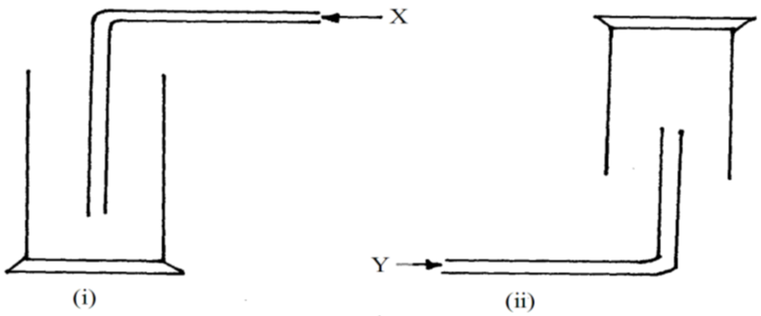
MARAKWET WEST DISTRICT

233/1
CHEMISTRY
PAPER 1
JULY/AUGUST 2015
TIME: 2 HOURS

1. State two reasons why we use the non- luminous flame for heating in the laboratory instead of using luminous flame. (2mks)

2. The diagram below shows how two gases x and y were collected.

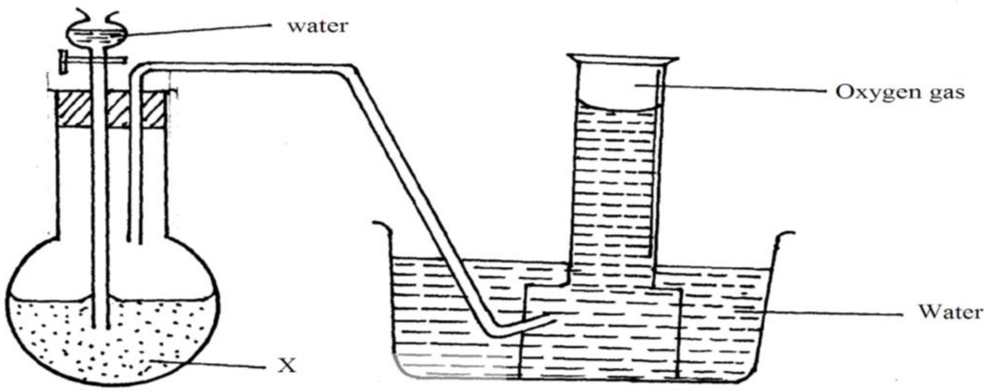


a) Name the two methods used. (1mk)
b) Which of the two gases x and y is denser? (1mk)

3. When burning magnesium was lowered in a gas jar full of carbon (IV) oxide, it continued to burn but when burning Zinc was lowered in a gas jar full of carbon (IV) oxide, it was put off. Explain these observations. (2mks)

4. a) Distinguish between a covalent bond and a co- ordinate bond. (2mks)
b) Draw a diagram to show bonding in a hydroxonium ion.
(H = 1.0, O = 16.0) (1mk)

5. The set up below was used to prepare a sample of oxygen gas. Study it and answer the questions that follow.



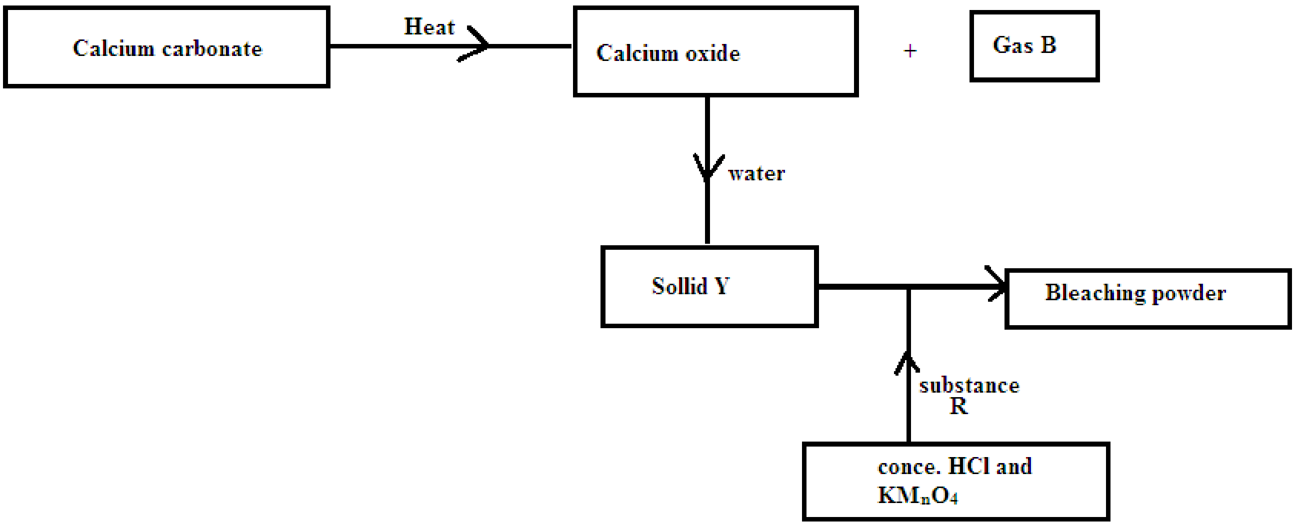
a) Name solid x. (1mk)
b) Write a chemical equation for the reaction that take place in the flask to produce oxygen gas. (1mk)

