

NAME.....ADM NO.....CLASS.....

233/2

CHEMISTRY

PAPER 2

JUNE, 2010

2 HOURS

**KASSU
JOINT EVALUATION TEST
2010**

- ❖ Answer all questions in the spaces provided
- ❖ All working **must** be clearly shown where necessary
- ❖ Electronic calculators and mathematical tables may be used.

FOR EXAMINER'S USE ONLY

question	Maximum score	Candidates score
1	13	
2	11	
3	11	
4	13	
5	10	
6	10	
7	12	
TOTAL	80	

This paper consists of 14 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated.

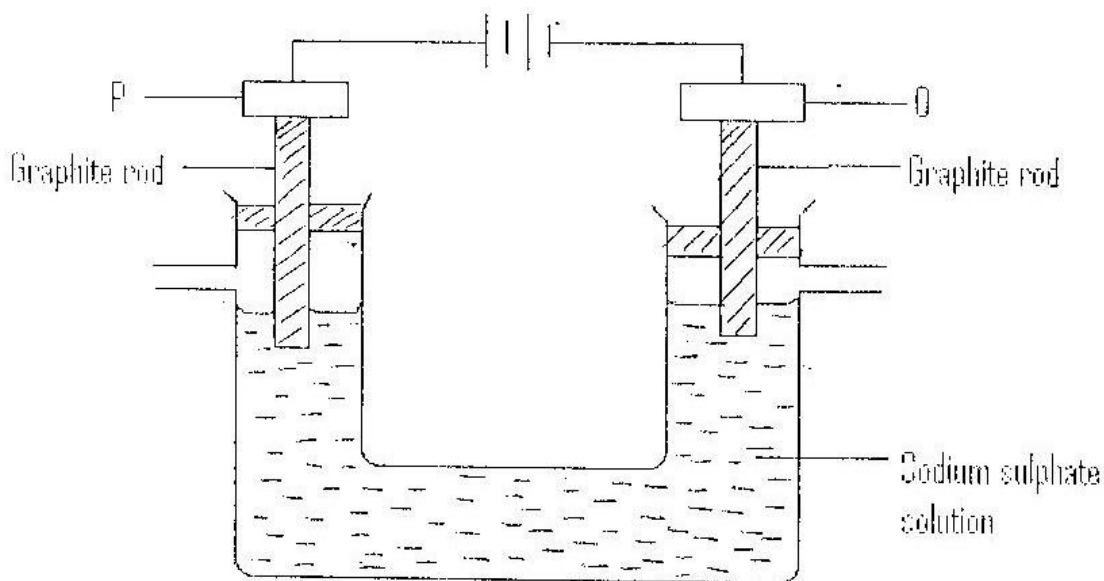
1. a) Below is a list of potential differences obtained when metals P,Q,R,S, and T are used in the following electrochemical cells: metal /metal ions // Cu^{2+} ions /copper solid.

Metal	Potential differences(volts)
P	- 0.10
Q	- 0.46
R	- 0.00
S	+ 0.45
T	+ 1.16

- i) Arrange the elements in order of reactivity starting with the strongest reducing agent
 (1 mark)
- ii) Write the representation for the cell which T is used
 (1 mark)
- iii) The standard reduction potential of copper is + 0.34 volts. Calculate the standard reaction potential of S.
 (2 marks)

