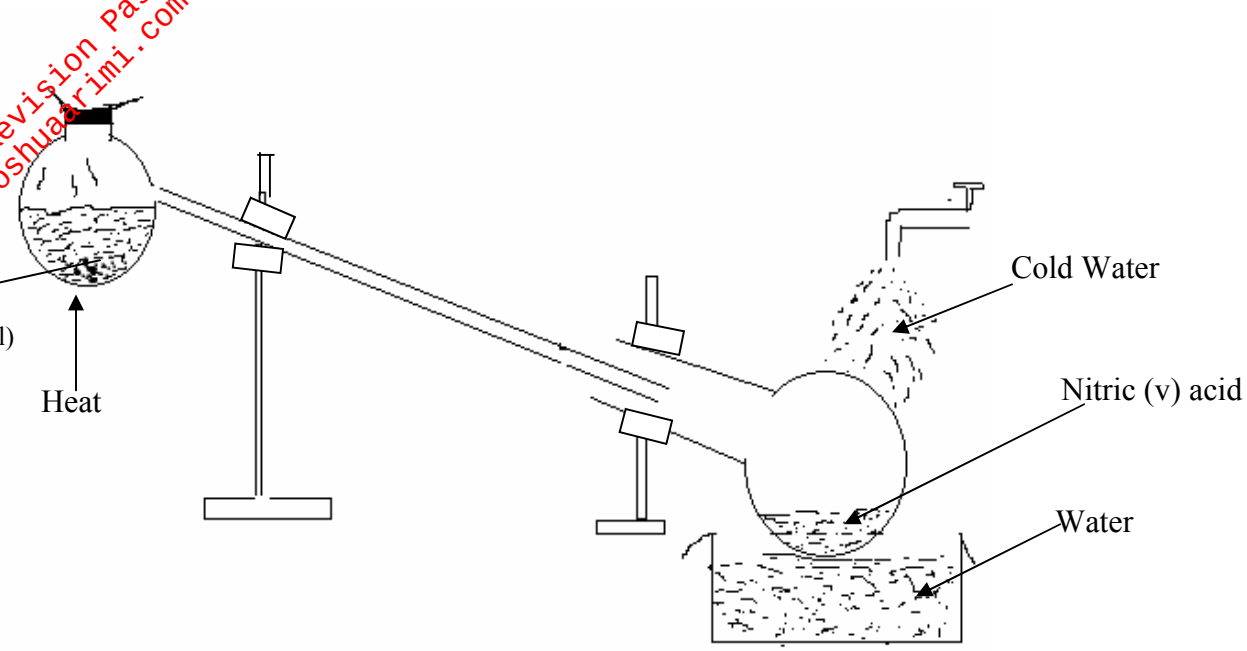
14. The diagram below shows a set up that was used to prepare and collect a sample of nitric acid.



(a) Give a reason why it is possible to prepare nitric (v) acid from sulphuric acid and potassium nitrate. (1mk)

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(b) Brown fumes were observed in the reaction vessel. Explain. (1mk)

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(c) Give one use of nitric (v) acid. (1mk)

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15. (a) Using dots(.) and cross (x) show the bonding between $^{12}_{6}X$ and $^{1}_{1}Y$. (2mks)

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(b) State one physical property of the compound formed in (a) above. (1mk)

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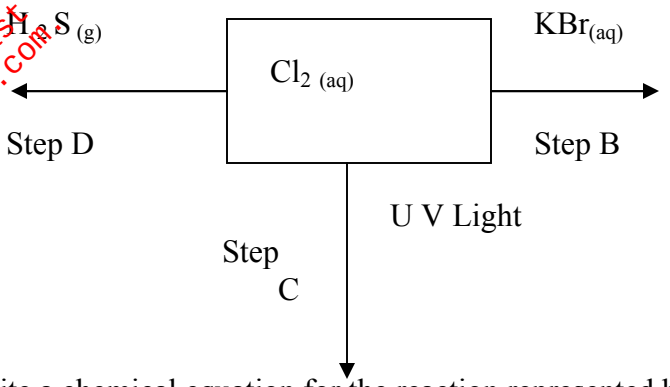
16. Study the following reaction scheme and answer the questions that follow. (1mk)



