

NAME..... INDEX NO.....

233/2
CHEMISTRY
PAPER 2
THEORY

KENYA CERTIFICATE OF SECONDARY EXAMINATION
FORM FOUR EVALUATION EXAMINATION

JULY/AUGUST 2010
FORM FOUR CHEMISTRY
PAPER 2

INSTRUCTIONS TO CANDIDATES

- Write your name and Index number in the spaces provided above.
- Answer all the questions in the space provided
- Mathematical tables and electronic calculators may be used.
- All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	12	
2	13	
3	11	
4	10	
5	12	
6	11	
7	11	
	80	

1. a) Study the table below and complete it. (P^{+3} & Q^{-2}) are not the actual symbols of the ions. (2 mrks)

Ion	Number of protons	Number of neutrons	Mass number	Electron arrangement
P^{+3}	-----	14	-----	2.8
Q^{-2}	16	-----	32	-----

- b) You are provided with information of elements in the same period. Study it and answer the questions that follow.

Element	Ionic radius (nm)	Atomic radius (nm)
X	0.102	0.136
Y	0.134	0.099
Z	0.202	0.181
W	0.170	0.175
Q	0.076	0.065

- (i) Which is the most reactive non-metal. Explain. (2 mrks)

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- (ii) Which elements are metals. (1 mk)

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- (iii) (i) Write the chemical equation for the reaction between element Q which is in group VI with sodium metal. (1 mk)

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- (ii) What type of bond & structure is formed in b (i) above. (1 mk)

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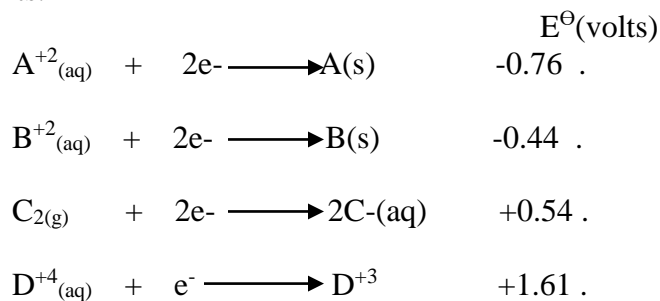
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(iii) Does the compound in b (ii) above conduct electricity? Explain. (1 mk)
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c) Element Z has atomic number 6.

(i) Draw dot-cross diagram of its most stable oxide. (2 mrks)
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(ii) Carbon (iv)oxide was bubbled through lime water in a test-tube for a long time. State the observations using chemical equations to explain. (2 mrks)
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2. Use the standard electrode potentials for the elements A, B, C & D given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.



a) Which element is the;

(i) Strongest oxidising agent. (1/2 mk)
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(ii) Strongest reducing agent

(1/2 mk)
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b) (i) Draw a labelled diagram of the electrochemical cell that would be obtained when half cells of element A & B are combined. (3 mrks)

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(ii) Calculate the E^\ominus value of the electrochemical cell constructed in b(i) above. (1 mk)

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(iii) Which two elements if used together in a cell would produce the largest e.m.f? (1/2 mk)

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c) Calculate the number of faradays required to completely reduce 0.1 mole of Fe^{+3} to Fe. (1 1/2 mks)

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d) One of the major application of electrolysis is electroplating. In chromium plating the steel article is usually plated first with nickel or copper then chromium in a plating bath which contain chromium compounds in sulphuric acid and water. Chromium deposits on the article.

(i) Give a reason why steel parts are chromium plated. (1 mk)

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(ii) Why is it necessary for the steel to be plated first with nickel or copper before chromium is applied? (1 mk)