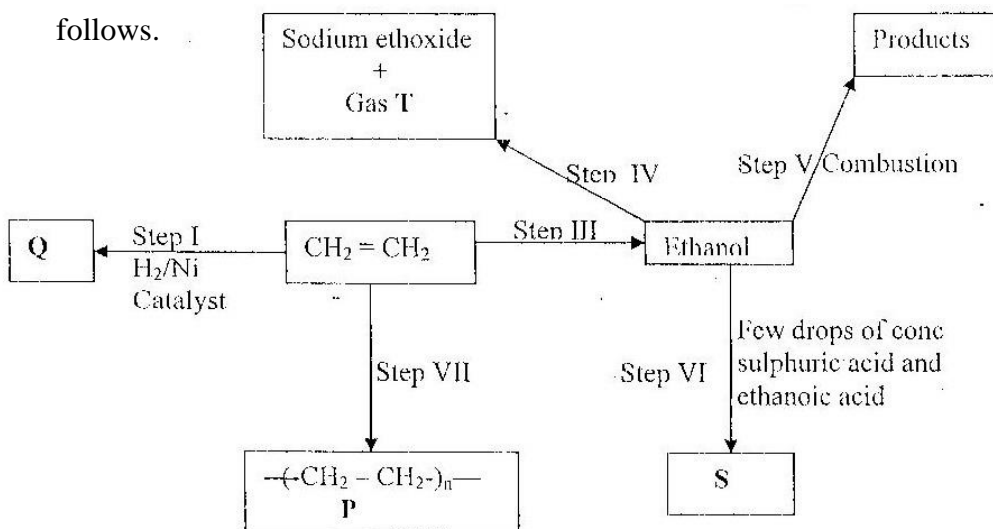
- iv) Chlorine displaces bromine from aqueous potassium bromide.
- a) Write an ionic equation for the reaction. (1 mark)
- b) What volume of chlorine measured at room temperature and pressure would replace all the bromide ions in 50cm^3 of 0.2 M potassium bromide (molar gas volume =24litres) (2 marks)

b) An experiment was carried out using the apparatus shown below.



Current was passed through the sodium sulphate solution containing litmus solution

- i) State the products at the electrodes
 - P..... (½ marks)
 - Q..... (½ mark)
 - ii) A blue colour was seen near electrode Q and red colour near electrode P account for these observations. (2 marks)
 - iii) How does the concentration of the solution change? Explain.(2 marks)
2. Study the information in the flow chart below and answer the question that follows.

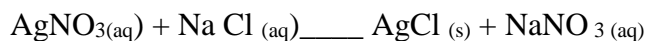


- a) Give the name of the compound Q and S (2 Marks)
 Q.....
 S.....
- b) State (2 marks)
 i) Type of reaction in step i.....
 ii) Conditions in step vii
- c) Write equation for the reaction in step V (1 mark)
- d) State and explain the effects of prolonged use of substance P. (2 marks)
- e) Draw and name the structure of the compound formed when substance Q reacts with excess chlorine gas. (2 marks)
- f) Write an equation for the hydrolysis of substance S (1 mark)
- g) Give the;
 i) Name of the substance used in step IV (½ mark)
 ii) Name of gas T (½ Mark)
3. a) The table below gives the solubilities of hydrated copper (II) sulphate in mol dm⁻³ at different temperatures.

Temperatures °C	Solubility (mol/dm ⁻³)
20	8 X 10 ⁻²
40	12X 10 ⁻²
60	16X10 ⁻²
80	22 X 10 ⁻²
100	30 X 10 ⁻²

- i) On the grid provided, plot a graph of solubility of copper (II) Sulphate against temperature. (3 marks)
- ii) From the graph determine the mass of copper (II) sulphate deposited when the solution is cooled from 70°C to 40°C. (Molar mass of copper (II) Sulphate =250g) (2 marks)
- b) In an experiment to determine the solubility of sodium chloride, 5.0 cm³ of saturated solution of sodium chloride weighing 5.35g were placed in a volumetric flask and diluted to a total volume of 250cm³. 25cm³ of dilute

solution of sodium chloride completely reacted with 24.1 cm³ of 0.1 M silver nitrate solution.



Calculate:

- i) Moles of silver nitrate in 24.1 cm³ solution (1 mark)
- ii) Moles of sodium chloride in 25.0 cm³ of solution (1 mark)
- iii) Moles of sodium chloride in 250cm³ of solution (1 mark)
- iv) Mass of sodium chloride in 5.0 cm³ of saturated sodium chloride solution (Na= 23, cl=35.5) (1 mark)
- v) Mass of water in 5.0 cm³ of saturated solution of sodium chloride (1 mark)
- vi) Solubility of sodium chloride in g/100g of water. (1 mark)

4. The grid below represents part of the periodic table. Study it and answer the question that follows. (Letters do not represent the actual symbols of the elements).

	R						A	X	
G					C	E			
							Q		

- a)
 - (i) How does the atomic size of G and C compare? Explain.(1 mark)
 - (ii) Write an equation for the reaction between G and A. (1 mark)
 - (iii) How do the PH of the chlorides G and E compare? Give a reason for your answer (2 marks)
 - (iv) State the observation made when the chloride of E is exposed to air (1 mark)
- b)
 - (i) On the grid indicate with a tick (✓) the position of the element Z which is the third found on the period and forms Z³⁻ IONS. (1 mark)

ii) Using dots (·) and crosses (X) to represent outermost electrons, show how bonding in the compound formed when R and A react.