(a) Write a chemical equation for the reaction represented by step B. (1mk)

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(b) State and explain the observation in step D. (2mks)

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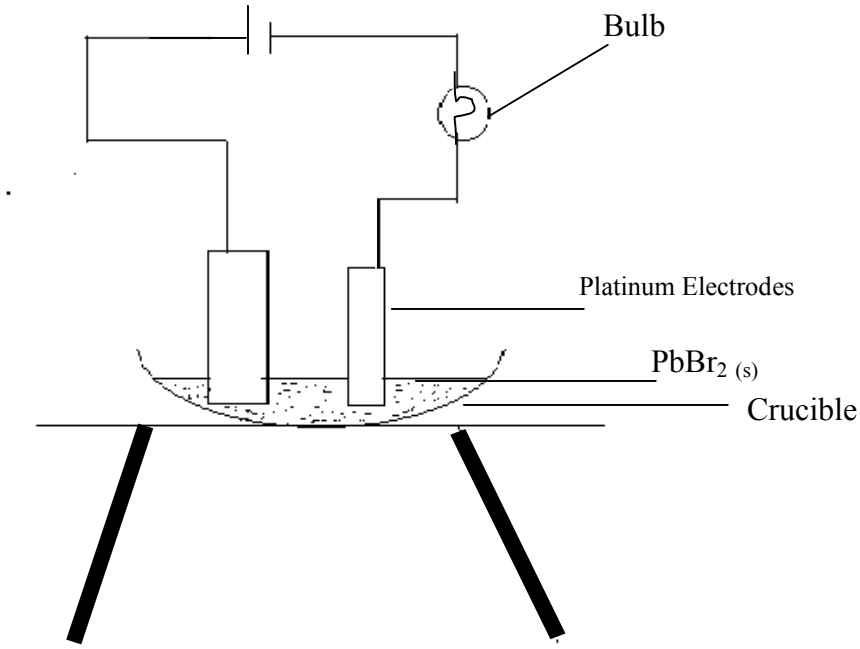
17. In an experiment to investigate the conductivity of substance, a student used the set up shown below.
The students noticed that the bulb did not light.



(i) What had been omitted in the set-up. (1mk)

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(ii) Explain why the bulb lights up when the omission is corrected. (2mks)

