

NAME ..... DATE .....

INDEX NO. .... SIGNATURE .....

233/2

CHEMISTRY

PAPER 2

(THEORY)

JULY/AUGUST, 2014

TIME: 2 HOURS.

## MBOONI WEST SUB - COUNTY JOINT EVALUATION TEST 2014

*Kenya Certificate of Secondary Education.*

233/2

CHEMISTRY

PAPER 2

(THEORY)

TIME: 2 HOURS.

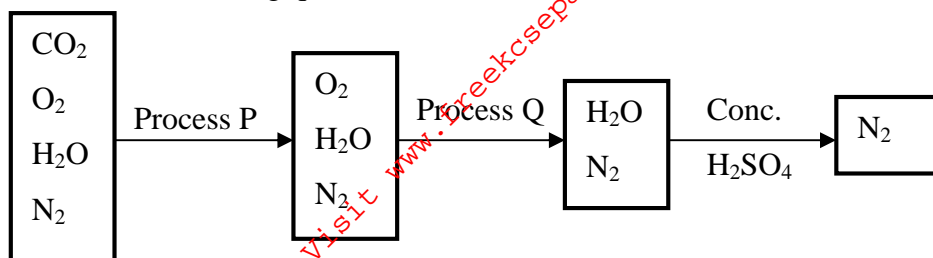
### INSTRUCTIONS TO CANDIDATES.

- Write your name and index number in the spaces provided above.
- Sign and write the date of exam in the spaces provided above.
- Answer **ALL** the questions in the spaces provided.
- Mathematical tables and silent electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.
- This paper consists of 9 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

### FOR EXAMINER'S USE ONLY.

Questions	Maximum score	Candidates score
1	9	
2	13	
3	12	
4	12	
5	12	
6	10	
7	12	
<b>Total score</b>	<b>80</b>	

1. The flow diagram below shows the process of obtaining nitrogen by fractional distillation. Use it to answer the following questions.



- (a) What is the purpose of the processes P and Q. (2 Marks)

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- (b) Identify the reagents used in processes P and Q (2 Marks)

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- (c) Write equations for the chemical processes in P and Q (2 Marks)

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- (d) Give four uses of oxygen (2 Marks)

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- (e) Give an impurity that could be found in the nitrogen gas obtained above. (1 Mark)

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2. (a) The grid below represents part of the periodic table. Study the information and answer the questions that follow. The letters do not represent the actual symbol of the elements.

C								
H		W		T		R	Y	F
	E		S				Z	
M	I							

- (i) Which element would form a trivalent cation? (1 Mark)

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- (ii) Write the equation for the reaction that would occur between E and Y. (1 Mark)

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(iii) Which elements belong to the region labelled W

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(iv) Which is the most reactive non-metallic element in the table above? Explain (2 Marks)

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(v) How does the atomic radius of T compare with that of Y (2 Marks)

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(b) The table shows some properties and electron arrangements of common ions of elements represented by letters D to K. Study the information and answer the questions that follow.

Element	Formula of ion	Ionic electron arrangement	Atomic radius (nm)	Ionic radius (nm)
D	D <sup>-</sup>	2.8	0.072	0.136
E	E <sup>+</sup>	2.8.8	0.231	0.133
F	F <sup>3+</sup>	2.8	0.143	0.050
G	G <sup>2+</sup>	2.8.8	0.133	0.074
H	H <sup>2+</sup>	2.8	0.160	0.064
I	I <sup>+</sup>	2.8	0.186	0.095
J	J <sup>3-</sup>	2.8.8	0.110	0.190
K	K <sup>-</sup>	2.8.8	0.099	0.181

(i) State the atomic numbers of elements F and G (1 Mark)

F

.....  
 .....

G

(ii) Select two metals that belong to period 3. (1 Mark)

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(iii) Element I reacts violently with water. Write the equation for the reaction. (1 Mark)

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(iv) Why is the ionic radius of G smaller than its atomic radius (1 Mark)

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(v) Compare and explain the reactivity of G and H

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3. In the Haber Process, nitrogen and hydrogen are reacted over iron catalyst to give ammonia gas.

(a) Explain how hydrogen gas used in the process is obtained. (2 Marks)

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(b) Write down an equation for the formation of ammonia from the raw materials (1 Mark)

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(c) Explain how the following factors would affect the yield of ammonia.

(i) High pressure (2 Marks)

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(ii) Low temperature (2 Marks)

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(d) Write an equation for the reaction between ammonia and copper (II) oxide. (1 Mark)

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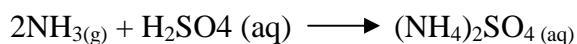
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(e) Explain the effect of the iron catalyst on the yield of ammonia in the Haber Process (2 Marks)

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(f)  $0.34\text{dm}^3$  of ammonia gas at s.t.p reacted with dilute sulphuric (VI) acid to form ammonium sulphate according to the following equation.