6. An element Y with atomic number J has two isotopes. The relative atomic mass of Y is 69.792. The relative abundance of an isotope with mass number 69 is 60.4%.
Calculate the mass number of the other isotope. (3mks)

7. The solubility of iron(II) sulphate crystals at 22^0c is 15.65 g per 100 g of water.
Define solubility. (1mk)
b) Calculate the mass of iron (II) sulphate at the 45 g of saturated solution at the same temperature. (3mks)

3. A small crystal of potassium manganate (VII) was placed in a beaker containing water. The beaker was left standing for two days without shaking. State and explain the observations that were made. (2mks)

9. Bleaching powder is a very important compound in laundry. The scheme below shows the process of making bleaching powder.



a) Name solid Y. (1mk)
b) Name substance R. (1mk)
c) Write the equation for the formation of bleaching powder. (1mk)

10. When 8.53 g of sodium nitrate were heated in an open test tube, the mass of oxygen gas produced was 0.83 g. Given the equation of the reaction as,

$$2NaNO_{3\,(s)} \rightarrow 2NaNO_{2(s)} + O_{2(g)}$$

Calculate the percentage of sodium nitrate that was converted to sodium nitrate.
(Na = 23.0, N = 14.0, O = 16.0) (3mks)

11. A dynamic equilibrium between nitrogen (IV) oxide and dinitrogen tetraoxide is established as shown below.

$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$

(pale yellow) (Red brown)

(i) What is meant by dynamic equilibrium? (1mk)

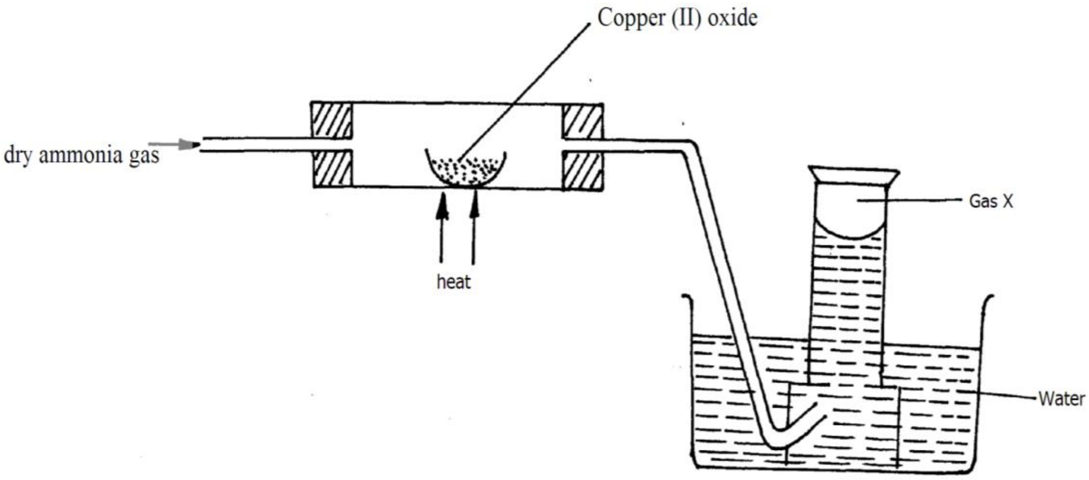
(ii) State the observation that would be made when the pressure of the equilibrium mixture is increased. (1mk)

12. Commercial sulphuric (VI) acid has a density of 1.8 gcm^{-3}.

a) Calculate the molarity of this acid.
(H = 1.0, S = 32.0, O = 16.0) (2mks)

b) Determine the volume of the commercial acid in (a) above that can be used to prepare $500cm^3$ of 0.2 M sulphuric (VI) acid solution. (2mks)

13. Study the diagram below and answer the questions that follow.

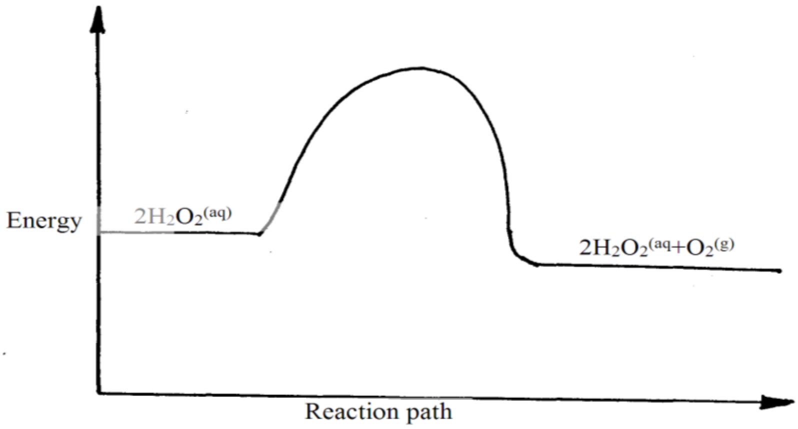


(i) What property of ammonia is demonstrated in the diagram shown above. (1mk)