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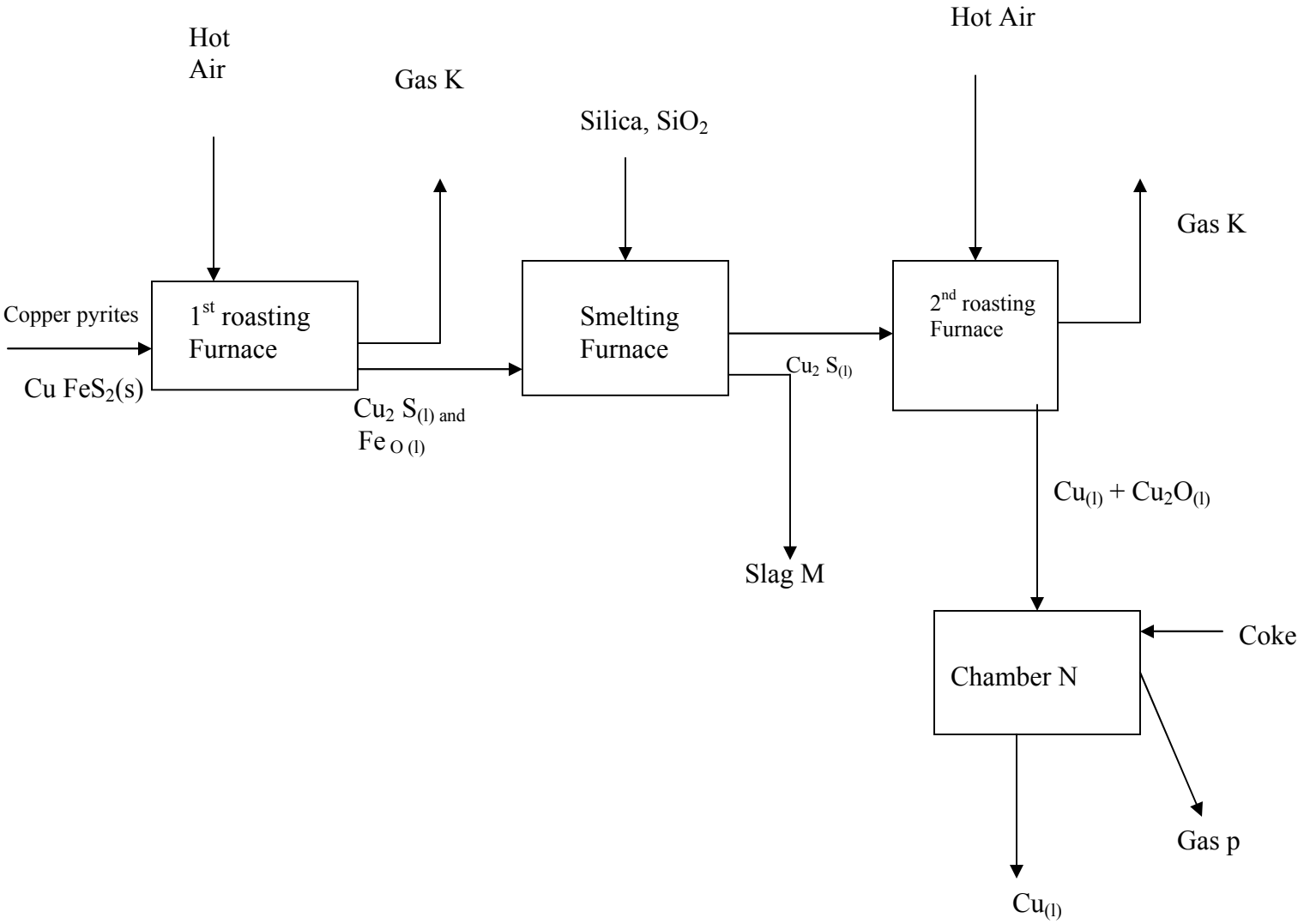
18. The flow chart below outlines some of the processes involved during the extraction of copper metal from copper pyrites. Study it and answer the questions that follow.



(i) Name gas K. (1mk)

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(ii) Write an equation for the reaction that takes place in the 1st roasting furnace. (1mk)

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(iii) What name is given to the type of reaction that takes place in chamber N. (1mk)

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19. If 25.0cm^3 of 0.1 M H_2SO_4 solution neutralized a solution containing 1.06g of sodium carbonate in 250cm^3 of solution, calculate the molarity and volume of the sodium carbonate solution used. (3mks)

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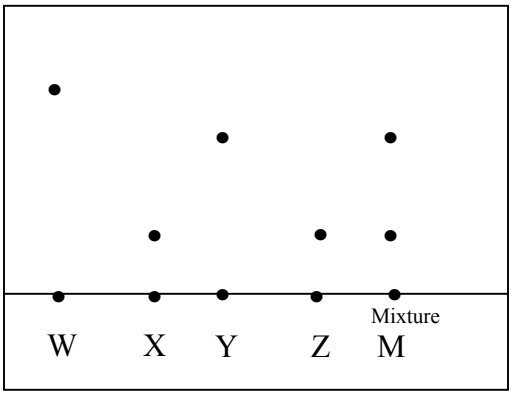
20. The diagram below represents the results obtained when paper chromatography was used to identify the two substances present in a mixture of M Study it and answer the questions that follow.



