

NAME.....

INDEX

NO.....

SCHOOL.....

CANDIDATE'S SIGNATURE.....

ALLIANCE HIGH SCHOOL

233/2

CHEMISTRY

PAPER 2

2016 MARCH

THEORY

TIME: 2 HRS

INSTRUCTIONS TO CANDIDATES

1. Answer ALL questions in this paper in the spaces provided
2. Mathematical tables and electronic calculators may be used for calculation
3. All working must be clearly shown where necessary

FOR EXAMINERS USE ONLY

QUESTION.	MAXIMUM SCORE	CANDIDATE'S SCORE
1	13	
2	2	
3	12	
4	11	
5	10	
6	9	
7	17	
8	6	
TOTAL	80	

*This paper consists of 12 printed pages.
Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing*

1. The table below shows properties of some elements represented by symbols W, X, Y and Z. Study the information in the table and answer questions that follows:

Element	Number of protons	Atomic radius(nm)	Boiling point °C
W	2	0.93	-269
X	10	1.31	-246
Y	18	1.54	-186
Z	36	1.89	-152

- (a) Write down the electron arrangement for elements W and X (2mrks)
- (b) In which group of the periodic table are the elements in the table above? Explain (2mrks)
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-
- (c) Explain the observation made if a mixture of W and oxygen is ignited. (2mrks)
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-
- (d) State and explain the trend in boiling points of elements W to Z. (2mrks)
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- (e) Explain why the atomic radius of W is smaller than that of X. (1 mk)
-
-
- (f) (i) State one use of element Y. (1 mrk)
-
- (ii) Metal P is a group 2 element in the periodic table and just below Q in the same group
- (a) Explain how the reactivity of metals P and Q with bromine compares (1mrk)
-
2. Calculate the oxidation numbers of nitrogen in:
- i) Ammonia NH_3 (1mk)
- ii) Nitric acid HNO_3 (1mk)

2. Solubility of potassium nitrate and copper (ii) sulphate were determined at different temperatures. The following data was obtained.

Temperature $^{\circ}\text{C}$		0	20	40	60	80	100
Solubility g/100g of water	KNO_3	12	30	75	125	185	250
	CuSO_4	15	20	35	45	65	80

Define the term solubility as used in salts.

(1mk)

.....

- i) On the graph paper provided, plot solubility curves for both salts, where solubility (vertical axis) is plotted against temperature.

(4mks)

Determine from the graph the solubility of each salt at 50°C

KNO_3

(1mk)

.....

CuSO_4

(1mk)

.....

- iii) At what temperature was the solubility of both salts equal?

(1mk)

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iv) Saturated solution of potassium nitrate at 70°C was cooled to 20°C what mass of the crystals formed? (1mk)

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c) i) What is the permanent hardness of water? (1mk)

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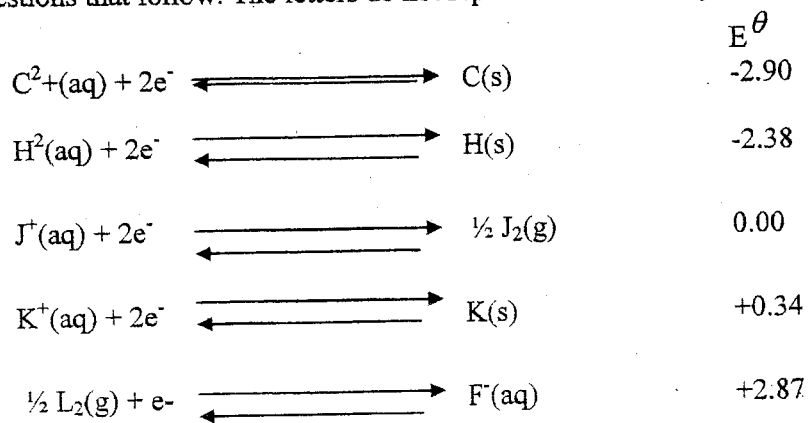
ii) State two chemicals substances that can be used to remove permanent hardness. (1mk)

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iii) State one advantage of using hard water for domestic use. (1mk)

.....

4. Use the standard electrode potentials for elements G,H,J,K and L given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.



(i) Which element is likely to be hydrogen give a reason for your answer (2mks)

.....

.....