(ii) State one use of gas x. (1mk)

14. Describe how a solid sample of lead(II) chloride can be prepared using the following reagents: Dilute nitric (V) acid, dilute hydrochloric acid and lead (II) carbonate. (3mks)

15. The diagram below is a sketch of the graph of the non- catalysed decomposition of hydrogen peroxide.



On the same axis, sketch the graph for the decomposition of hydrogen peroxide when manganese (IV) oxide is added. (2mks)

16. The table below shows ionization energy of three elements in the same group of the periodic table.

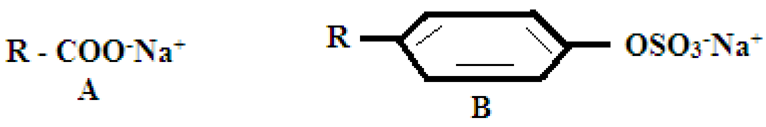
Element	1^{st} ionization energy KJ/ mole	2^{nd} ionization energy KJ/ mole
C	900	1880
D	736	1450
E	590	1150

a) Arrange the above elements in order of their reactivity from most reactive to least reactive. (1mk)

17. b) State Charle's law. (1mk)

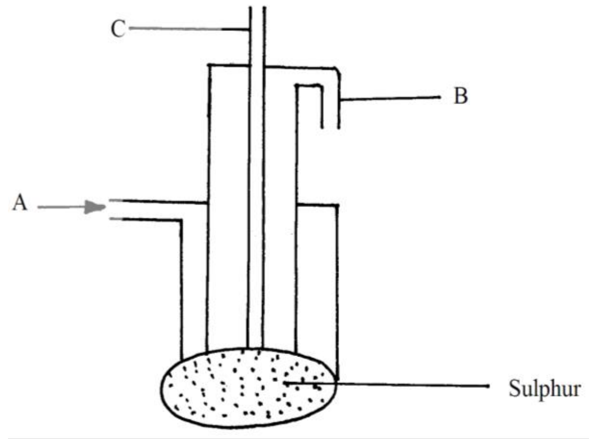
b) A ballon used in a meterological station contains $250dm^3$ of helium at 25^0c and 100 kPa pressure. Calculate the temperature when will burst, when its volume reaches $400dm^3$ and 80 k Pa pressure. (3mks)

18. The structure below represents two cleansing agents A and B.



State a cleansing agent that would be suitable for washing in water containing calcium chloride. Give a reason. (2mks)

19. The diagram below shows the method used during the extraction of sulphur by frasch process.



a) Name the substances that pass through the tubes.

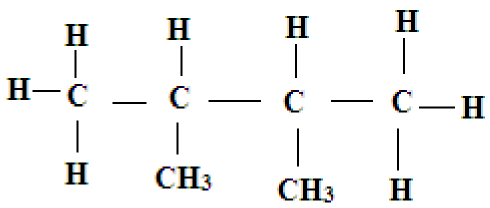
A…………………………………………………………………………………………..

B…………………………………………………………………………………………..

b) Explain how sulphur at 200 m down the soil reaches the ground surface. (2mks)

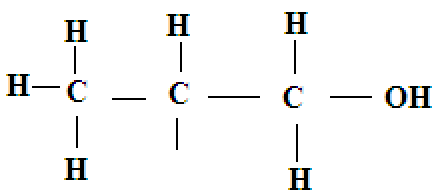
20. Name the following organic compounds. (3mks)

a)



b) $CH_3CH_2COOCH_2CH_3$

c)



21. Study the properties of substances V1 to V4 in the table below and answer the questions that follow.

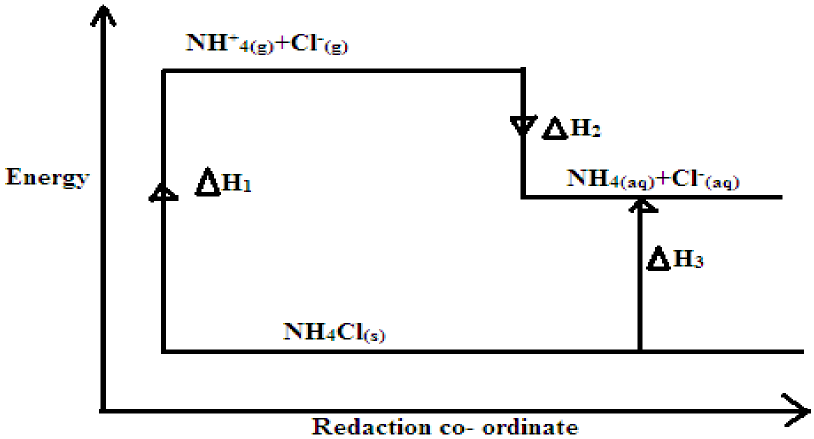
Substance	Solubility in water	Solubility in petrol	Melting point (^{0}c)	Boiling point (^{0}c)
V_1	Insoluble	Soluble	-30	250
V_2	Insoluble	Insoluble	1535	3000
V_3	Insoluble	Soluble	16.8	44.8

V_4	Insoluble	Soluble	75	320

a) Which of the substances are liquids at 24^0c? (1mk)

b) Describe how a mixture containing V2 and V4 can be separated. (2mks)

22. Study the diagram below and answer the questions that follow.



a) What do the following represent? (2mks)

ΔH_1 ....

