Name

233/2
CHEMISTRY
Paper 2
(Theory)
July/August 2013
Time: 2 Hours

Candidate's Signature_____

WESTLANDS **DISTRICT JOINT** EXAMS

Kenya Certificate of Secondary Education

CHEMISTRY
Paper 2
(Theory)
July/August2013
Time: 2 Hours

INSTRUCTIONS TO CANDIDATES

a) Write your name and index number in the spaces provided above
b) Sign and write the date of examination in the spaces provided above.
c) Answer all the questions in the spaces provided.
d) Mathematical tables and silent electronic calculators may be used.
e) Ail working must be clearly shown where necessary.
f) This paper consists of 8 printed pages.
g) Candidates should check thequestions to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
- 1	11	
2	15	
3	12	
4	11	
5	10	
6	10	
7	11	
Total Score	*m*	

Answer ALL the questions in the spaces provided.

1. The table below gives some properties of three salts; D, E and F.

Salt	D	E	F
Solubility	Insoluble	Soluble	soluble
Effect of heat	Decomposes forming a white residue G and a colourless gas H, Gas H forms a white precipitate with lime water.	Decomposes to form a yellow residue and two gases I and I. Gas I is reddish-browt and Gas J is colourless.	Dissociates into two gases; K and L. Gas K turns wet litmus paper blue. Gas K and L readily recombine on cooling to form dense white fumes of salt F

Further tests showed that when residue G was reacted with water and the product heated with salt F, gas K was evolved. When D reacted with nitric (V) acid, there was effervescence. The resulting solution formed a white precipitate with dilute Sulphuric (VI) acid, but not with hydrochloric acid.

a) Identify

i) Gas H (Imk)

ii) Gas 1 (Imk)

iii) Salt D (Imk)

iv) Salt F (Imk)

b) Write an equation for the thermal decomposition of D. (Imk)

c) Name the compound formed when G is reacted with water. (Imk)

d) A solution of salt E reacted with an aqueous solution gas L, fdrmng a white precipitate that dissolved when warmed.

i) Write an ionic equation for the formation of the white precipitate. (Imk)

ii) Write the formulae of the ions that are present in salt E. (Imk)

e) Explain what would be observed if Sodium hydroxide was added to a solution of E, dropwise till in excess. (2 mks)

f) Write a chemical equation for the effect of heat on F. (Imk)

a) Petrol is a mixture of several alkane molecules ranging from pentane (C.H) to decane ($C_mH_{,,}$). Name the process by which petrol is obtained from crude oil. (Imk)

b) A decane molecule derived from petrol is cracked into hydrocarbon with equal number of Carbon atoms in each molecule.

i) What is cracking? (imk)

ii) State one condition necessary for the above process. (Imk)

iii) Write an equation for the cracking of a decane molecule. (Imk)

iv) The molecule with lower molecular mass obtained from cracking of decane may have different isomers. What.are isomers? (Imk)

v) Draw and name two isornes of the compound reffered to in (iv) above. (2 mks)

c) Biodiesel is made from a vegetable oil by the following reaction.

$$\begin{array}{l} {}^{C}17^{H}35^{COOCH}2 \\ \quad | \\ C_{17}H_{35}COOCH \end{array} + 3CH_3OH \blacksquare\text{-»} 3C_{I7}H_3,COOCH_3 + \begin{array}{l} CHoOH \\ | \\ CH\ OH \\ \\ CH_2OH \end{array}$$

I Methanol Biodiesel i, , ,

$C_{17}H_{35}COOCH_2$ Glycerol

Vegetable oil

i) What kind of compound are vegetable oil and biodiesel? \ Imk)

ii) What other product is made fom vegetable oil by heating it with aqueous sodium hydroxide. (1 mk)

d) Describe a test which would distinguish between octane and octene. (3 mks)

Test

Result with octane

Result with' octene

e) There are two types of polymerization reaction. Give their names and explain the difference between them (3 mks)

a) The grid below shows part of the periodic table. (The letters do not represent the actual symbols). Use it to answer the questions that follow.

T							Q
			S		R	K	
A	J	Y		U	P	L	
W						M	B

i) Select the most reactive non-metal (1 mk)

ii) Select an element that forms a divalent cation. (Imk)

iii) Element Z has atomic number 14. Show its position in the grid. (Imk)

iv) How do the atomic radii of U and J compare? (2 mks)

v) How do electrical conductivitiy of A and Y compare? (2 mks)

vi) How does the boiling point of elements K,L and M vary? Explain (2 mks)

b) Write the chemical equations for the reaction between oxides of

i) A and water. (Imk)

ii) Y with Sodium hydroxide (Imk)

iii) P and water (Imk)

Zinc is normally extracted from its natural ores, such as Zinc blende, ZnS, and Calamine, $ZnC0_3$.

