Name ………………………..……………………… Index No. ..……………..…….……

School …………………………………………... Candidates Sign: …………....…..…

  Date: …………………………..

233/2
CHEMISTRY
Paper 2
THEORY
July / August – 2014
Time: 2 Hours

MMS JOINT EXAMINATION - 2014
Kenya Certificate of Secondary Education (K.C.S.E)

233/2
CHEMISTRY
Paper 2
THEORY
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INSTRUCTIONS TO CANDIDATES
- Write your name and index number in the spaces provided above.
- Answer ALL the questions in the spaces provided.
- Mathematical tables or electronic calculators may be used.
- All working MUST clearly be shown where necessary.

FOR EXAMINERS USE ONLY

Question	Maximum Score	Candidate's Score
1	11	
2	11	
3	12	
4	13	
5	12	
6	11	
7	10	
Total Score	80	

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

1. An experiment was carried to study how heat change varies when various quantities of hydrochloric acid was added to fixed volume of potassium hydroxide solution in an insolated

plastic beaker. The results are shown in the table. Use the results to answer the questions that follow.

EXPERIMENT	1	2	3	4	5	6	7
Volume of 2M $KOH_{(aq)}$ (cm^3)	50	50	50	50	50	50	50
Volume of $HCl_{(aq)}$ (cm^3)	20	40	60	80	100	120	140
Heat energy evolved (KJ)	1.1	2.2	3.4	4.5	5.67	5.67	5.67

a) Plot a graph of heat change (y – axis) against the volume of hydrochloric acid on the grid provider below. (3 mks)

b) How many moles of potassium hydroxide are contained in $50cm^3$ of the solution. (1 mk)

c) From the graph, determine the volume of dilute hydrochloric acid required to completely neutralize $50cm^3$ of 2M potassium hydroxide (2M KOH) (1 mk)

d) Using the value above, determine the concentration of hydrochloric acid in moles per litre. (2 mks)

e) Determine the temperature change (T) at end point (specific heat capacity = 4.2kj/gg/K) (2 mks)

f) Explain why the molar heat of neutralization between ethanoic acid and potassium hydroxide will be lower than that between hydrochloric acid and potassium hydroxide. (2 mks)

2. a)The set up below was used to obtain dry nitrogen gas from air. Study it and answer the questions that follow.
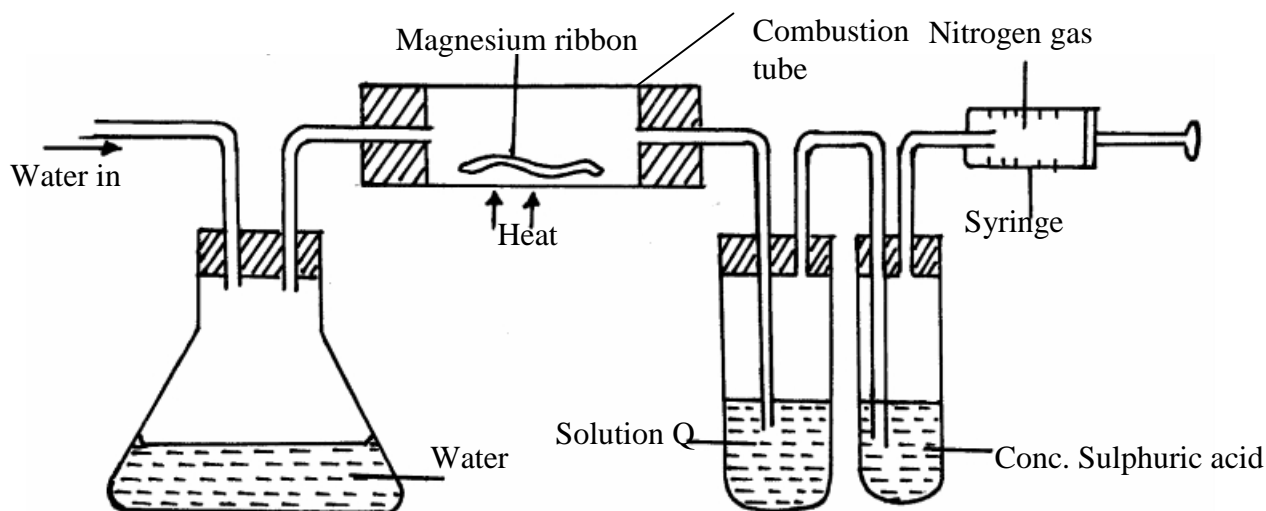
(i) Name the method used above. (1 mk)
(ii) Identify solution Q. (1 mk)
(iii) State the observation made in the combustion tube. (1 mk)
(iv) What is the function of concentrated sulphuric acid in the set up above. (1 mk)
(v) Name one impurity in the nitrogen gas collected by this method. (1 mk)

b) The set up below was used to prepare Nitric (v) acid in the laboratory using concentrated sulphuric acid on potassium nitrate crystals. Study it and answer the questions that follow.

