NAME:……. ADM.NO:……..CLASS:……

ALLIANCE HIGH SCHOOL
FORM FOUR CHEMISTRY
END OF TERM 1 2020
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

a) **Write your name an admission number.**
b) **Answer all the questions in the spaces provided.**
c) **Mathematical tables or calculator may be used.**
d) **All working must be clearly shown.**

Question	Max Score	Candidate Score
1	11	
2	12	
3	12	
4	12	
5	11	
6	12	
7	9	

1. Study the information in the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	**Atomic number**	**Melting point ˚c**
A	11	97.8˚c
B	13	660
C	14	1410
D	17	-101
E	19	63.7

a) Write the electron arrangement for the ions formed by element B and D. (1 mk)

b) State the element which is
(i) The most reactive non metal. (1 mk)

(ii) Has a giant atomic structure (1 mk)

c) In which period of the periodic table does element E belong. (1 mk)

d) Element E loses its outermost electron more readily than A. Explain. (1 mk)

e) Using dot (•) and cross (x) to represent the outermost, show bonding in the compound formed when elements C and D combine. (2 mks)

f) Explain why the melting point of element B is higher than that of element A. (1 mk)

g) Describe how a solid mixtures of the sulphate of element E and Barium sulphate can be separated into solid samples. (3 mks)

2. a) Give the systematic names of the following compounds.

(i) $CH_2\ CH_2\ \underset{\underset{CH_3}{|}}{C}\ \underset{\underset{CH_3}{|}}{C}\ CH_3$ (1 mk)

(ii) $HOCH_2\ CH_2\ OH$ (1 mk)

(iii) $CH_3\ CH_2\ CH_2\ \overset{\overset{O}{\|}}{C}{-}\ O - CH_2\ CH_2\ CH_3$ (1 mk)

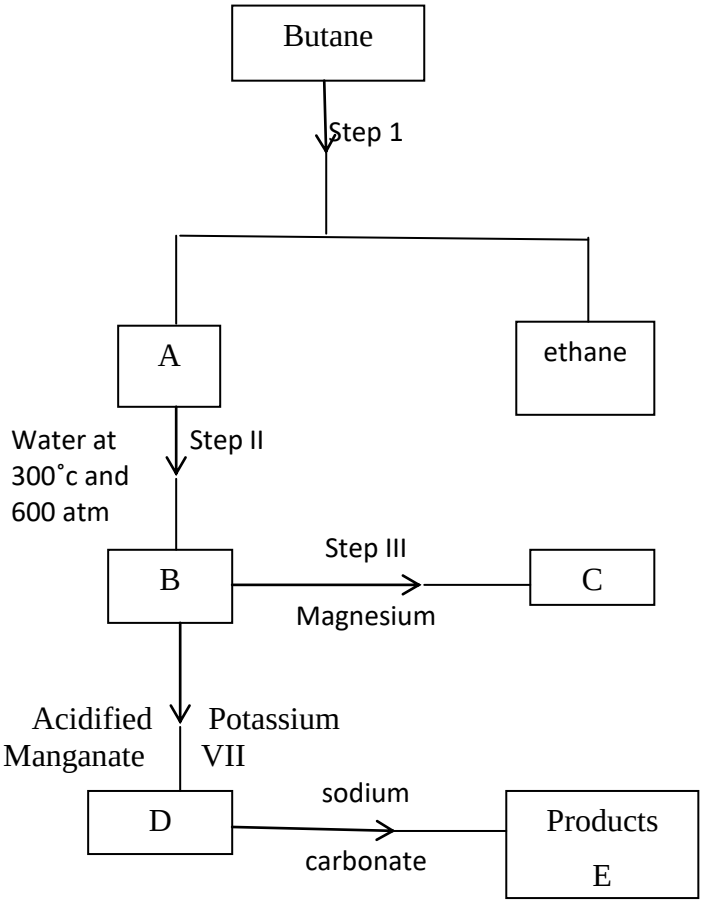
b) State the observations made when propan –1–01 reacts with

(i) Acidified potassium dichromate (VI) solution (1 mk)

(ii) Potassium metal (1 mk)

c) Describe a chemical test that can be used to distinguish between methanol and methanoic acid. (2 mks)

d) Study the flow chart below and answer the questions that follow.



(i) State the conditions necessary for the reaction in Step 1 to occur. (2 mks)

(ii) Identify substance B and write chemical equation between B and acidified Potassium Manganate VII (2 mks)

(iii) Identify products E. (1 mk)

3. a) (i) State two factors that should be considered when choosing a fuel for cooking. (1 mk)

(ii) Calculate the heat of formation of propane from the following date.

