

NAME.....INDEX NO:.....DATE.....

SCHOOL.....SIGNATURE.....

233/2

CHEMISTRY

PAPER 2 (THEORY)

2 HOURS

JULY /AUGUST 2010

LAICOMET FORM FOUR EXAM

233/2

CHEMISTRY

PAPER 2

INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided above.
2. Answer **ALL** the questions in the spaces provided
3. Mathematics tables and electronic calculators may be used
4. **ALL** working **MUST** be clearly shown where necessary.

FOR EXAMINERS USE ONLY

QUESTIONS	MAXIMUM SCORE	CANDIDATES SCORE
1	14	
2	12	
3	11	
4	13	
5	11	
6	12	
7	7	

a The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters are not the actual symbols of the elements.

Q								R	S
T									U
V									Z

i Which element will require the least amount of energy to remove the outermost electron? (1mk)

.....

ii Select the element that has the greatest tendency to form covalent (molecule with itself.) Explain. (2mks)

.....

iii What is the general name given to the family elements to which Q, T, and V belong? (1mk)

.....

iv An element W has atomic number 15 . Indicate the position on the grid. (1mk)

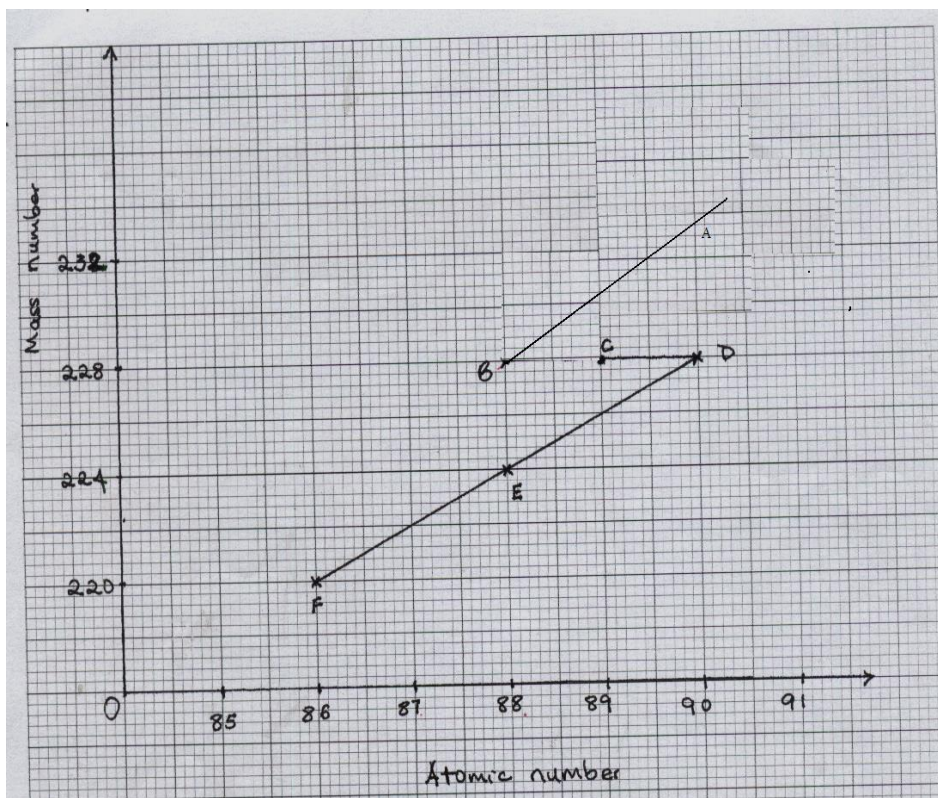
v The atomic radius of S is smaller than that of Z. Explain (1mk)

.....

vi Element T is less reactive than element V. Explain. (1mk)

.....

b The graph below represents a radioactive decay series for isotope A . Study it answer the questions that follow



i) Name the type of radiation when: A changes B (1mk)

.....

ii) Write an equation for the nuclear reaction that occur when C changes to D (1mk)

iii) Identify a pair of isotope for an element in the decay series (1mk)

.....

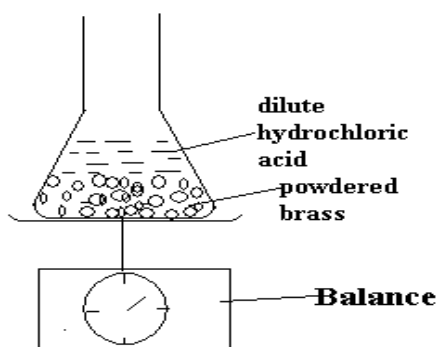
vi) What are isobars? Identify a pair of isobars in the decay series. (2mks)

.....