ΔH_2 ....

b) Write an expression to show the relationship between $\Delta H_1, \Delta H_2$ *and* ΔH_3 . (1mk)

23. Calculate the molar masses of the following compounds.

a) Iron (II) sulphate (Fe = 56, S = 32, O = 16) (1mk)

b) Potassium manganate (VII) (K = 39, Mn = 55, O = 16) (1mk)

24. Using the following half cell standard electrode potentials to answer the questions that follow. The letters do not represent the actual symbols of the elements.

E^θ *volts*

$C^{2+}_{(aq)}+2e^- \rightleftharpoons C_{(s)} -2.38$

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

(i) In the space provided draw a well labeled diagram of the electrochemical cell that would be obtained when the two half cells are combined. (2mks)

(ii) Write the cell notation in (i) above. (1mk)

25. Element y has atomic number 13 and element x has atomic number 12.

a) Which element has the smallest atomic radius? Explain. (1 ½ mks)

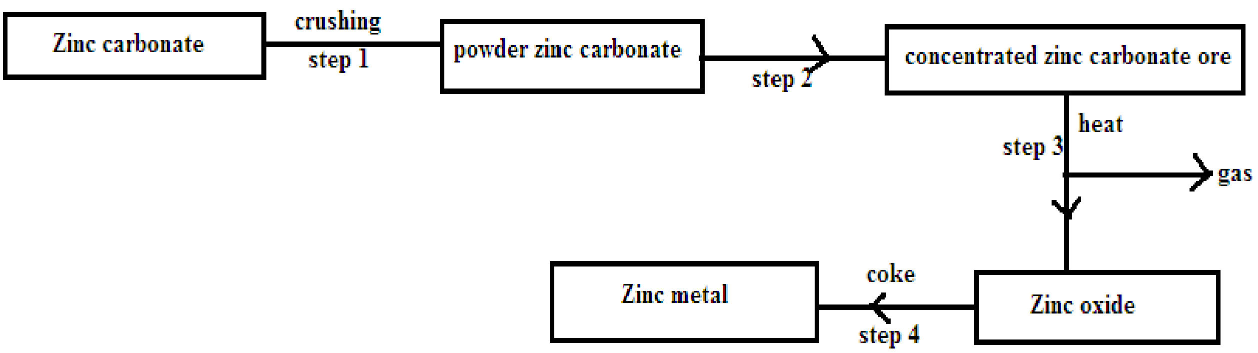
b) Select the element that has the highest melting point. Explain. (1 ½ mks)

26. During the electrolysis of silver nitrate, a current of 5.0 A was passed through the electrolyte for 3 Hours.

a) Write the equation for the reaction which took place at the anode. (1mk)

b) Calculate the mass of the silver deposited (Ag = 108, 1F =96500c) (2mks)

27. The flow chart below shows steps used in the extraction of zinc from one of its ores.



a) Give the name of one zinc ore used for extraction of zinc. (1mk)

b) Name the process that is used in step 2 to concentrate the ore. (1mk)

c) Write an equation for the reaction which takes place in step 3. (1mk)

d) Name one use of zinc other than galvanizing. (1mk)

28. After 7.5 hrs the percentage of a certain nuclide in a sample of ore was found to be 12.5%.

a) What is meant by the term half- life. (1mk)

b) Determine the half- life of the nuclide. (2mks)

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PAPER 2
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TIME: 2 HOURS

l. a) The electron arrangement of Ions A^{2+} and B^{3-} are 2.8 and 2.8.8 respectively. Write down the Electron arrangement of the elements. (1mk)

A…………………………………………………………………………………………..

B…………………………………………………………………………………………..

b) Study the information in the table below and answer the questions that follows. The letters are not the actual symbols of the elements.

ELEMENT	Atomic Number	Boiling Point (°C)
V	3	1333
W	13	2470
X	16	445
Y	18	-186
Z	19	774

i) Which element

I) Is a gas at room temperature ? Explain taking room temperature as 25°c. (½ mks)

II) Does not form an oxide. Explain (½ mk)

iii) Write down the

i) Formula of the sulphate of element W (lmk)

ii) Equation for the reaction between elements V and X (lmk)

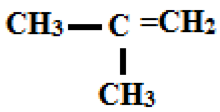
iii) what type of bond would exist in the compound formed when element X and w react. Give a reason for your answer . (2mks)

iv) Select the most electropositive element. Explain (2mks)

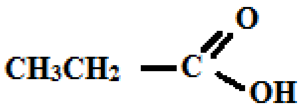
v) Explain why the boiling point of element W is higher than that of element (2mks)

2. a) Give the IUPAC names of the following (2mks)

i)

