

NAME: INDEX NO:.....

Candidate's Signature:

Date:.....

233/2

CHEMISTRY

Paper 2

THEORY

March/April, 2011

Time: 2 ¼ Hours

MOKASA JOINT EVALUATION EXAMINATION

Kenya Certificate of Secondary Education

233/2

CHEMISTRY

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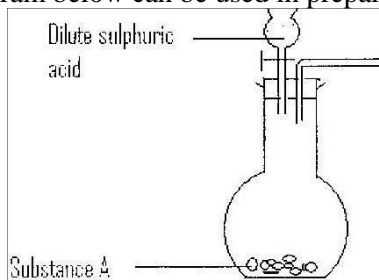
Instructions to Candidates

- Write your name and index number in the spaces provided above.
- Sign and write the date of the examination.
- Answer **all** the questions in the spaces provided in the question paper.
- All working **MUST** be clearly shown where necessary.
- Mathematical tables and silent electronic calculators may be used

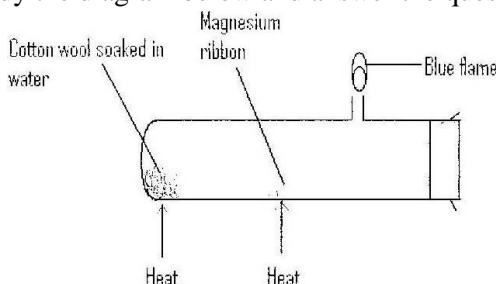
FOR EXAMINER'S USE ONLY

Question	Maximum Score	Candidate's Score
1	08	
2	13	
3	11	
4	12	
5	08	
6	13	
7	15	
Total	80	

1. (i) The diagram below can be used in preparation of hydrogen gas in the lab



- (a) Identify substance A. (1 mk)
 - (b) Complete the diagram to show how dry hydrogen gas can be collected (2 mks)
 - (c) State two uses of hydrogen (2 mks)
- (ii) Study the diagram below and answer the questions that follow



- (a) State the observations that would be made when heat is applied (1 mk)
- (b) Write a chemical equation for the reaction in the boiling tube (1 mk)
- (c) Give the chemical equation for the reaction taking place at the blue flame (1 mk)

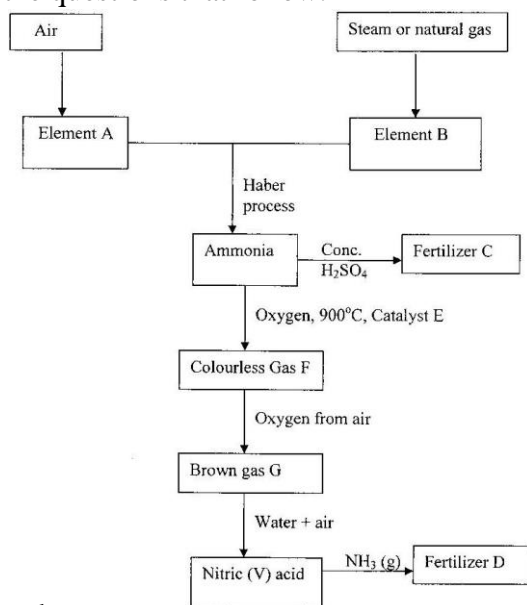
2. (a) Study the information in the table below and answer the questions that follow.

The letters are not the actual symbols of the elements

Element	Atomic Number	Melting Point (⁰ C)
G	6	3730
H	8	-218
J	10	-249
K	11	97.8
L	13	660
M	16	113
N	17	-101
P	20	850

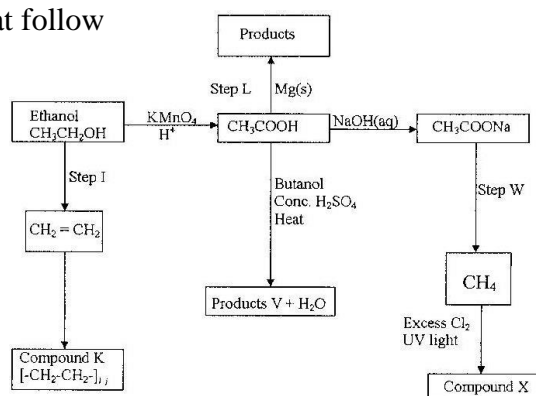
- (i) To which period and group does element P belong? (1 mk)
 Period
 Group
 - (ii) Select the most unreactive element. Give a reason. (2 mks)
 - (iii) Write an equation for the formation of an ion by element M. (1 mk)
 - (iv) Draw a dot (.) and cross (x) diagram to show bonding between elements G and H in the ratio 1:1 (2 mks)
 - (v) Name the type of bonding and structure responsible for the indicated melting point of element N. (2 mks)
 Bonding.....
 Structure.....
 - (vi) Which element between K and L is a better conductor of electricity? Explain (2 mks)
- (b) Describe how to prepare lead(II) sulphate, starting with lead (II) oxide powder. (3 mks)

3. The reaction scheme below outline a method of preparation of fertilizers C and D. Use it to answer the questions that follow.