(2 marks)

c) Study the information in the table below and use it to answer the questions that follow. (Letters do not represent the actual symbols of the elements).

Element	Atomic number	Melting point(°c)	Formula of chloride	Melting of chloride point(°c)
G	11	98	GCL	801
H	12	650	HCL ₂	715
J	14	1410	JCL ₄	-70
L	20	851	LCL ₂	780

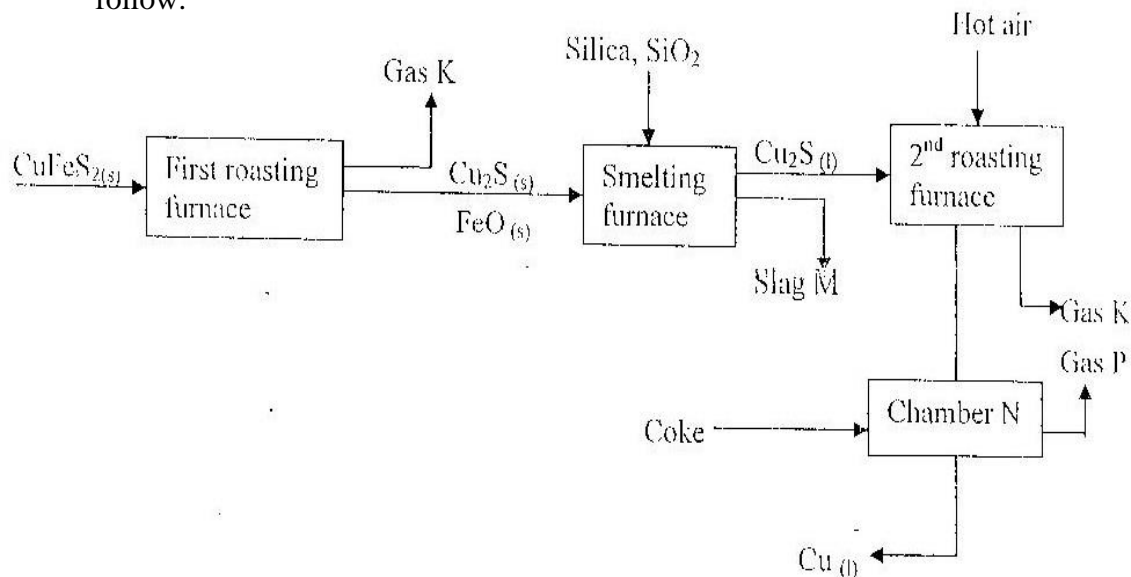
(i) Which elements are metals? Give a reason (2 marks)

(ii) What is the oxidation state of J in its chloride? (1 mark)

(iii) How does the reactivity of H and L with water compare? Explain.

(2 marks)

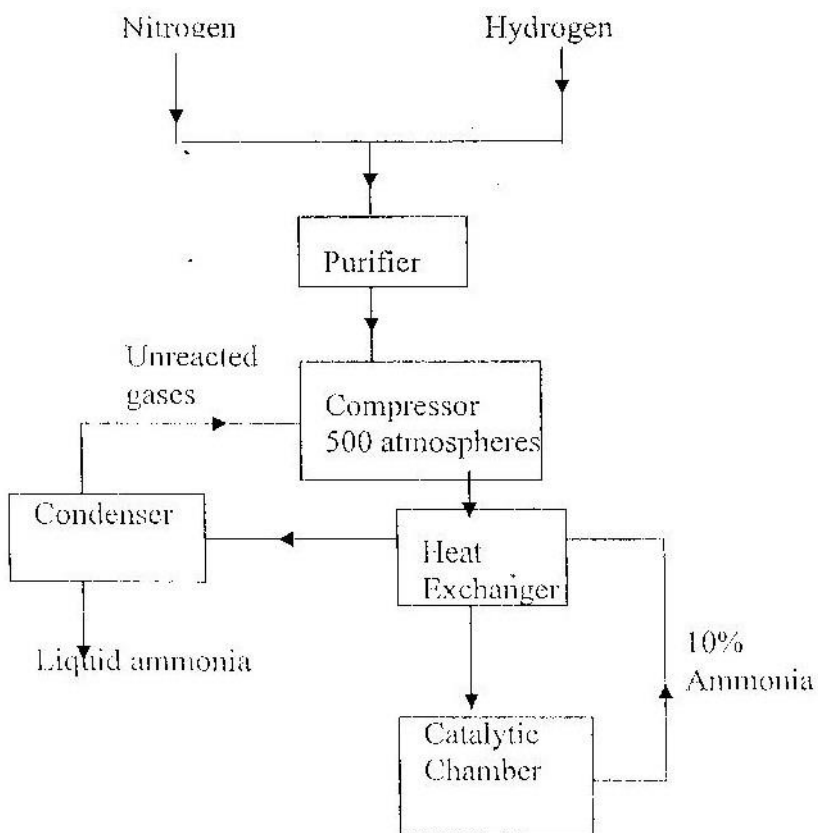
5. The flow chart below outlines some of the process involved during extraction of copper from its ore, copper pyrite (CuFeS₂) .study it and answer the questions that follow.