Conc. H_2SO_4

KNO_3

Heat

Cold water
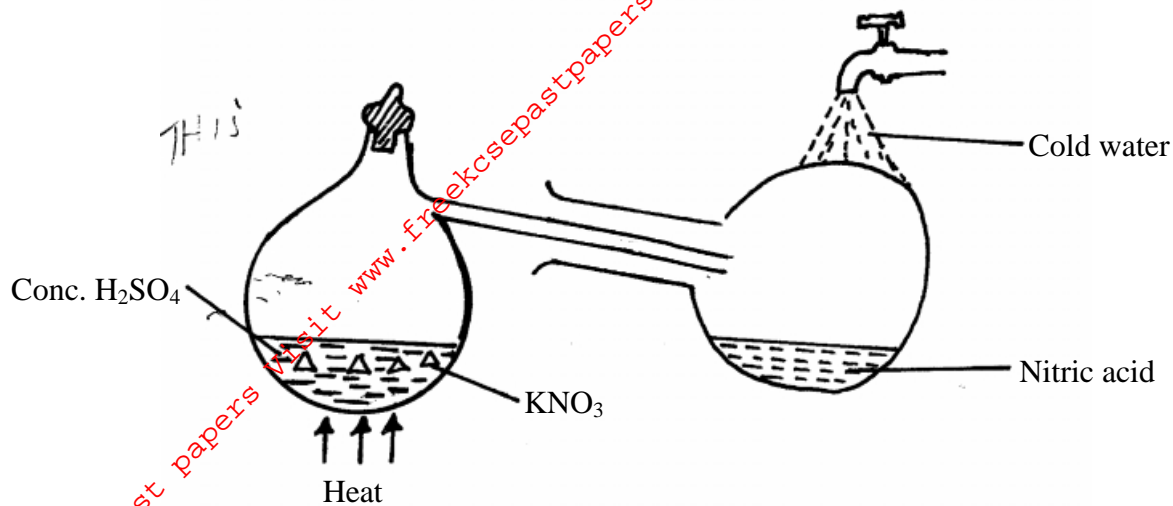
Nitric acid

(i) Explain why sodium nitrate is not appropriate option in place of potassium nitrate. (2 mks)

(ii) A reddish brown gas was observed in the retort. Explain. (1 mk)

(iii) Copper reacts with the nitric acid formed but does not react with hydrochloric acid. Explain. (1 mk)

c) 60 – 50% Nitric (v) acid is produced from the absorption chamber in the industrial manufacture of the nitric acid. Describe how the percentage of the acid can be increased. (2 mks)

3. The table below shows part of the periodic table, the letters do not represent the actual symbols of the element. Study it and answer the questions below .

| | | | | | | | | X |
B							V	
P			S	T		U		
	Q						Y	

a) Identify the element that;

(i) Forms amphorteric oxide. (1 mk)

(ii) Is a halogen at room temperature. (1 mk)

b) Write the formula of the compound formed between elements Q and Y. (1 mk)

c) Name the shaded region in the periodic table. (1 mk)

d) Metal Z is more reactive than P but falls in the same period as Q, on the grid above place element Z in its place. (1 mk)

e) Explain the difference in the melting points of element P and S. (2 mks)

f) Write the electron arrangement for the **ions** formed by elements (2 mks)

P

U

g) Give **one** commercial use of element X. (1 mk)

h) Compare the atomic radius of element B and V. Explain. (2 mks)

4. a)(i) Name the compounds below

P: CH_3CCH (1 mk)

R: $CH_3CH_2CH_2CH_2OH$ (1 mk)

S: $CH_3CHCHCH_3$ (1 mk)

T: $CH_3CH_2CH_3$ (1mk)

(ii) Describe a chemical test you would carry out to distinguish T and S. (2 mks)

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b) Study the table below and answer the questions that follow.