$C_{(s)} + O_{2(g)}, \longrightarrow CO_{2(g)}, \quad \Delta H = -395kJ/mol$

$H_{2(g)} + ½ O_{2(g)} \longrightarrow H_2O_{(l)} \quad \Delta H = -286kJ/mol$

$C_3 H_{8(g)} + 5O_{2(g)} \longrightarrow 3CO_{2(g)} + 4H_{2(l)}O \quad \Delta H = -2209 kJ/mol$ (3 mks)

b) In an experiment to determine the molar heat of reaction when magnesium displaces copper, 0.15g of magnesium powder were added to $20cm^3$ of 2M copper (II) Sulphate solution. The temperature of copper (II) sulphate solution was 24.0˚c while that of the mixture was 45.0˚c.

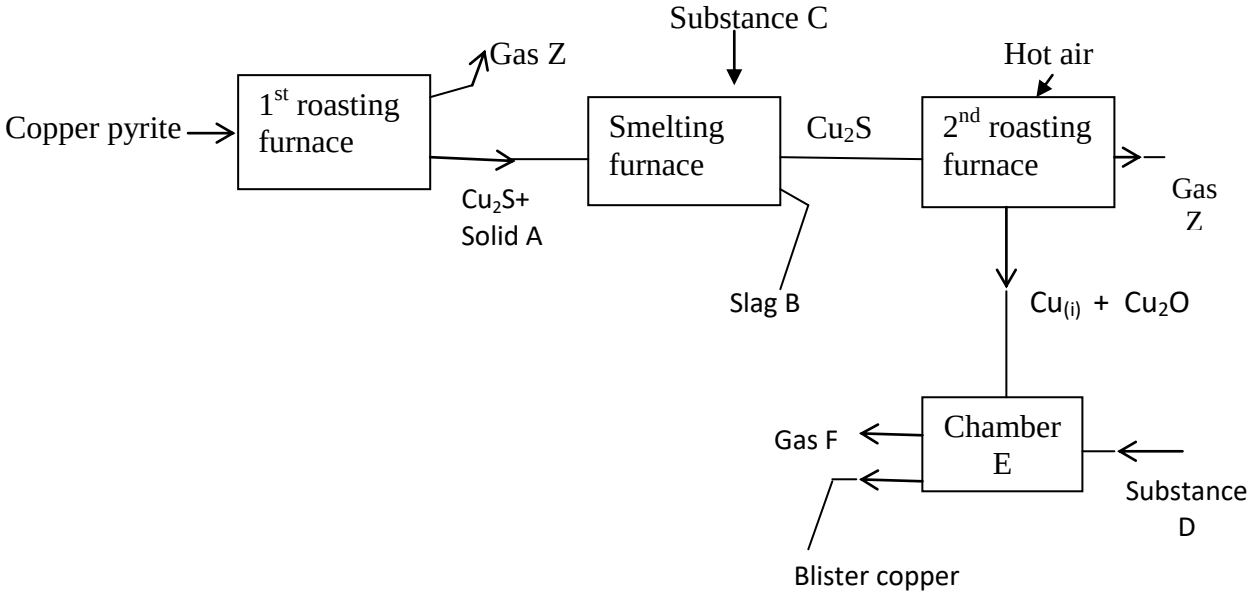
(i) Other than increase in temperature, state and explain the observations which were made during that reaction. (2 mks)

(ii) Calculate the heat change during the reaction (specific heat capacity of solution = $4.2Jg^{-1}k^{-1}$, density of the solution = $1g/cm^3$. (2 mks)

(iii) Determine the molar heat of displacement of copper by magnesium. (2 mks)

(iv) Sketch an energy level diagram for the reaction. (2 mks)

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



a) (i) Write the formula of copper pyrite. (1 mk)

(ii) Write the equations for the reactions taking place in the 2nd roasting furnace. (2 mks)

(iii) Identify substance C and write an equation for the reaction that takes place in smelting furnace. (2 mks)

b) The copper obtained in chamber E is impure. Draw a well labelled diagram showing the set up you would use to refine copper. (3 mks)

c) Given the mass of copper obtained from the above extraction is 400kg, determine the percentage purity of the ore if 2000kg of it was fed to the 1st roasting furnace.
(Cu = 63.5, Fe =56, S = 32) (3 mks)

d) State two uses of copper. (1 mk)

5. a) The table below shows the solubility of ammonium phosphate in water at different temperatures.

Temperature (˚c)	Solubility of ammonium phosphate in g/100g of water
10	63.0
20	69.0
30	75.0
40	82.0
50	89.0
60	97.0

(i) On the grid provided draw the solubility curve of ammonium phosphate. (3 mks)

(ii) Using the graph, determine the solubility of ammonium phosphate at 35˚c (1 mk)

b) 120g of a saturated of ammonium phosphate was prepared at 35˚c.