.....

The half life of a certain radio – active nuclide is 6 days. On the 1st of march a source of this nuclide had a mass of 1g .On what date would you expect the mass of this nuclide to be reduced to 0.125 g (2mks)

2. The diagram below shows the arrangement of the apparatus used by a student to study the reaction between brass which is a mixture (alloy) of copper and zinc and aqueous hydrochloric acid



The original mass of brass was 120g. The reading on the balance were recorded at regular interval.

The table below shows the results obtained.

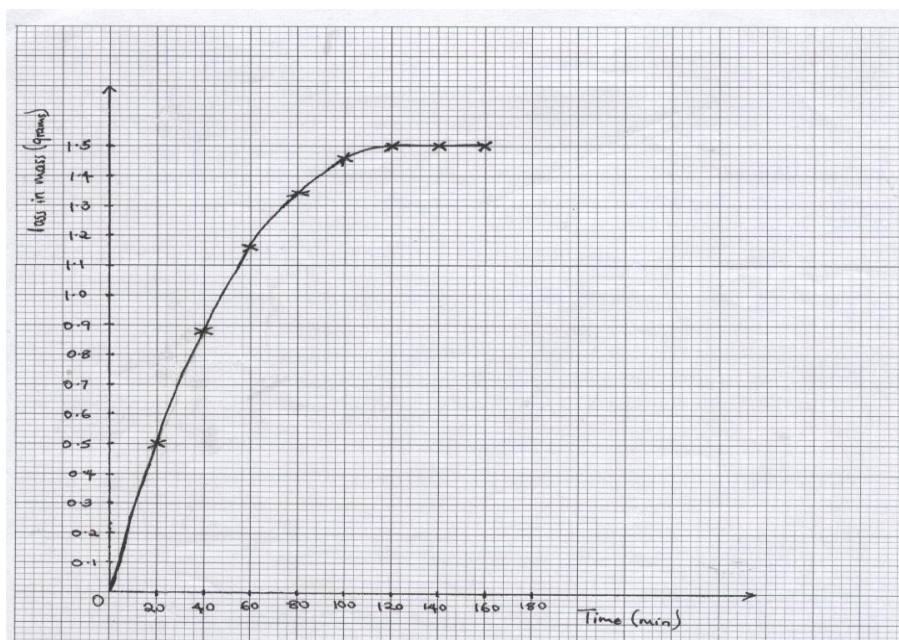
Time in Minutes	Reading on the balance	Total loss in mass
0	600.00	0.00
20	599.50	0.50
40	599.12	0.88
60	598.84	1.16
80	598.66	1.34
100	598.54	1.46
120	598.50	1.50
140	598.50	1.50
160	598.50	1.50

a i) What is the total mass of the conical flask and its contents at the beginning of the experiment. (1mk)

ii Why does the reading on the balance decrease with time during the first 120 seconds ? (1mk)

.....

b When total loss in mass was plotted against time x – axis , the graph below was obtained



i The rate of reaction at time (t) is the slope of the curve at that particular time. From the graph determine the rate of reaction 50 minutes after the start of the experiment.

(3mks)

ii On the graph, sketch the curve which would be obtained if the experiment was repeated at higher temperature. (1mk)

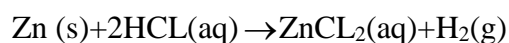
c. i What was the mass of zinc metal in the brass . ($H = 1, Zn = 65$) (2mk)

ii Calculate the percentage of Zinc metal in brass. (1mk)

d. i Why was it necessary to grind the brass into a powder in this experiment.(1mk)