Compound	Melting points (k)	Boiling point (k)
C_4H_{10}	135	272.5
C_3H_6	88	225.3
$C_4H_{10}O$	184	391
C_5H_{12}	143	309.3
$C_2H_4O_2$	289.6	393

(i) Which of the compounds are gases at room temperature (298K). Explain. (2 mks)

(ii) The compounds $C_4H_{10}O$ is an alcohol. How does its solubility in water differ from the solubility of C_5H_{12} in water? Explain. (2 mks)

(iii) Select two compounds which are members of the same homologous series. (1 mk)

c) Propane can be changed into methane and ethene as shown in the equation below.

$$CH_3CH_2CH_3 \xrightarrow{\text{High temperature}} CH_4 + C_2H_4$$
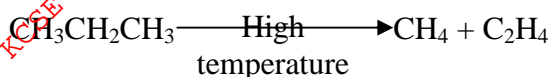
(i) Name the process undergone by propane. (1 mk)

(ii) Sate **two** industrial uses of methane. (1 mk)

5.   a) The diagram below shows a cross – section of a lead – acid accumulator. Study it and answer the questions that follow.


Lead plate anode

Lead plate coated with PbO_2 cathode

Dilute sulphuric acid
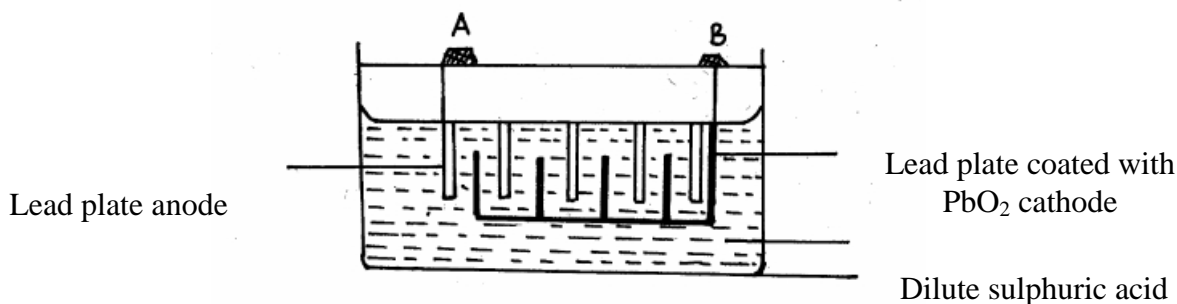
(i) The electrolyte used in the cell is dilute sulphuric acid, why is dilute hydrochloric acid not used. (1 mk)

(ii) Explain the significance of toping with distilled water during recharging of the cells above and not dilute acid. (2 mks)

(iii) Give the ionic equation for the reaction at the anode during recharging. (1 mk)

(iv) Give **one** advantage and **one** disadvantage of the cell above. (2 mks)

b) Study the standard electrode potentials for the half – cells given below and answer the questions that follow (letters are not the actual symbols of the elements)

		E volts
$A^+_{(aq)} + e^-$ ⇌ $A_{(s)}$		- 2.92
$B_{2\,(aq)} + 2e^-$ ⇌ $2Br^-_{(aq)}$		+ 1.09
$C^+_{(aq)} + e^-$ ⇌ ½ $C_{2\,(g)}$		0.00
$D^{2+}_{(aq)} + 2e^-$ ⇌ $D_{(s)}$		- 0.13
$E_{2\,(g)} + 2e^-$ ⇌ $2E^-_{(aq)}$		+ 1.36
$F^{2+}_{(aq)} + 2e^-$ ⇌ $F_{(s)}$		+ 0.34

(i) Identify the strongest oxidizing agent. Give a reason for your answer. (2 mks)

(ii) Which two half cells would produce the highest potential difference when combined. (1 mk)

(iii) Explain what would happen if a solution of $A^+_{(aq)}$ was kept in container made of F for sometime. (2 mks)

c) One of the uses of electrolysis is to anodize aluminium. Explain the importance of this process. (1 mk)