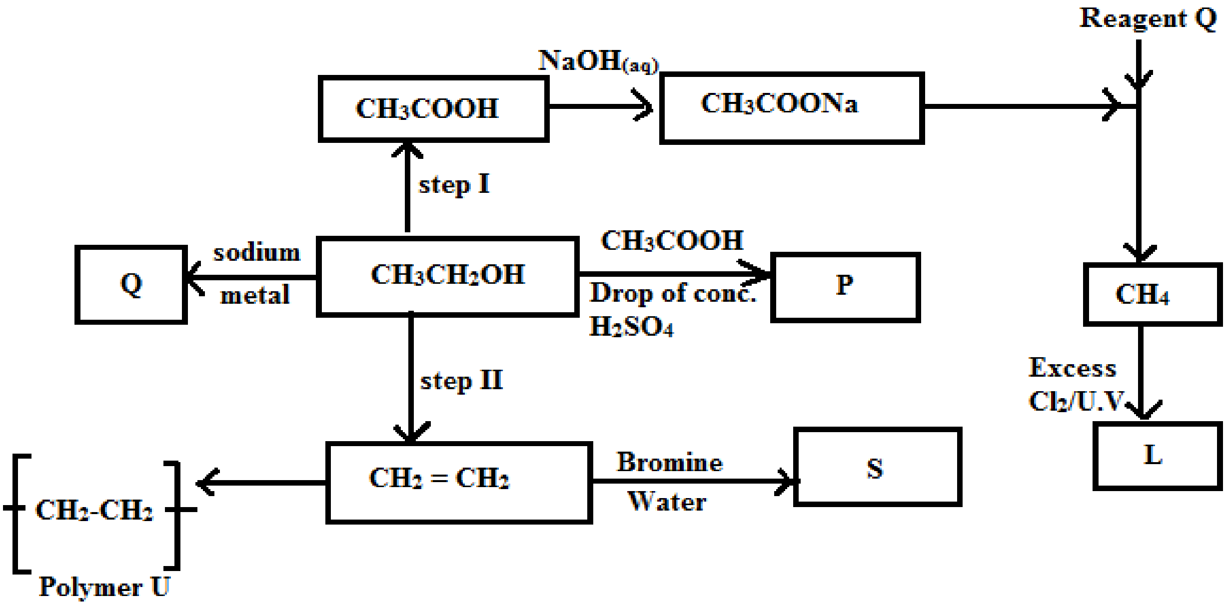


ii)



i) Describe one chemical test that you would use to distinguish between the two compounds represented by the formulae C_2H_6O and $C_2H_4O_2$ (2mks)

c) Study the below reaction scheme to answer the questions that follows.



a)

i) Reagent Q (½ mk)

ii) Substance S (½mk)

ii) Write the formula of compound P (lmks)

iii) Draw the structural formula of L and give its name (lmks)

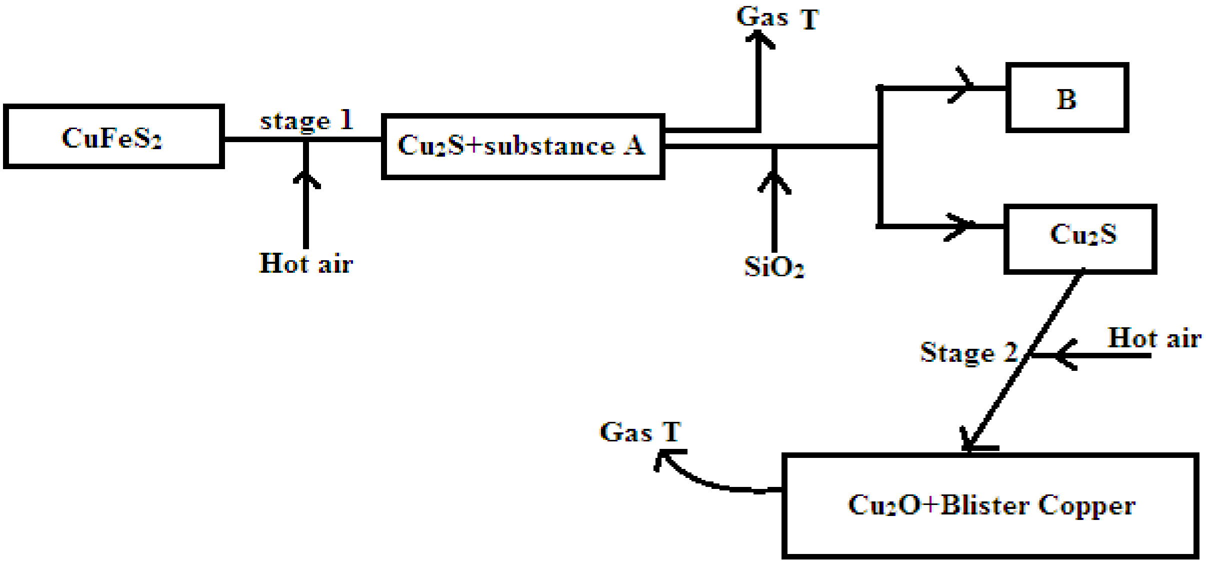
iv) Name the type of reaction, the reagent(s) and condition for the reactions in the following steps (2mks)

Step I……………………………………………………………………

Step II……………………………………………………………………

v) If the relative molecular mass of U is 56000, determine the number of monomer samples n in the polymer (2mks)

3. The flow chart shows the process used to extract copper. Study and answer the following questions that follow.



Name

(i) Gas T (½ mk)