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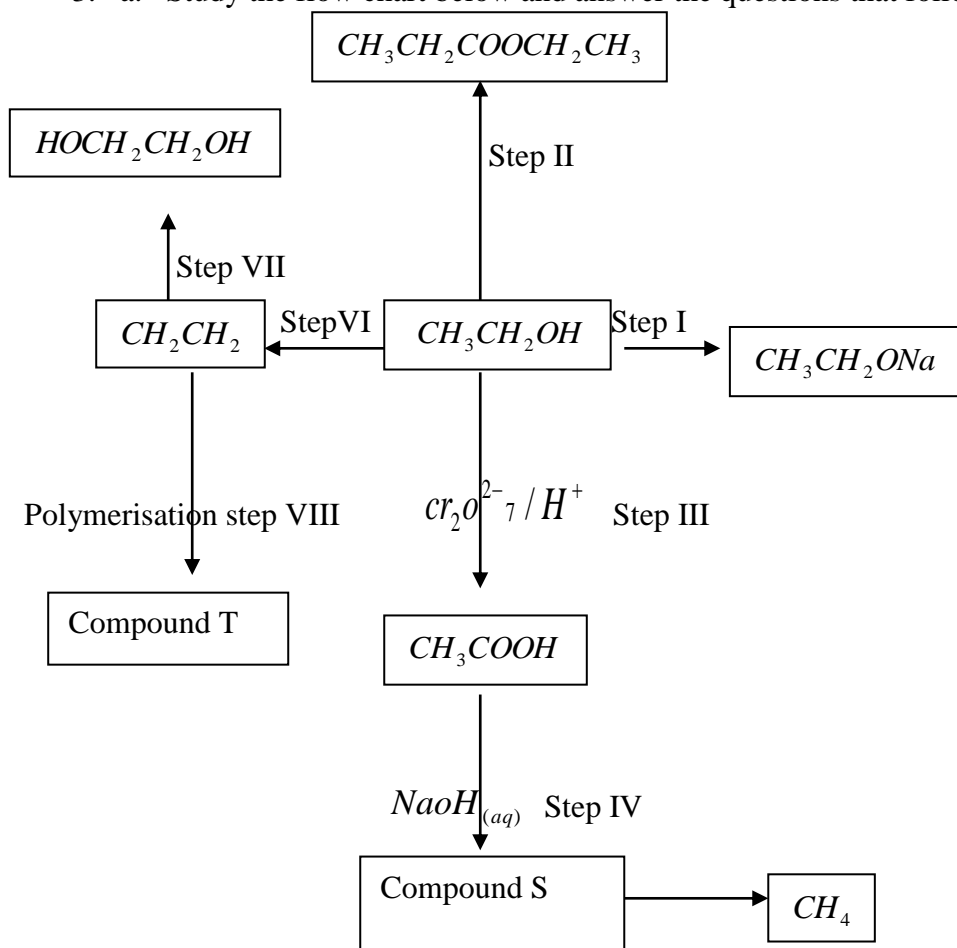
ii Given that the following reaction took place in the conical flask,



Calculate the number of moles of hydrochloric acid used in this experiment

(2mks)

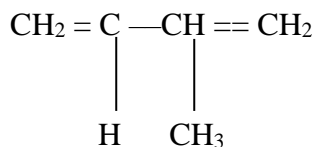
3. a. Study the flow chart below and answer the questions that follow



- i Name compounds (1mk)
 - S.....
 - T.....
- ii State the conditions and reagents necessary for the following steps to take place

Steps	<u>conditions</u>	<u>reagents</u>
I.....		
II		(2mks)
- iii Name processes II and IV (2mks)
 - II.....
 - IV.....
- iv Write the equation for the formation of compound S (1mk)
- v Give one use of T (1 mk)
 -
- vi Write an equation for the complete combustion of CH₄ (1mk)

b Natural rubber is made from the monomer isoprene whose structure is



i Give the IUPAC name of Isoprene (1mk)

.....

ii Draw the polymer unit of natural rubber showing (1mk)

4. a. Below is a list of potential differences obtained when metals G, H, I, J and K are used in the followings electrochemical cell . Metal (s) / metal ions (aq) // Copper II ion (aq) Copper(s)

Metal	$E^\theta(\text{volts})$
G	-1.10
H	-0.46
I	0.00
J	+0.45
K	1.16

i Identify metal I giving a reason. (2mks)

.....

ii Which two of the above metals, when used in electrochemical cell would give the largest potential difference (1mk)

.....

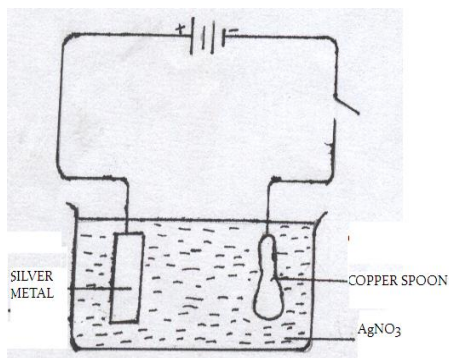
iii Calculate the cell e.m.f for the cells in (ii) above (2mks)

iv Draw a labeled diagram of the electrochemical cell formed in (ii) above (3mks)

v Which of the metals in the above list cannot be displaced by any of the other metals in the list. explain?