- a) (i) Name gas k (1 mark)
- (ii) Write an equation for the reaction that takes place in the first roasting furnace (1 mark)
- (iii) Write the formula of the cation present in the slag M (1 mark)
- (iv) Identify gas P (1 mark)
- (v) What name is given to the reaction taking place in chamber N (1 mark)
- b) Copper obtained from chamber N is not pure. Draw a well labelled diagram to show the set –up that can be used to refine the copper by electrolysis. (2 marks)
- c) A current of 5.0 amperes was passed through molten anhydrous Copper (II) Chloride of 10 minutes using inert graphite electrodes. Calculate the mass of copper deposited.. (3 marks)
- (1 Faraday=96500 coulombs, Cl=35.5, Cu=63.5)

6.

- I. The Diagram below represents the haber process for the manufacture of ammonia. Study it and answer the questions that follow.



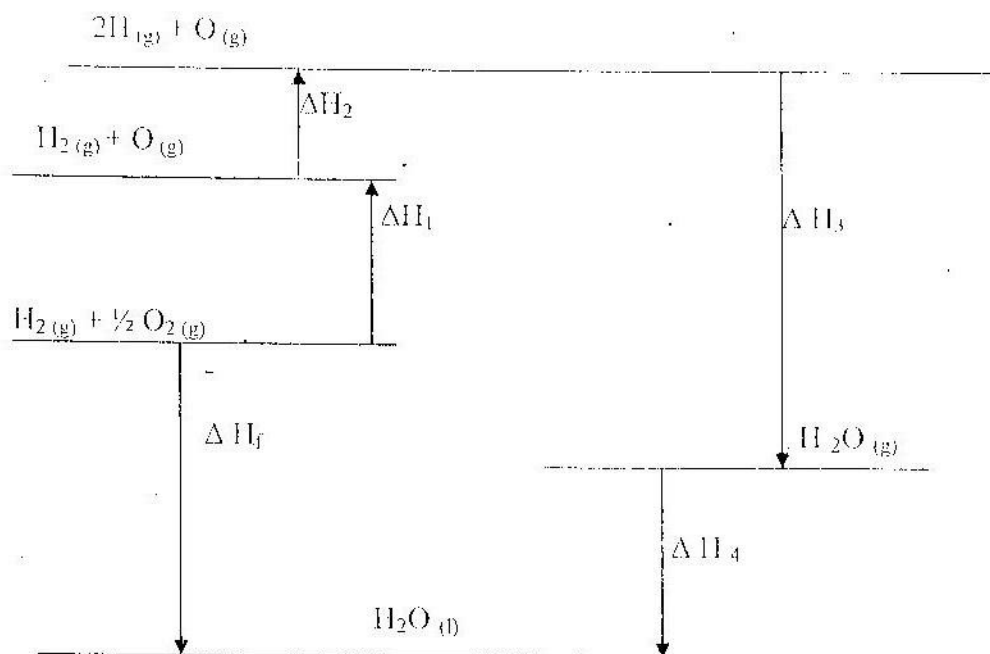
- a) Name two impurities removed by the purifier. (2 marks)
- b) The catalyst used in the process is finely divided iron. Why iron is finely divided? (1 mark)
- c) In the Haber process, the conversion of nitrogen and hydrogen in to ammonia is only 10% .the remaining unreacted gas are recycled. What is the advantage of this? (1 mark)
- d) Apart from iron catalyst and pressure of 500 atmospheres, state any other condition required for this process. (1 mark)
- e) The equation for the reaction that forms ammonia is as follows,