(a) On the chromatogram, show the solvent front. (1mk)

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(b) Which substances are present in the mixture M. (1mk)

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(c) Why is it possible to classify W,X,Y and Z as pure substances. (1mk)

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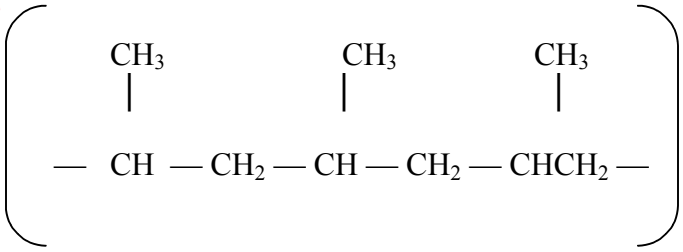
21. The structure given below represents a segment of a polymer. Use it to answer the questions that follow.



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(a) Derive the structure of the monomer. (1mk)

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(b) Given that that molecular mass of the polymer is 21,000. Find the number of the monomers (C=12, H=1) (2mks)

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22. Carbon (II) oxide reacts with hydrogen gas and establishes an equilibrium represented by the equation below.

$CO_{(g)} + 2H_{2(g)} \rightleftharpoons CH_3OH_{(g)}$ DH = +ve

(a) Explain how the yield of the product will be affected it the pressure of the system is reduced. (1mk)

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(b)What variation of temperature would lead to a higher yield of product? (1mk)

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23 (i) State Charles' law. (1mk)

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(ii) The capacity of a balloon to hold a gas at 5^oc is $1dm^3$ before it bursts due to expansion. Show whether it will burst or not at 35^oc at constant pressure. (2mks)

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24. Dilute nitric acid reacts with copper according to the equation.

$$3Cu_{(s)} + 8H^+_{(aq)} + 2NO_3^-{}_{(aq)} \longrightarrow 3Cu^{2+}_{(aq)} + 2NO_{(g)} + 4H_2O_{(l)}$$

(a) What is the oxidation number of nitrogen in:-

(i) NO_3^- (1mk)

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(ii) NO (1mk)

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(b) With respect to nitrogen, explain whether the above reaction is an oxidation or reduction process. (1mk)

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25. The table below gives the standard reduction potentials of elements represented by letters A, B, C, D and F. The letter does not represent the actual symbols of elements. Study and answer the questions that follow.

			E^θ (v)
$A^{2+}_{(aq)} + 2e^-$	$\rightleftharpoons$	A (s)	-2.90
$B^{2+}_{(aq)} + 2e^-$	$\rightleftharpoons$	B(s)	-2.38
$C^+_{(aq)} + e^-$	$\rightleftharpoons$	C (g)	0.00
$D^{2+}_{(aq)}$	$\rightleftharpoons$	D (s)	+0.35
$F_{(aq)} + e^-$	$\rightleftharpoons$	F^- (g)	+ 2.87

(a) (i) Identify element C, stating your reasons. (1mk)

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(ii) Identify the strongest reducing agent.

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(b) In the space provided, draw a well labeled diagram of a standard electrochemical cell whose electrodes are elements B and D. (2mks)

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26. State one property of helium that make it possible to be mixed with oxygen to be used by deep sea divers. (1mk)

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27.(a) What is a saturated solution. (1mk)

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(b) The data below was obtained by a group of students who wanted to determine the solubility of a salt x at 25^{o}C. Use the data to answer the questions that follow.

Mass of dry crucible = 18.0g.

Mass of Crucible + saturated salt = 27.0g.