.....

b A copper spoon was coated with silver metal as shown below



i Write down the equation for the reaction that occur at the copper spoon cathode

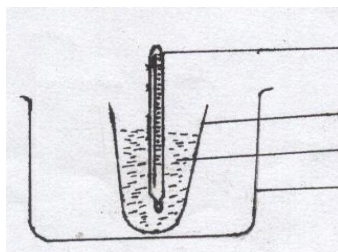
(1mk)

.....

ii How many grams of silver would be deposited on the spoon in two hours using steady current of 0.03 A (Charge of 1 mole of electron = 96500coulombs, Ag = 108)

(3mk)

5. The apparatus below was used to determine the molar heat of displacement of copper



Thermometer
Polystyrene
CuSO₄ (aq) + Zn(s)
Plastic bank

1.0g of Zinc powder was added to 50cm³ of 0.2M copper (II) sulphate solution and the mixture stirred gently. The temperature rose from 21⁰C to 28⁰C.

a. Explain why

i A glass rod instead of iron was used to stir the mixture. (1mk)

.....
.....

ii Polystyrene cup was used instead of glass beaker. (1mk)

.....
.....

b. Write a chemical equation for the above reaction. (1mk)

c. i Calculate the number of moles of copper (ii)sulphate solution. (1mk)

ii Calculate the molar heat of displacement of copper.

(Specific heat capacity of solution = $4.2 \text{ J g}^{-1} \text{ K}^{-1}$, Density of solution = 1 g cm^{-3})

d. Why is the molar heat of displacement obtained in C (ii) above or lower than the actual value? (1mk)

.....

.....

e. Draw an energy level diagram for the reaction above

If magnesium ribbon was used in place of zinc, compare the ΔH Value with that of zinc.

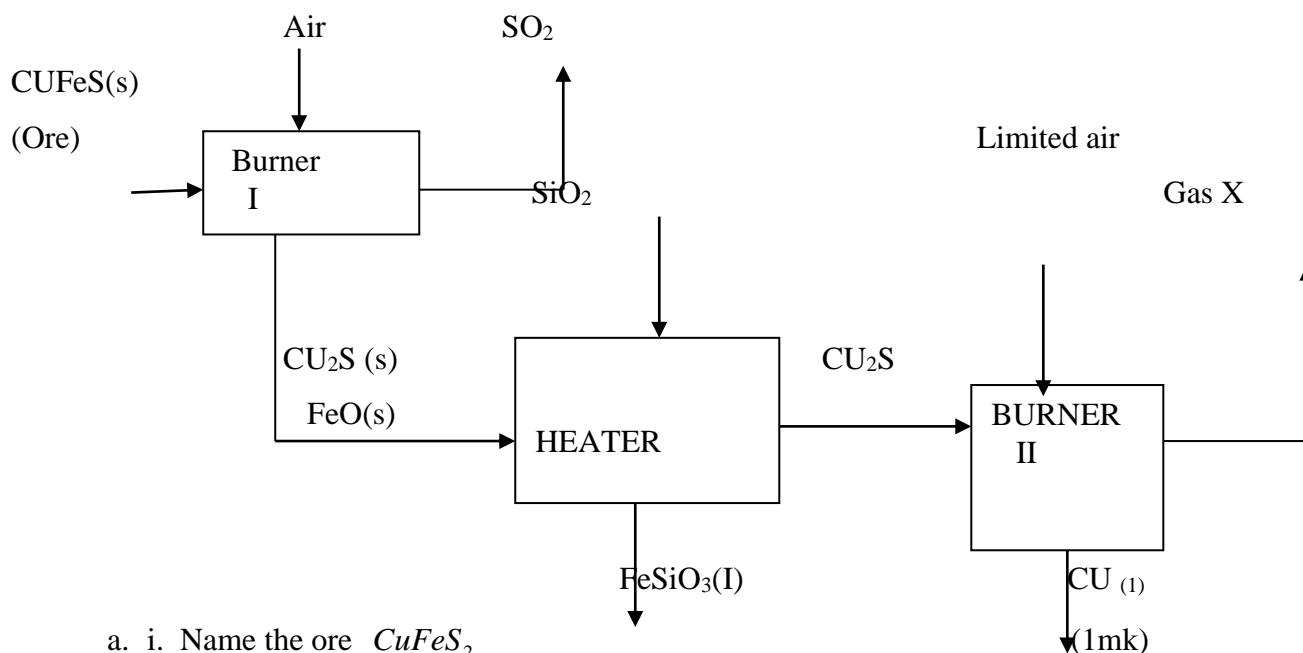
Give reason

(2mks)

.....

.....

6. The flow chart below represents the steps followed when extracting copper from one of its ores



a. i. Name the ore CuFeS_2

(1mk)

.....