(ii) What is the E^θ value of the strongest reducing agent? (1mk)

(iii) In the space provided, draw a labeled diagram of the electro-chemical cell that would be obtained when half-cells of elements H and K are combined (3mks)

(iv) Calculate the E^θ value of the electrochemical cell constructed in (iii) above (1mk)

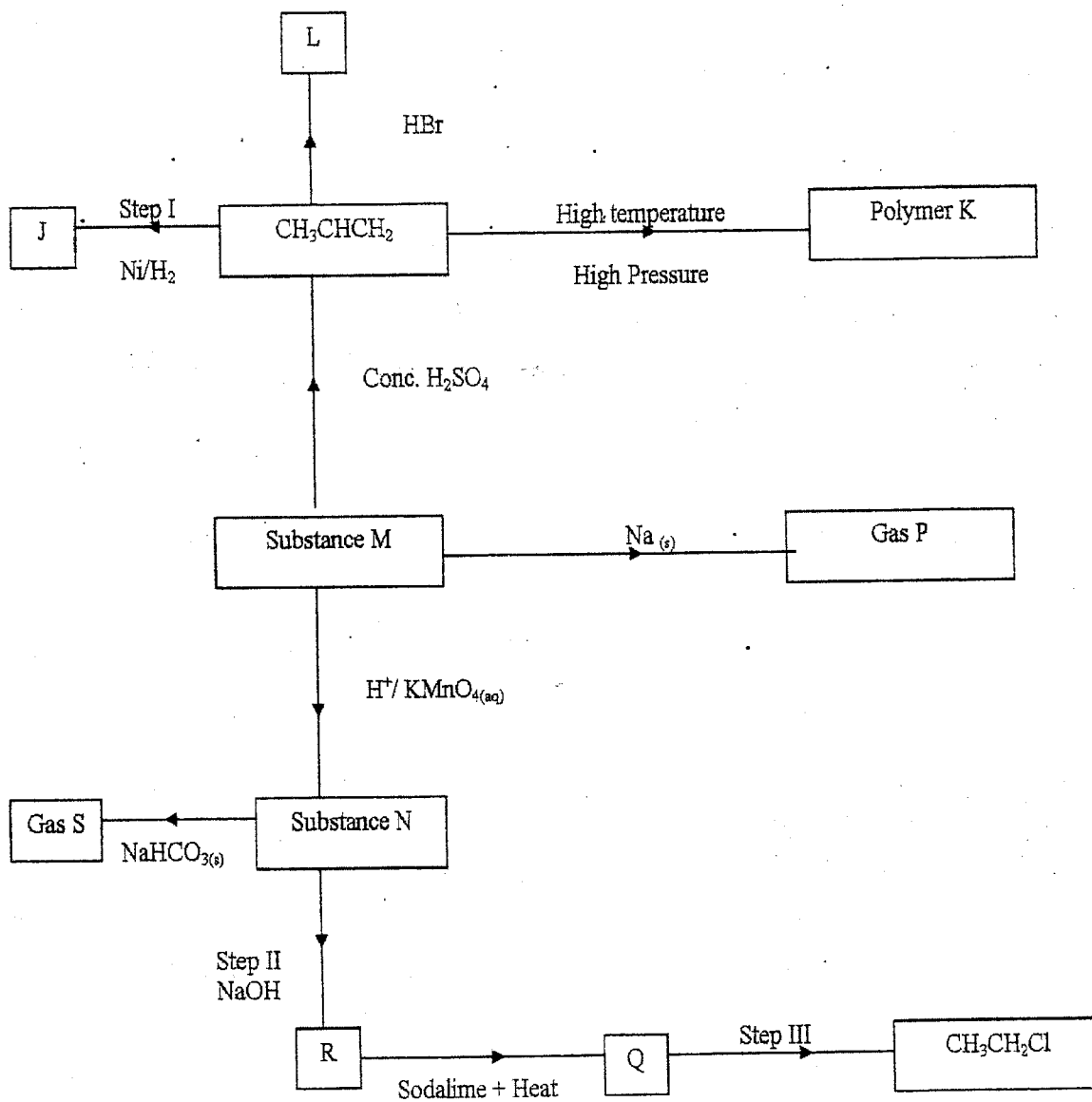
(b) During the electrolysis of aqueous copper (ii) sulphate using copper electrode, a current of 0.2 amperes was passed through the cell for 5 hours.

(i) Write an ionic equation for the anode. (1mk)

(ii) Determine the change in the mass of the Anode which occurred as a result of the electrolysis process.

(Cu=63.5, 1 Faraday =96500 coulombs) (3mks)

5. Use the flow chart below to answer the questions that follow.



(a) Name the following

(i) Gas S

(1 mrk)

.....