(ii) Substance A (½ mk)

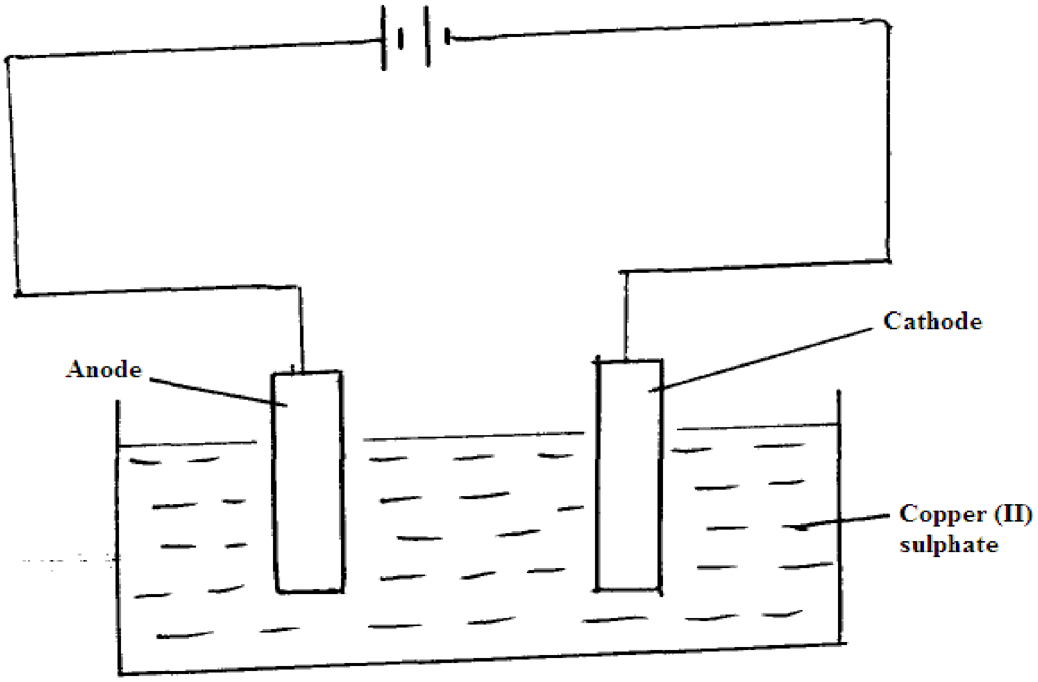
(iii) Write equations for the reaction taking place at

i) Stage 1 (1mk)

ii) To form substance B (1mk)

iii) State two effects that this process could have on the environment. (1mk)

b) The diagram below shows blister copper may be purified.



i) What is the anode made up of? (1mk)

ii) State and explain the observations made when the circuit is complete. (2mks)

iii) In an experiment like the one shown above, a current was passed through the electrolyte for 4 hours and the mass of the copper deposit at one terminal was found to be 5 kg. Calculate the current which was passed. (Cu = 63.5, 1F = 96500c) (3mks)

iv) Explain why copper can-be extracted electrolytically from aqueous. Copper II sulphate electrolytically from while Magnesium cannot-be extracted from its aqueous sulphate by the same method. (2mks)

4. a) Complete the following nuclear equation: (2mks)

i) $^{31}_{15}P + ^{2}_{1}H \rightarrow$ ____________ $+ ^{1}_{1}H$

ii) $^{10}_{5}B +$ ______________ $^{13}_{7}N + ^{1}_{0}n$

b) I. Below is part of the Thorium decay series:

$$^{232}_{90}Th \xrightarrow{(i)} ^{228}_{88}Ra \xrightarrow{(ii)} ^{228}_{89}Ac \xrightarrow{(iii)} ^{228}_{90}Th \xrightarrow{(iv)} ^{224}_{88}Ra$$

Name particles (i) and (ii) (lmk)

II Write an overall nuclear equation for the conversion of 232 to 224 (lmk)

Th Ra

90 88

c) State two differences between chemical and nuclear reactions. (2mks)

d) The table below gives the counts per minutes of a radioactive isotope after decaying –at different times

Time (minutes)	0	10	20	30	40	50	60	70
Counts per minutes	800	580	427	305	225	165	122	85

i) On the grid provided plot a graph to the counts per minute (vertical axis)against time. (3mks)