6.   The diagram below shows a set up for a laboratory preparation and collection of pure dry chlorine gas using PbO_2 and reagent P.
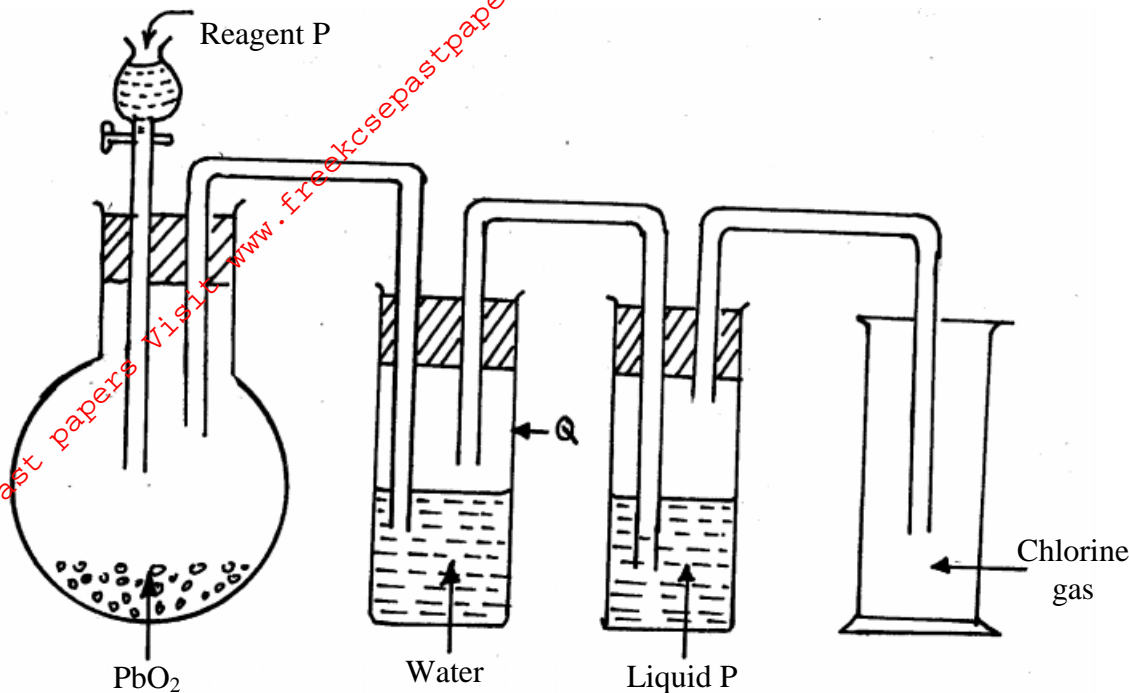
(i) Name Reagent P. (1 mk)

(ii) What is the purpose of water in Q. (1 mk)

(iii) State the oxidation number of lead in PbO_2 used above. (1 mk)

(iv) Lead (ii) chloride formed in the above reaction is insoluble. Explain why it does not form an insoluble coating over PbO_2 and stop the reaction prematurely. (1 mk)

b) State and explain the observation made when excess ammonia gas reacts with chlorine gas. (2 mks)

c) State and explain the observation that would be made if excess chlorine gas was bubbled into an aqueous solution of sodium iodide. (2 mks)

d) Calculate the mass of the product that would be formed when $200cm^3$ of hydrogen chloride gas reacts completely with excess ammonia gas.
(H = 1.0, N = 14, Cl = 35.5, molar gas volume at r.t.p = 24 litres) (3 mks)

7.   a) The scheme below is part of the steps followed in extraction of lead metal from its ore. The ore is initially crushed into fine powder then concentrated through float froathing filtered and then dried.
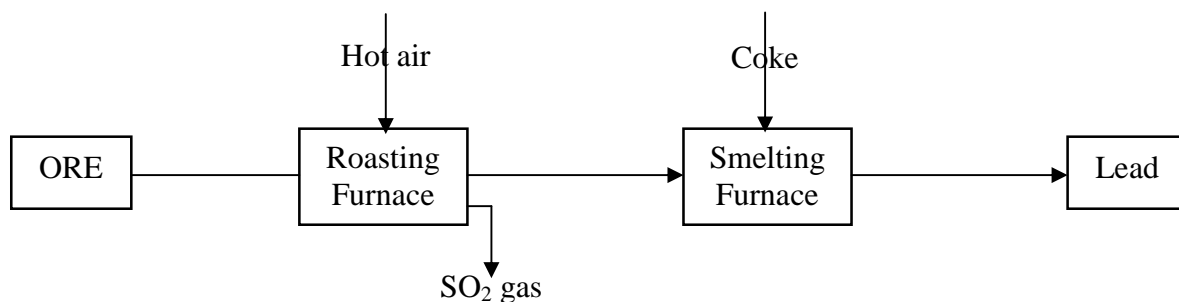
(i) Explain the purpose of (2 mks)

I Crushing

II Hot air

(ii) Name the ore used above (1 mk)

(iii) Give **one** use of lead other than as an electrode in acid - lead accumulators. (1 mk)

b) Give the name of each of the processes described below which takes place when the salts are exposed to air for sometime.

(i) Sodium chloride used as table salt becomes wet (1 mk)

(ii) Copper (ii) nitrate forms an aqueous solution (1 mk)

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(iii) Fresh crystals of sodium carbonate decahydrate becomes covered with a white powder of sodium carbonate monohydrate (1 mk)

c) A hydrated salt has the following composition by mass sodium 18.55%, sulphur 25.80%, oxygen 19.35% and the rest water of crystallization, its relative formula mass is 248. Determine the formula of the hydrated salt.

(Na = 23, S = 32, O = 16, H = 1) (3 mks)

END