(ii) Gas p (1 mrk)

(iii) Compound J (1 mrk)

(b) Name process in

(i) Step I (1 mrk)

(ii) Step II (1 mrk)

(iii) Step III (1 mrk)

(c) Draw two structural Isomers of compound L. (2 mks)

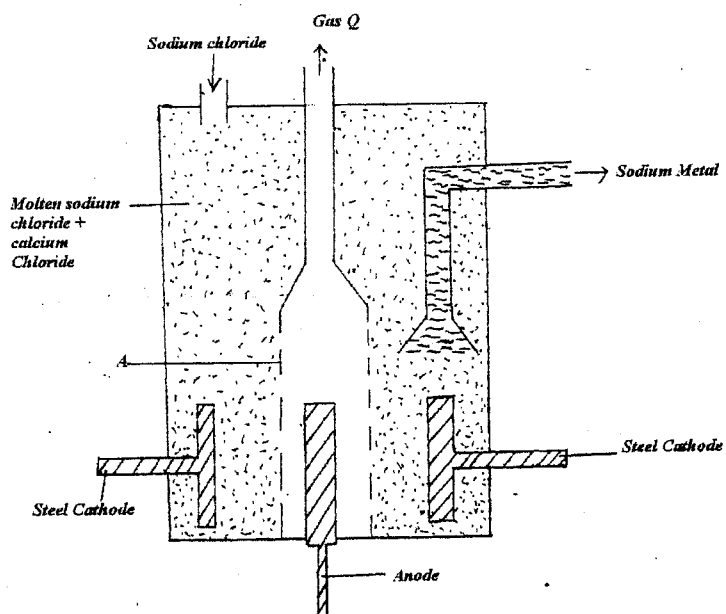
(d) Write a chemical equation for the complete combustion of Substance M. (1 mrk)

(e) Name the reagent and condition in step III.

(i) Reagent. (1 mrk)

(ii) Condition

6. Below is a simplified diagram of the down's used for the extraction of sodium metal. Study it and use it to answer the questions that follow.



i) Name the main ore of sodium. (1mk)

.....

ii) Name gas Q (1mk)

.....

iii) Write an ionic equation for the reaction in which gas Q is formed (1mk)

.....

iv) What material is the anode made of? Give a reason.

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v) State two uses of gas Q (1mk)

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vi) State and explain why calcium chloride is added to sodium chloride. (2mks)

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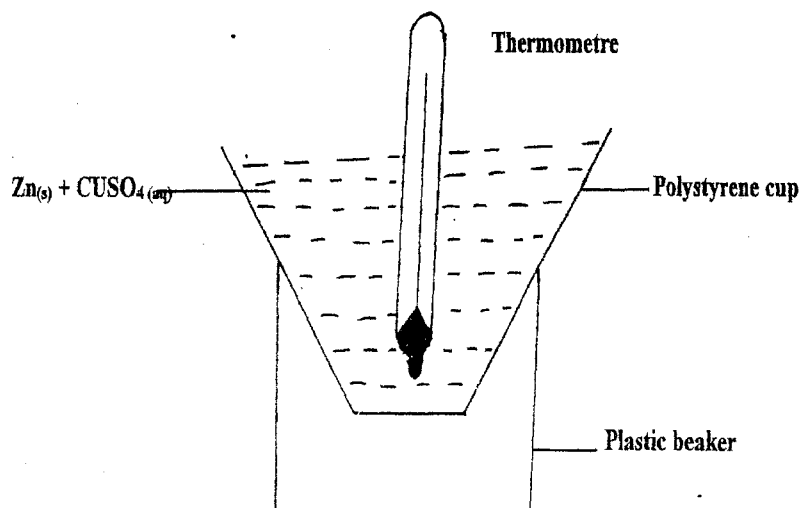
vii) What is the function of the part labeled A in the diagram. (1mk)

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viii) State the observation made when sodium burns in air. Write an equations for the for the reaction that takes place. (2mks)

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7. a) The set -up below was used to determine the molar heat of displacement of copper.



A 1.0g of zinc powder was added to 50cm^3 of 0.2M copper (ii) Sulphate solution and the Mixture was stirred gently. The temperature of the mixture rose from 20°C to 27°C

(i) Give a reason why polystyrene cup was used instead of a glass beaker? (1mk)

.....