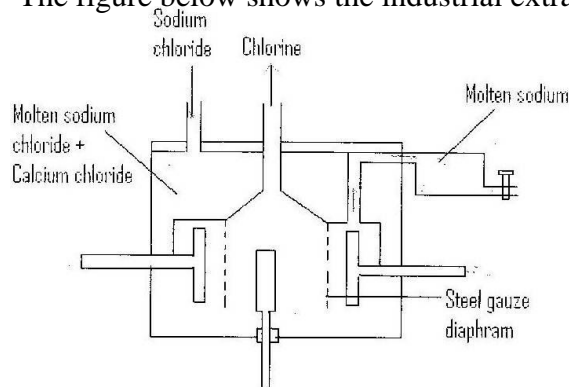
- (a) Identify substances (2 mks)
- B.....
- D.....
- E.....
- F.....
- (b) A moist red litmus paper was put into a gas jar of ammonia. State and explain the observation made (2 mks)
- (c) Fertilizer C is produced by passing ammonia into concentrated sulphuric (VI) acid as shown in the diagram (1 mk)
- (i) Write the equation for the formation of fertilizer C (1 mk)
- (ii) Calculate the mass of sulphuric (VI) acid in Kg required to produce 25 kg of the fertilizer C (S = 32.0, O = 16.0, N = 14.0, H = 1.0) (3 mks)
- (d) In an experiment excess gas ammonia gas passed over heated copper (II) oxide in a combustion tube.
- (i) State the observation that was made in the combustion tube at the end of experiment (1 mk)
- (ii) What property of ammonia is shown in the above reaction (1 mk)
- (iii) Name one use of ammonia (1mk)

4. The scheme below shows a series of reactions starting with ethanol. Study it and answer the questions that follow



- (a) (i) name the types of reactions in step 1 (1 mk)
- (ii) Give the reagent (s) and condition (s) necessary for step 1 to take place (2 mks)
- (b) Write the equation for the reaction that takes places in step L (1mk)
- (c) Name product V and give the equation responsible for its formation (2 mks)
- (d) Give the IUPAC name and structural formula of compound X (2 mks)
- (e) State the type of reaction involved in the formation of compound K. (1 mk)
- (f) Give the reagent (s) necessary for step W to take place (1 mk)
- (g) If the relative molecular mass of K is 44800, determine the value of n (2 mks)

5. The figure below shows the industrial extraction of sodium metal



- (i) Name the industrial process represented above (½ mk)
- (ii) (a) On the diagram identify the cathode and anode (1 mk)
 (b) Name the substance most suitable for making the anode. Give reason for your answer
- (iii) Write an ionic equation for the reaction that takes place at the anode (1 mk)
- (iv) Why is it possible to collect sodium formed as shown in the diagram (½ mk)
- (v) State and explain one major way through which the quantity of electricity required in the above process is reduced (1 mk)
- (vi) Why is aqueous sodium chloride not used as an electrolyte in extraction of sodium metal?
- (vii) State one use of sodium metal (1 mk)

6. (a) Use the half – equation and standard electrode potentials below to answer the questions that follow

Half – reaction	E° (volts)
$\text{Cd}^{2+}(\text{aq}) + 2\text{e}^- \longrightarrow \text{Cd}(\text{s})$	-0.40
$\text{Mn}^{2+}(\text{aq}) + 2\text{e}^- \longrightarrow \text{Mn}(\text{s})$	-1.18
$\text{Ni}^{2+}(\text{aq}) + 2\text{e}^- \longrightarrow \text{Ni}(\text{s})$	-0.25
$\text{Au}^{3+}(\text{aq}) + 3\text{e}^- \longrightarrow \text{Au}(\text{s})$	+1.50

- (i) Identify the strongest oxidizing agent (1 mk)
- (ii) Calculate the electromotive force a cell consisting of Mn(s) and Ni(s) half - cells (2 mks)
- (iii) Predict whether the reaction represented below will occur. Give a reason
 $\text{Mn}^{2+}(\text{aq}) + \text{Cd}(\text{s}) \longrightarrow \text{Mn}(\text{s}) + \text{Cd}^{2+}(\text{aq})$ (2 mks)
- (iv) Write down the cell representation for the electrochemical cell which will produce the highest voltage (2 mks)
- (b) An aqueous solution of zinc nitrate is electrolyzed using carbon electrodes.
 - (i) Write down the equations for the reactions at the electrodes (2 mks)
 Anode.....
 Cathode.....
 - (ii) State and explain what happens to the concentration of the electrolytes as the experiment progresses (2 mks)
 - (c) Calculate the volume of oxygen gas evolved when a current of 3 amperes is passed through copper (II) sulphate solution for 5 minutes, using inert electrodes. (3 mks)
 Molar gas volume at r.t.p = 24000 cm³; 1 Faraday = 96500 coulombs

7. (a) In an experiment to determine the molar heat of reaction when zinc displaces copper, 0.8 g of zinc powder were added to 50 cm³ of 0.2 M copper (II) sulphate solution. The temperature of copper (II) sulphate was 22°C, while that of the mixture was 32°C.
 - (i) Other than increase in temperature, state and explain the observation which were made during the reaction (3 mks)
 - (ii) Calculate the heat change during the reaction (Specify heat capacity of the solution = 4.2 Jg⁻¹ K⁻¹ and the density of solution = 1gcm⁻³ (2 mks)
 - (iii) Determine the molar heat of displacement of copper by zinc (Cu= 63.5, Zn = 64.0)(2 mks)
 - (iv) Write the ionic equation for the reaction (1 mk)
 - (v) Sketch the energy level diagram for the reaction (2 mks)
 - (b) (i) State the Hess Law (1 mk)