$$\text{N}_2 (\text{g}) + 3 \text{H}_2 (\text{g}) \rightleftharpoons \text{NH}_3 (\text{g})$$
 State and explain the effect of increasing pressure on the yield of ammonia. (2 marks)
- f) Give one use of ammonia other than manufacture of nitric (V) acid. (1 marks)

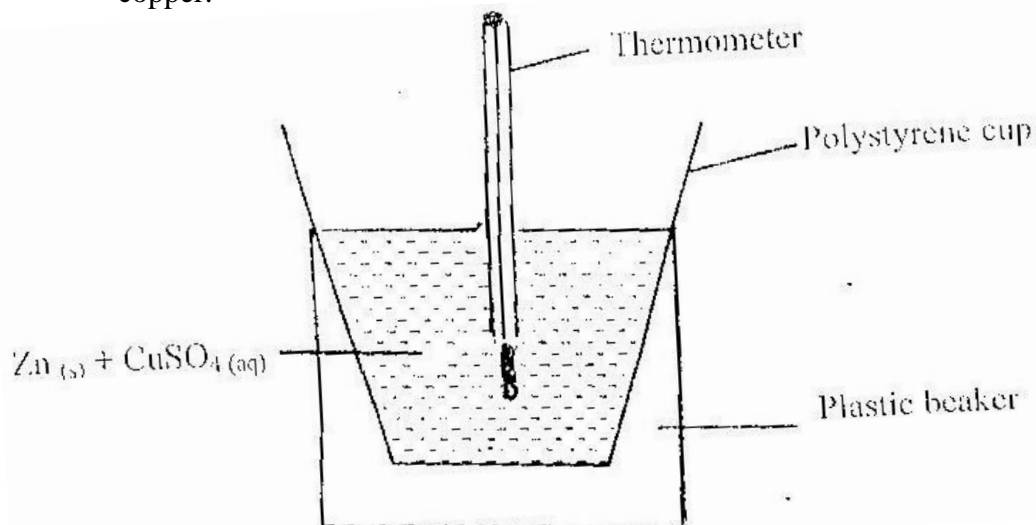
II. In the manufacture of nitric (V) acid from ammonia and air, ammonia is catalytically oxidized to nitrogen (II) oxide.

- (i) Name the catalyst used in the reaction. (1 mark)
- (ii) Write a balanced chemical equation for the reaction between ammonia and air. (1 mark)
- (iii) The reaction between nitrogen (IV) oxide and water forms nitric acid and another acid.
- (a) Give the systematic name of the other acid. (1 mark)
- (b) What is done to ensure nitric (V) acid is obtained (1 mark)

7. a) Below is the energy level diagram for the formation of water.



- Which ΔH values will have a positive sign? (1mk)
 - What change is represented where heat change ΔH_1 is involved? ($1/2$ mk)
 - What is the process taking place where ΔH_4 is involved? ($1/2$ mk)
 - What is ΔH_f in terms of ΔH_1 , ΔH_3 and ΔH_4 for the reaction? (1mk)
 - Explain whether the reaction in (iv) is exothermic or endothermic. (1mk)
- (b) The set up below was used to determine the molar heat of displacement of copper.



A 1.0g zinc powder sample was added to 50cm³ of 0.2M copper (II) sulphate solution and the mixture stirred gently. The temperature of the mixture rose from 20⁰c to 27⁰c.

- (i) Explain why polystyrene cup was used instead of a glass beaker. (1mk)
- ii) Write a chemical equation for the above reaction (1 mark)
- iii) Calculate the number of moles of copper (II) sulphate in the solution (1 mark)
- iv) Calculate the molar heat of displacement of copper (2 marks)
(Specify heat capacity of solution =4.2KJ/Kg/K, density of solution =1g/cm³)
- c) Fossil fuels when burnt emit gases that pollute the environment .Name two such gases. (1 Mark)