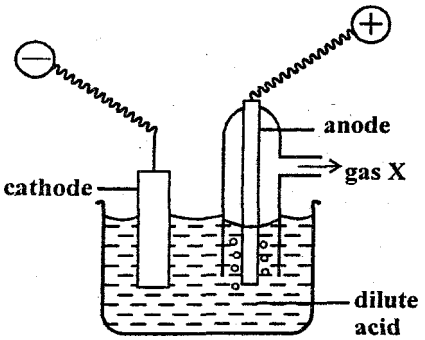
a) Why is it not appropriate to refer to these ores as Zinc Sulphide and Zinc Carbonate respectively? (Imk)

b) The first step in the extraction process is roasting of the ores.

i) Write equations for the reactions taking place during roasting of the two ores. (2 mks)

ii) Write an equation for the reaction in which zinc is formed. (Imk)

c) Zinc can be produced in a purer form through the electrolysis of its oxide dissolved in dilute sulphuric acid as shown in the diagram below.



i) What are the other ions in the electrolyte apart from Zn^{2+} and $SO^{2'}$? (2 mks)

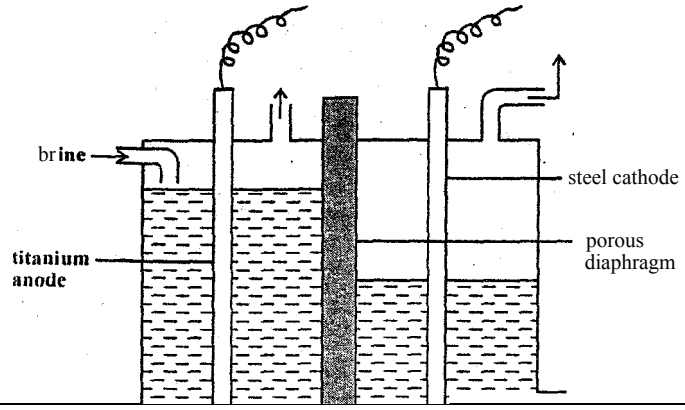
ii) Write down the cathode and anode half reactions. (2 mks)

iii) Identify gas X. (Imk)

d) Give two uses of Zinc. (2 mks)

a) Explain how sodium Carbonate is used to purity brine when mixed with Calcium Chloride and Magnesium Chloride. (2 mks)

b) The diagram below represents a diaphragm cell used to electrolyse pure brine.



i) Write the equations for the reaction that takes place at:

I. Cathode (Imk)

II. Anode (Imk)

ii)Name

I. Product at U (Imk)

II. Another material that can be used instead ofTitanium. (Imk)

III. The impurity present in the product at U. (I m k)

iii) State two functions of the diaphragm (2 mks)

c) Give two industrial use of the product at U (I m k)

The table below shows reduction potentials for five half cells. Study it and answer the questions that follow. (Letters do not represent the actual symbols of the elements.)

	E “(Volts)
X,. + 2 e —> 2 X laq)	+ 0.54
Y²* + 2e '->Y (aq) _ (s)	-0.44
G²" +2e —»G \ (aq) is)	+0.34
2Z"\ (aq) +2e -» Z, 2 (»)	0.00
W³⁺ (aq) +e -» W²⁺ (aq)	+0.77

i) Identify the strongest oxidising agent. (I m k)

ii) Write the equation for the reaction which taks place when solid Yis added to a solution containingG^{2*} ions (Imk)

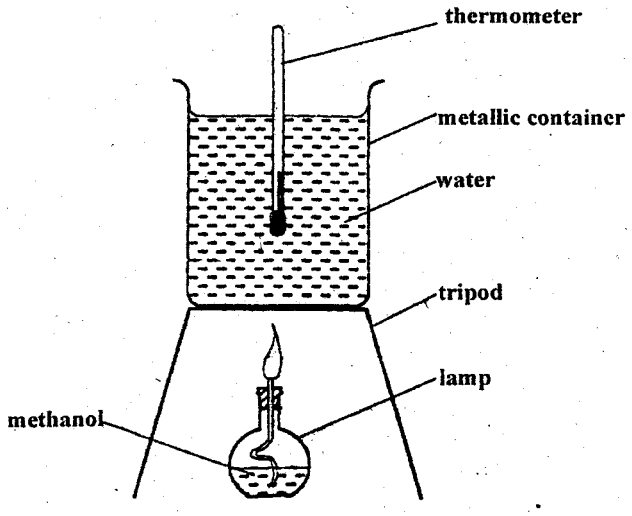
iii) Calculate the E° value for the reaction in (ii) above. (Imk)

iv) Draw a labelled diagram of the electrochemical cell formed in (ii) above. (3 mks)

b) i) Which substance in the table could be used to oxidise 2x to x, (Use E° value for the section to explain your answer) (Imk)

ii) State the functions of the salt-bridge. (2 mks)

In an experiment to determine the heat of combustion of methanol (CH_3OH), a student used a set-up like the one shown in the diagram below.



Volume of water = 500cm^3
Final temperature of water= 27.0°C
Initial temperature of water = 20.0°C
Final mass of lamp +■ methanol =22.1 lg
Intial mass of lamp + methanol = 22.98g
Density of water = 1 .Og/cm^3

a) Write an equation for the combustion of methanol. (Imk)

i) The number of moles of methanol used in this experiment (2 mks)
(C=12,H*,0= 16)

ii) The heat change in this experiment. (I m k)

iii) The heat of combustion per mole of methanol. (2mks)

c) Explain why the value of molar heat of combustion for methanol obtained in this experiment is different from the theoretical value. (1 mk)

d) i) On the axis below', draw an energy level diagram for combustion of methanol. Include activation energy. (2 mks)

ii) The experiment was repeated with ethanol in place of methanol. Explain the difference in molar heat of combustion for the two alkanols. (2 mks)