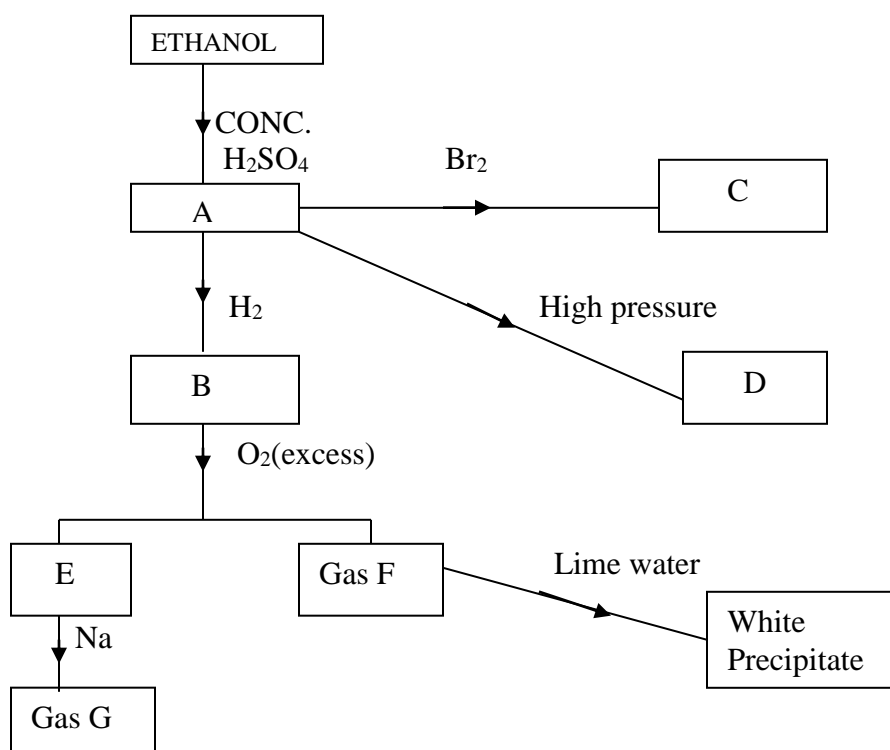
(iii) Give an ionic equation for the process responsible for chromium plating. (1 mk)

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(iv) If an electrical current of 4:5 amperes is passed through the chromium plating for twenty (20) hours, what would be the mass in grams of chromium deposited on the steel article? (Cr = 52.0, Faraday = 96500 coulombs) (3 mrks)

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3. Study the flow chart below and answer the questions that follow.



a) Identify substances:

(4 mrks)

A _____

B _____

F _____

G _____

b) Write down the equation for the formation of:

(i) Substance C

(1 mk)

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(ii) E and F

(2 mrks)

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(iii) Gas G

(2 mrks)

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c) Substance D was found to have a molecular mass of 42,000. Determine the number of molecules present in the substance. (H=1, C=12)

(2 mrks)

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d) State:

(i) The condition necessary for the conversion of ethanol to substance A.

(1 mk)

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(ii) The catalyst required in the conversion of A to B.

(1 mk)

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4. a) The results below were obtained in an experiment conducted by form 3 students from Keringet Secondary school using Magnesium.

- Mass of the crucible + lid	= 19.52g
- Mass of the crucible + lid + Magnesium Ribbon	= 20.36g
- Mass of the crucible + lid + Magnesium oxide	= 20.92g

(i) Use the results to find the percentage mass of Magnesium & Oxygen in Magnesium oxide (2 mrks)

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(ii) Determine the empirical formula of magnesium oxide. (Mg=24.0,o=16.0) (2 mrks)

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b) Sodium hydroxide pellets were accidentally mixed with sodium chloride 8.8g of the mixture were dissolved in water to make one litre of solution. 50cm³ of the solution was neutralised by 20cm³ of 0.25M sulphuric acid.

(i) Write an equation for the reaction that took place. (1 mk)

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(ii) Calculate the:

number of moles of the substance that reacted with sulphuric acid. (2 mrks)

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number of moles of the substance that would react with sulphuric acid in the one litre solution (1 mk)