(ii) Write an ionic equation for the reaction in the above experiment. (1mk)

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(iii) Calculate the number of moles of copper (ii) sulphate in the solution. (1mk)

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(iv) Determine the molar heat of displacement of copper by Zinc. (Specific heat Capacity of the solution = 4.2 KJ/g/K. Density of solution = 1 g cm³) (3mks)

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

(vi) State and explain two observations which are made during the reaction apart from rise in temperature (1mk)

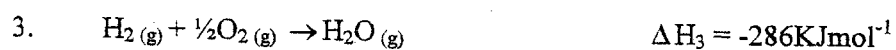
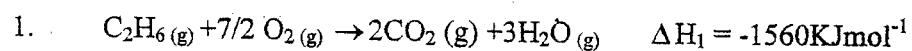
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(vii) State two factors that determine the choice of fuel. (1mk)

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(b) Define the standard enthalpy of formation of a substance (1mark)

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(c) Use the thermo chemical equations below to answer the questions that follow



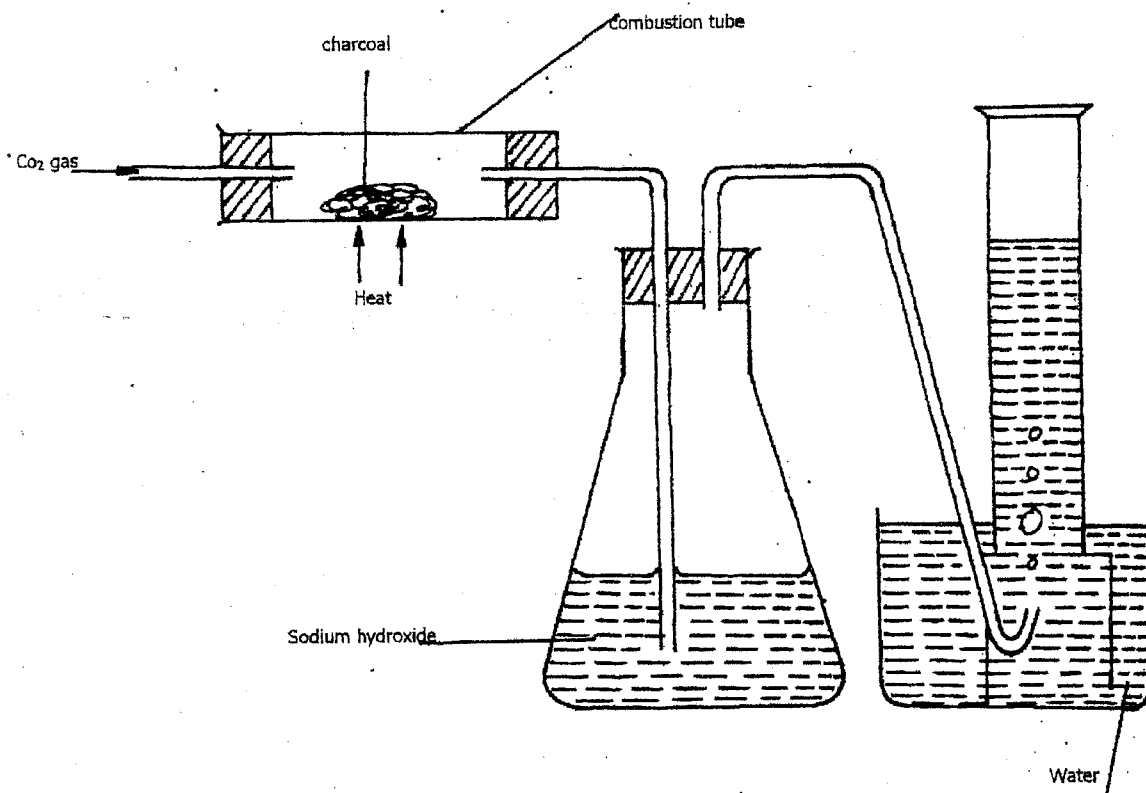
(i) Name two types of heat changes represented by ΔH_3 (2marks)

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.....

(ii) Draw an energy level diagram for the reaction represented by equation (2mrks)

(iii) Calculate the standard enthalpy of formation of ethane (2mrks)

8. In an experiment, carbon (IV) Oxide gas was passed over heated charcoal and the gas produced collected as shown in the diagram below.



- (a) (i) Write an equation for the reaction that took place in the combustion tube (1mrk)
- (ii) Name another chemical substance that can be instead of sodium hydroxide
 (1mrk)
- (iii) Describe a simple chemical test to distinguish between carbon (II) Oxide and carbon (IV) Oxide (1mk)
- (iv) What is the purpose of sodium hydroxide in the above set-up (1mk)

.....
(v) What property of the gas makes it possible to be collected as shown above

.....
(1mk)

(vi) State one use of carbon (II) oxide

(1mk)
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END