Mass of crucible + salt after evaporating to dryness = 22.0g

Calculate the solubility of the salt at 25^{o}C. (2mks)

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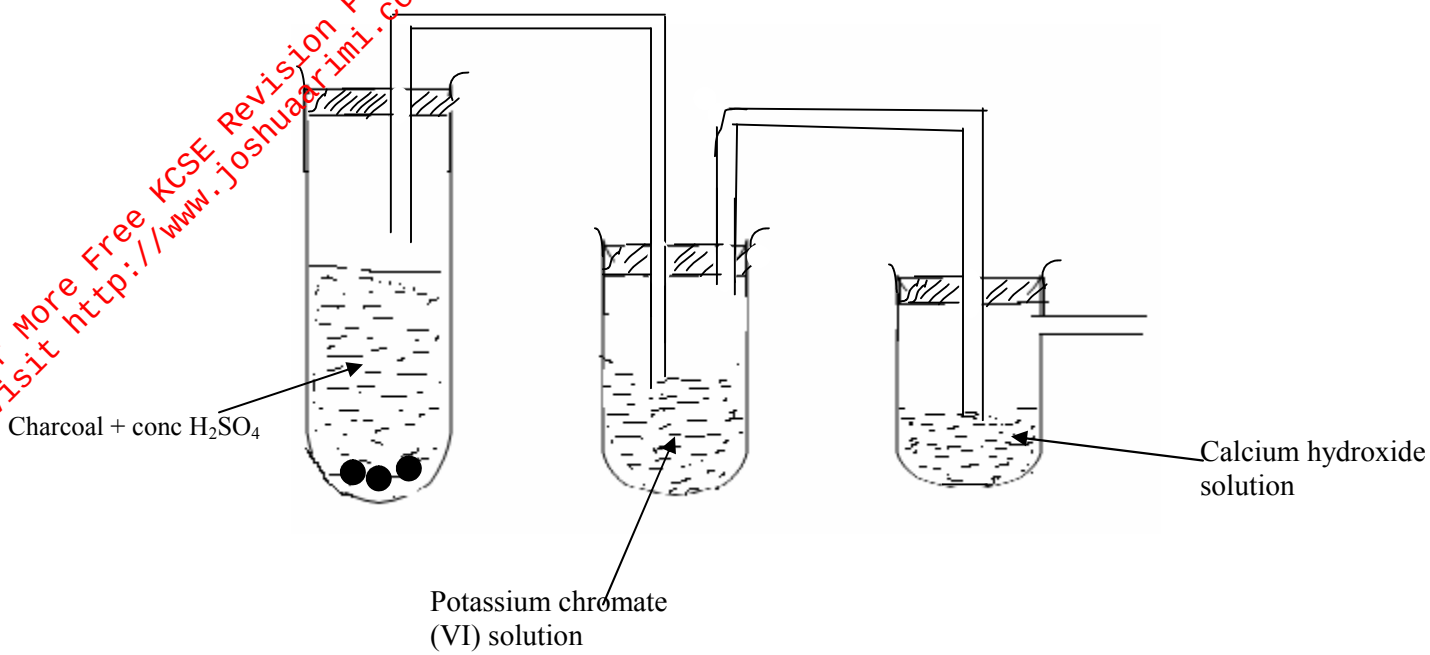
28. Concentrated sulphuric (VI) acid was heated with charcoal in the apparatus shown below:-



(a) (i) Name the gases given off. (1mk)

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(ii) Write the chemical equation for the reaction in the test tube. (1mk)

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(b)(i) State what was observed in the tube containing potassium chromate (VI). (1/2mk)

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(ii) What was observed in the tube containing calcium hydroxide. (1/2mk)

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29. (a) A certain solution K was analysed using various testing reagents. The table below shows the tests and observations made.

	TEST	OBSERVATION
(i)	Addition of 3 drops of lead (II) nitrate	White precipitate formed
(ii)	Addition of 3 drops of barium nitrate	White precipitate formed
(iii)	Addition of $5cm^3$ of 2M hydrochloric acid	Effervescence of gas observed
(iv)	Addition of $2cm^3$ of acidified potassium Chromate (VI)	Change of colour from orange to green

(i) Name the anion present in the solution. (1mk)

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(ii) Write an ionic equation for the reaction that takes place in step II (1mk)

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(b) Solid Aluminium hydroxide can be prepared by reacting excess ammonia solution with aluminium chloride solution. Explain why excess sodium hydroxide cannot be used. (1mk)

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