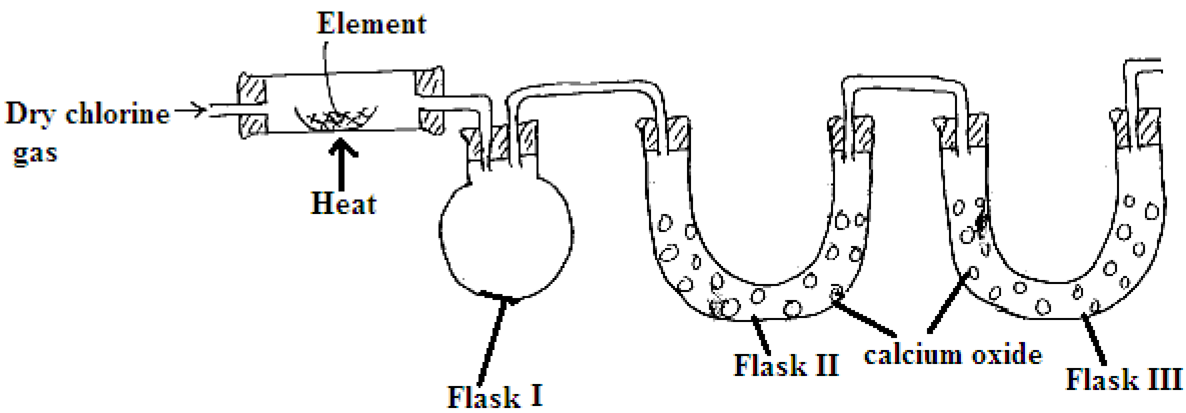
ii) Using the graph, determine the

I) Half-life of the radioactive Isotope (lmk)

II) Mass of the Isotope which would remain after 110 minutes if the original mass of the Isotope was 64g. (lmk)

e) Give one use of radioactive Isotopes in Medicine. (lmk)

5. The set up below was used to prepare anhydrous chlorides of a number of elements in a laboratory where no fume cupboard was available. The chlorides were to be collected in flask I.



The following table shows the melting points of the chlorides that were prepared.

Chloride	Nacl	Alcl3	Sicl4	Pcl3
Melting point (K)	1074	Sublimes(451)	203	182
Boiling Point (K)	1686	________	331	349

a) It is necessary to pass chlorine gas through the apparatus before heating of the element begins Explain (2mks)

b) Give two functions of Calcium oxide in flask II and III (2mks)

c) Explain why it would not be possible to collect any sodium Chloride in flask I (2mks)

d) Name one other substance that can be used in tubes I and II instead of Calcium Oxide (lmk)

e) Write an equation for the reaction that forms aluminium chloride (lmk)\

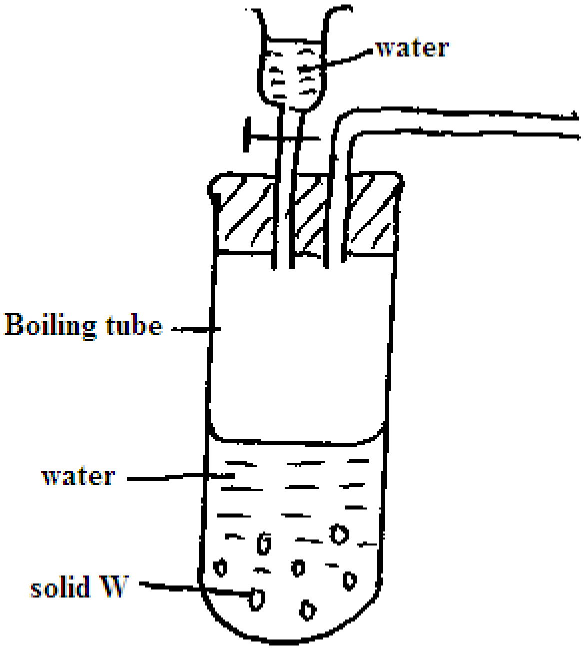
f) In what state would silicon chloride be collected in flask I Explain (lmk)

g) In one such a reaction excess Phosphorus was reacted with 240cm3 of Chlorine. Calculate the mass of phosphorus (III) Chloride that was deposited (P= 31.0, Cl= 35.5 and one mole of A gas occupies 24000cm^3 at r.t.p) (3mks)

6. a) Give the name of each of the processes described below which takes place when the substances named are subjected to the conditions given (3mks)

	Substance	Condition	Name of process
i)	Iron (II) sulphate heptahydrate	Exposed to air changes from crystalline to powder	
ii)	Concentrated Sulphuric (VI) acid	Exposed to air increases in volume	
iii)	Zinc nitrate	Exposed to air changes into a solution	

b) The diagram below shows a set-up by a student in an attempt to prepare and collect dry oxygen gas.



i) Complete the diagram to show how dry oxygen can be collected (3mks)

ii) Identify solid W (lmk)

iii) Write a chemical equation for the reaction taking place in the boiling tube (1mk)

c) A piece of Phosphorus was burnt in excess air and the product obtained was shaken with small amount of hot water to make a solution.

i) Write an equation for the burning phosphorus in excess air (1mk)

ii) The solution obtained in C(i) above was found to have a PH of 2. Explain (lmk)

d) Explain why cooking pots made of aluminium do not corrode easily when exposed to air. (2mks)

7. a) What is meant by empirical formula of a compound (lmk)

b) i) A hydrated salt has the following composition by mass.
Copper 25.4%)sulphur 12.8%, Oxygen 25.8%, water 36%. Its relative formula mass is 249.5 Determine the empirical formula of the hydrated salt. (3mks)

ii) 9.98g of the hydrated salt were dissolved in distilled water and the total volume made to 200cm3 of solution. Calculate the concentration of the salt solution in moles per litre. (2mks)

c) When a solid sample of sulphur is heated in a test-tube it changes into a liquid which flows easily)on further heating, the liquid darkens and does not flow easily. Explain these observations (2mks)

d) $Na_{(s)} \rightarrow Na^{+}_{(g)}\ \Delta H = +ve$ (lmk)

e) The table below gives some bond energies of some bonds

. Bond	Bond energy (KJmol^{-1})
H-H	435
Cl-Cl	243
H- Cl	431

Calculate the enthalpy changes for the reaction

$H_{2(g)} + Cl_{(g)} \rightarrow 2HCl_{(g)}$ (2mks)

MARAKWET WEST DISTRICT

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CHEMISTRY
PAPER 3
JULY/AUGUST 2015
TIME: 2 ¼ HOURS

INSTRUCTIONS

1. Take the first 15 minutes to read the question paper and make sure you have all the chemicals and apparatus that you may need.
2. Mathematical tubes and electronic calculators can be used.