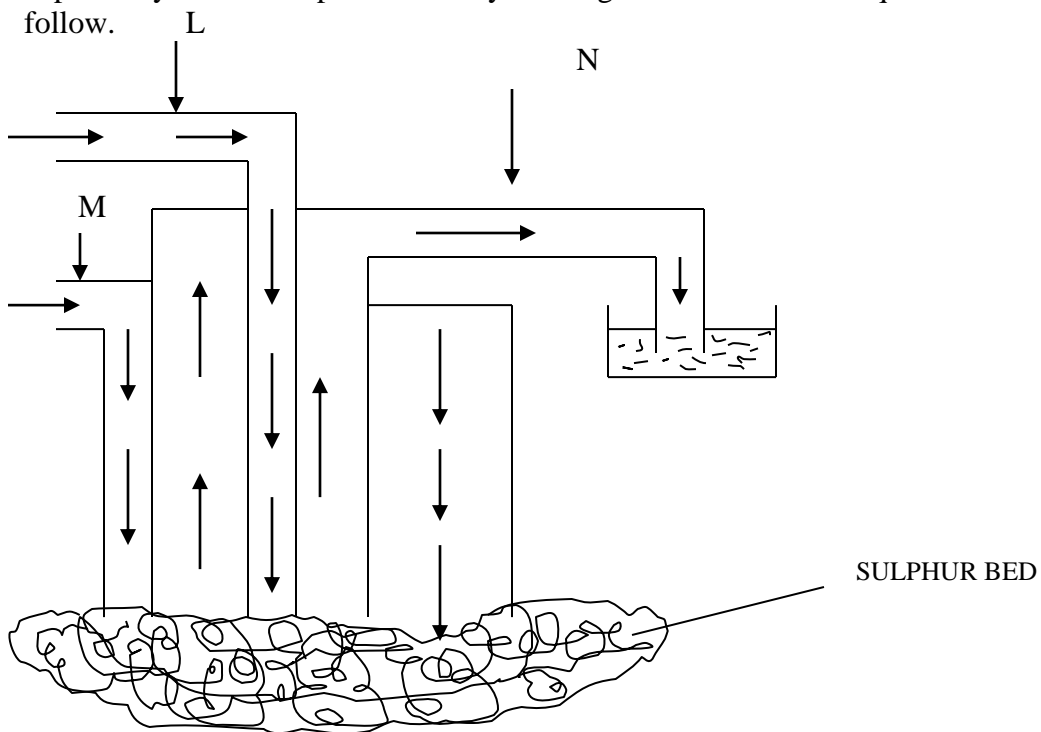
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(iii) the percentage of sodium chloride in the mixture. (2 mrks)

(H=1.0; Na=23.0; Cl=35.5; O=16.0)

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5. a) The diagram below represents the extraction of sulphur from its underground deposits by the Frasch process. Study the diagram and answer the questions that follow.



- (i) Name the substances that pass through pipes L, M and N. (3 mrks)

L _____

M _____

N _____

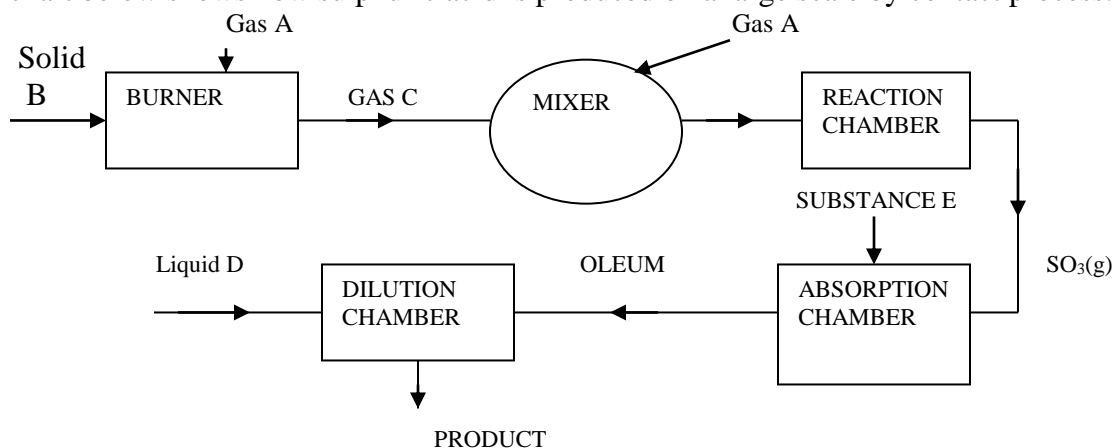
- (ii) What is the purpose of the
 (i) Superheated water (1 mk)

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- (ii) Hot compressed air. (1 mk)

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b) The flow chart below shows how sulphuric acid is produced on a large scale by contact process.