....

ii Write equation for the reaction that occur in the heater

(2mks)

iii What is the purpose of the silicon (IV) Oxide in this process (1mk)

.....
.....

iv Write equations for the reactions that produces copper in burner II (2mks)

v Name Gas X(1mk)

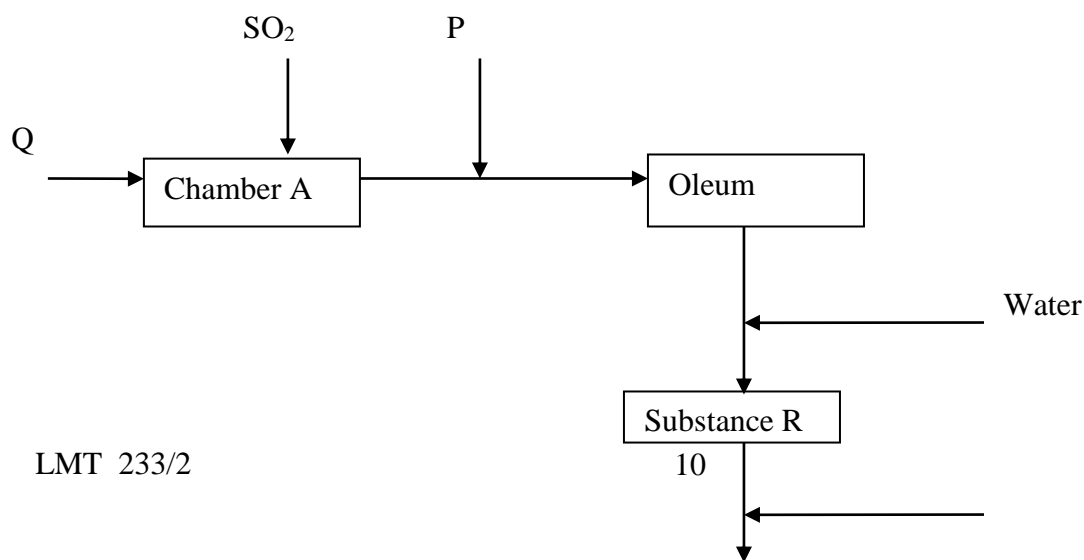
b. The amount of sulphur (iv) oxide that can dissolve in 1dm^3 of water at different temperatures is as shown below.

Temperature ($^{\circ}\text{C}$)	5	10	20	25	35	50	56
Solubility in grams of S°_2 in 1dm^3 of water.	190	154	107	90	67	42	35

i Plot a graph of solubility of sulphur (iv) oxide against temperature (x- axis) (4mks)

ii Calculate the molarity of the solution at 50°C (1mk)
(S= 32, O=16).

7. The flow chart below shows part of the contact process and other extensions.

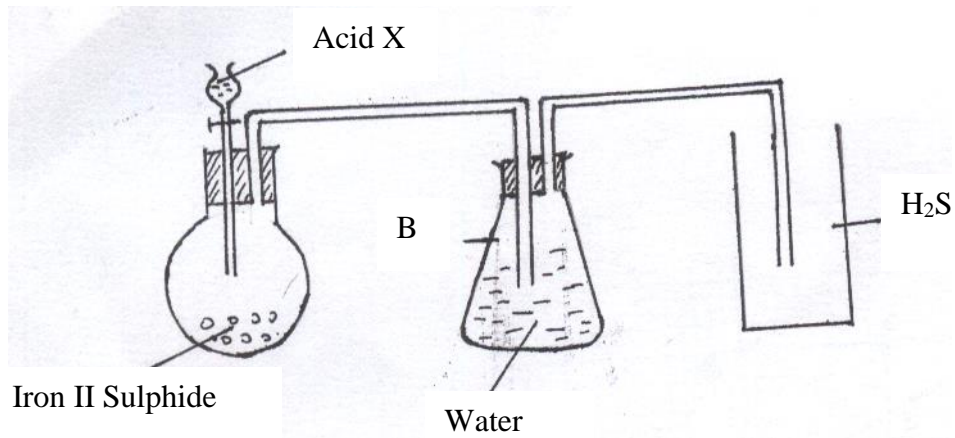


Hot copper



- a. i Name two catalysts that could be used in Chamber A (1mk)
-
-
- ii Which one of the two catalysts is preferred? Explain (2mks)
-
-
- iii Identify substance P.(1mk)
- iv Write down the equation for the reaction that take place between substance R and the hot copper metal (1mk)

b. The set up below was used to prepare hydrogen sulphide gas



- i Write the chemical equation for the reaction in the round bottomed flask. (1mk)
- ii What is the function of water in the conical flask B (1mk)
-