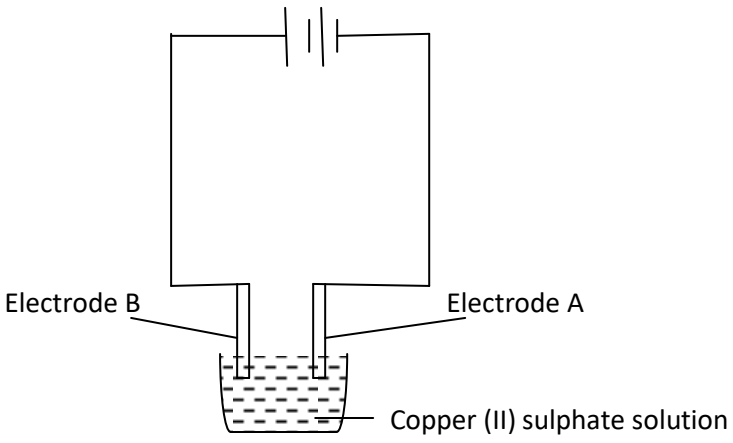
(i) What is meant by a saturated solution? (1 mk)

(ii) Calculate the mass of ammonium phosphate which was used to prepare the saturated solution. (2 mks)

c) (i) Potassium in fertilizer may be in the form of potassium nitrate.
Describe how a sample of a fertilizer may be tested to find out if it contained nitrate ions. (2 mks)

(ii) Calculate the mass of nitrogen present in 50kg bag contained pure ammonium phosphate. (N = 14, P = 31, H = 1, O = 16) (2mks)

6. I Students performed an experiment of electrolysis of copper (II) sulphate using copper
electrodes.



a) State two observation made during the experiment. (1 mk)

b) Write the equation for the reaction at
- electrode A

- electrode B

c) Unknown current was passed for 40 minutes through copper (II) sulphate solution and a mass of 4.8g was deposited at the cathode Cu = 64, IF = 96500c.

a) Calculate the quantity of electricity passed. (1 mk)

b) Calculate the current used. (1 mk)

II Study the standard electrode potentials below and answer the questions that follow.

	(Eθvolts)
$Al_{(aq)}^{3+} + 3e \rightleftharpoons Al_{(s)}$	-1.66V
$Cu_{(aq)}^{2+} + 2e \rightleftharpoons Cu_{(s)}$	+0.34V
$Fe_{(aq)}^{2+} = 2e \rightleftharpoons Fe_{(s)}$	-0.44V
$Zn_{(aq)}^{2+} + 2e \rightleftharpoons Zn_{(s)}$	-0.76V

a) Which substance is the strongest oxidising agent? Explain. (1 mk)

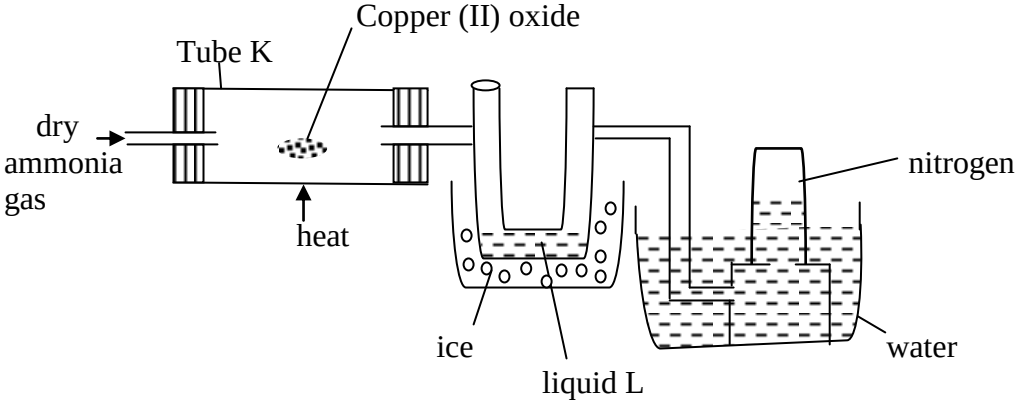
b) Draw a diagram for an electrochemical cell made using Aluminium and iron electrodes. (2 mks)

c) Write the half equations for the reactions in each half cell. (1 mk)

d) Calculate the e.m.f of the cell. (1 mk)

e) Write the cell representation for the above cell. (1 mk)

7. The diagram below shows a set up that can be used to obtain nitrogen gas in an experiment.



(i) Name liquid L. (1 mk)

(ii) What observations would be made in tube K after heating for sometime? (1 mk)

(iii) Write a chemical equation for the reaction that took place in tube K. (1 mk)

(iv) If $400cm^3$ of ammonia gas reacted completely with copper (II) oxide. Calculate.
(a) Volume of nitrogen gas produced. (2 mks)

(b) Mass of copper (II) oxide that reacted Cu = 63.5, 0 = 16, molar gas volume at r.t.p = 24 litres. (2 mks)

(v) At the end of the experiment the pH of water in the beaker was found to be about 10. Explain. (2 mks)