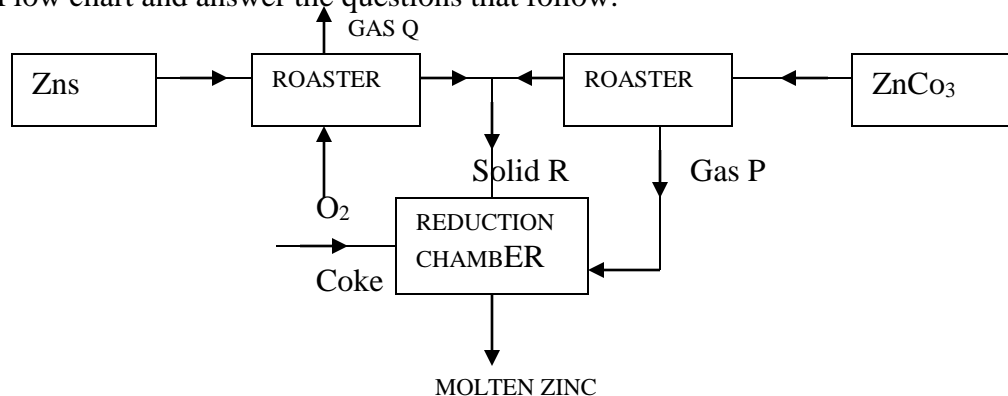
- (i) Identify:
- (i) Gas A(1 mk)
 - (ii) Solid B(1 mk)
 - (iii) Gas C(1 mk)
 - (iv) Substance E(1 mk)

(ii) Name the catalyst used in the reaction chamber (1 mk)

(iii) Write a chemical equation for the reaction taking place in the dilution chamber. (1 mk)

c) state one industrial use of sulphuric acid. (1 mk)

- 6 The flow chart below shows the extraction of Zinc from two ores. Study the Flow chart and answer the questions that follow:



- a) What is the common name of the ore ZnS? (1 mk)

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- b) Name the gases

P _____ (1 mk)

Q _____ (1 mk)

- c) Write the equations for the production of the gases P and Q.

P _____ (1 mk)

Q _____ (2 mrks)

- d) Name solid R (1 mk)

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- e) Write two equations for the reactions taking place in the reduction chamber.

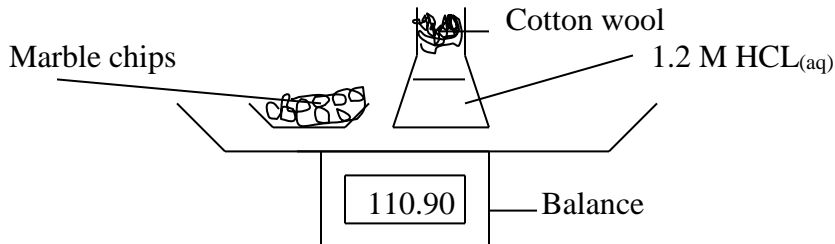
I _____ (1 mk)

II _____ (1 mk)

- f) Give two uses of zinc metal. (2 mrks)

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7. a) A student used the apparatus shown below to find the loss in mass during the reaction between 20.0g of marble chips (in excess) and 30.0cm³ of 1.2M hydrochloric acid.



- (i) Why was the mass at time 0 recorded with the marble chips separate from the conical flask. (1 mk)

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- (ii) The marble chips were then added to the acid and the mass recorded every after 30 seconds. The experiment was repeated using the same mass of marble but finely powdered and also same volume of acid and concentration. The results of the two experiments were recorded on the table as shown below.

TIME (SECS)	EXPERIMENT I		EXPERIMENT II	
	Mass (g)	Loss in mass (g)	Mass (g)	Loss in mass (g)
0	110.90	0.00	110.90	0.00
30	110.62	0.28	110.42	0.48
60	110.42	0.48	110.23	0.67
90	110.27		110.14	
120	110.17		110.10	
150	110.10		110.10	
180	110.10		110.10	

- (I) Complete the table by filling the missing values. (4 mrks)

- (II) On the same axis, plot the graphs of loss in mass against time for experiment I and II. (4 mrks)

- (III) What was the loss in mass in each experiment after 75 seconds. (2 mrks)

- (iii) A third experiment was done in which the same mass (in excess) of powdered marble was added to 30.0cm³ of 1.80M of hydrochloric acid was used. Sketch a third curve on the same axis to represent this experiment and label it as experiment III. (1 mk)