1. You are provided with;

0.1M Sulphuric (vi) acid, solution Q.

Sodium hydrogen Carbonate solid, R.

You are required to determine the solubility of Sodium hydrogen Carbonate in **g/l00g** of water.

Procedure.

i) Put solid R in a **250cm^3** beaker. Measure **100cm^3** of distilled water, using **100cm^3** measuring cylinder. Stir the contents vigorously using a glass rod. Place the beaker with its contents in a safes Place to allow the contents to settle for about 3 minutes. Now assemble the burette and materials required for titration.

ii) Without disturbing the precipitate, pipette **25cm^3** of the clear solution and transfer it to a 250cm^3 volumetric flask. Fill the flask to the mark with distilled water and shake well. Label this solution as solution S. Take the temperature of the solution. Transfer solution into a **250cm^3** beaker.

iii) Fill the burette with solution Q Pipette **25cm^3** of solution S into a conical flask. Add 2-3 drops of Methyl orange indicator and titrate with solution **Q.**
Record your results in the table below.
Temperature of solution S=………………………………. °C.

Final burette reading (**cm^3**)	**I**	**II**	**III**
Initial burette reading(**cm^3**)			
Volume of solution **Q** used(**cm^2**)			

a) Determine the average volume of solution Q used. (lmk)

b) Calculate the number of moles of Sulphuric (vi) acid, solution Q that were used. (lmk)

c) Calculate the number of moles of Sodium hydrogen Carbonate solid R that were in the solution S that were used. (2mks)

d) Calculate the number of moles of Sodium hydrogen Carbonate solid R, in 250m1 of the diluted solution S. (2mks)

e) Calculate the number of moles of Sodium hydrogen Carbonate solid R, in the original 100cm^3 of the solution. (Na=3 H=1 C=12 0=16 assume density of water is lg/cm^3) (3mrks)

f) Calculate the solubility of the Sodium hydrogen Carbonate solid R in water. (Na=3 H=1 C=12 0=16 assume density of water is lg/cm^3 (3mrks)

2. You are provided with;

2 M Sulphuric (vi) acid
6 pieces of metal N.

You are required to determine the rate of reaction between metal N and Sulphuric acid.

Procedure:

Measure **70cm^3** of **2M** Sulphuric (vi) acid using **100cm^3** measuring cylinder and transfer the solution into 100cm^3 beaker. Place the beaker over a white tile or a white sheet of paper. Drop one piece of metal N into the beaker and record the time taken for the metal **N** to disappear. Drop the piece of metal **N** vertically at the center of the solution and it should be in contact with the acid on both surfaces. Record your result in the table below under experiment I.

Repeat the same procedure by measuring 60,50,40,30 and 20cm^3 of the acid for experiment II, III, IV,V and VI respectively. Dilute the acid in experiments II, III, IV, V by adding 10,20,30,40, and 50cm^3 of distilled water respectively.

Record your results in the table below:

Experiment	I	II	III	IV	V	VI
Volume of acid + water in (cm^3)	70+0	60+10	50+20	40+30	30+40	50+20
Concentration of acid in (moles/litre)						
Time in (seconds)						

(6mks)

a) (i) From the table of results, draw a graph of concentration of Sulphuric (vi) acid in mole/litre against

Time in seconds (on x-axis) (4mks)

ii) Explain the shape of the curve (lmk)

b) From the graph determine the average rate of the reaction. lmk)

c) Using the same axes sketch the curve of concentration against time if 4.OM of Sulphuric (vi) acid was used.

3. You are provided with solid Q. Carry out the tests below and write your observations and inferences in the spaces provided.

a) Dissolve solid Q in about 20 cm^3 of distilled water in a boiling tube. And into 5 separate test tubes, put about 2 cm^3 of the solution and use it for tests (b) to (f) below.

Observations	Inferences
(½ mk)	

b) To the 1st portion, add drops of 2M sodium hydroxide solution.

Observations	Inferences
(½ mk)	

c) To the 2nd portion, add 2 or 3 drops of lead (II) nitrate solution.

Observations	Inferences
(½ mk)	

d) To the 3rd portion, add a few drops of barium (II) chloride solution followed by 2 cm^3 of 2M hydrochloride acid, then shake the mixture.

Observations	Inferences
(½ mk)	

e) To the 4th portion, add drops of acidified potassium manganate (VII) solution.

Observations	Inferences
(½ mk)	

f) To the 5th portion, add 5 drops of acidified potassium dichromate (VI).

Observations (½ mk)	Inferences

End