Determine the mass of the ammonium sulphate produced (2 Marks)

(N = 14, H = 1, S = 32, O = 16; molar gas volume at s.t.p =  $22.4\text{dm}^3$ )

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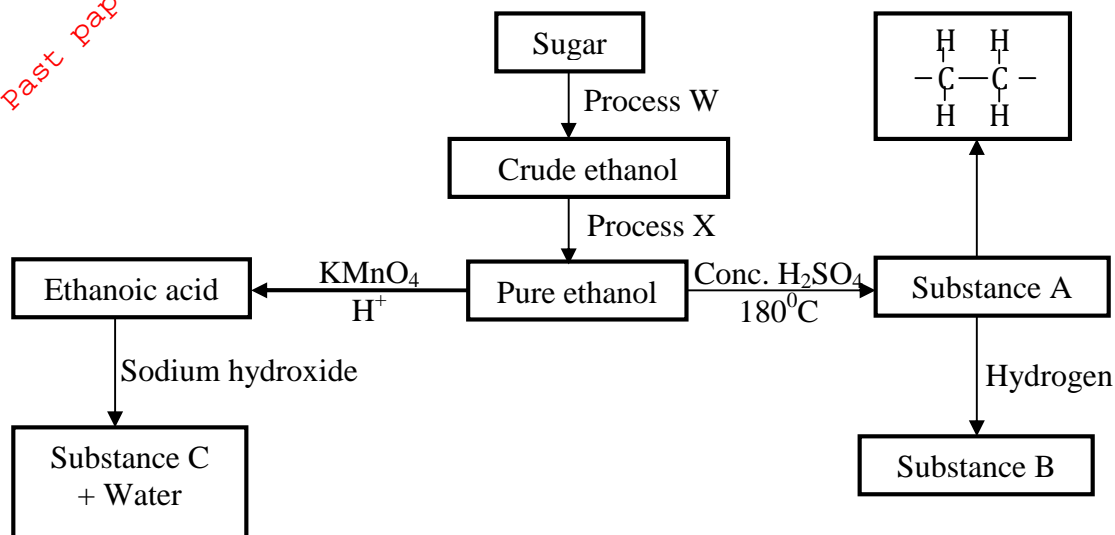
4. (a) Name four components of crude oil

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(b) What is the difference between thermal cracking and catalytic cracking? (2 Marks)

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(c) Study the flow chart below and answer the questions that follow:-



(i) Identify process W and Y (1 Mark)

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.....

(ii) Name substances B and C (1 Mark)

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(iii) Write the equation for the reaction leading to production of substance A. (1 Mark)

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(iv) Substance B was completely burned in air. Write the equation for the reaction. (1 Mark)

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(v) State and explain the observation made when bromine is added to a gas jar full of substance B in the presence of sunlight. (2 marks)

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(vi) The polymer D has a relative molecular mass of 112, 000. Calculate the value of n (C = 12, H = 1)

(2 marks)

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5. (I) Study the standard electrode potentials for the half cells given below and answer the questions that follows.

	$E^{\ominus}$ (volts)
$K^{+}_{(aq)} + e^{-} \longrightarrow K_{(s)}$	-2.92
$L^{+}_{(aq)} + e^{-} \longrightarrow L_{(s)}$	+0.52
$C^{+}_{(aq)} + e^{-} \longrightarrow \frac{1}{2} C_{2(g)}$	0.00
$D^{+}_{(aq)} + 2e^{-} \longrightarrow D_{(s)}$	-0.44
$\frac{1}{2} E_{2(aq)} + e^{-} \longrightarrow E_{(aq)}$	+1.36

(a) Identify the strongest oxidizing agent. Explain. (2 marks)

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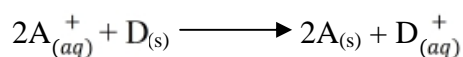
(b) (i) Which two half cells would produce the highest potential difference when combined (1 Mark)

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(ii) Give the cell arrangement for b (i) above (1 Mark)

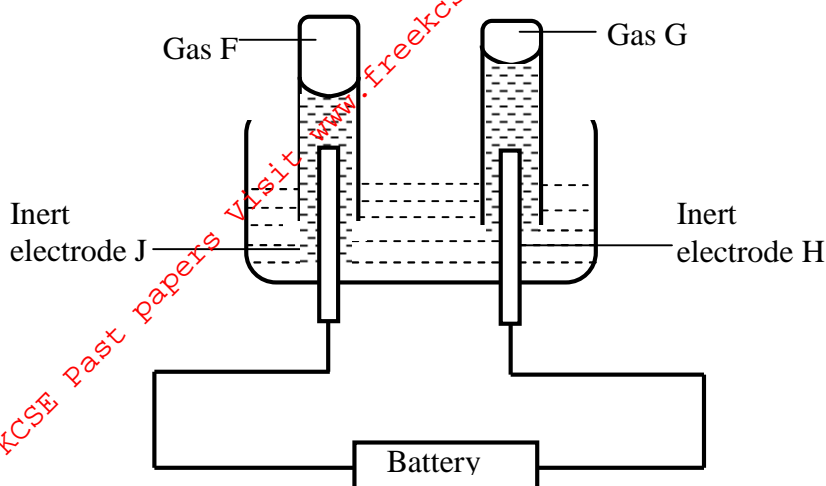
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(c) Explain whether the reaction represented by the equation below can take place. (2 Marks)



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(II)  $90\text{cm}^3$  of acidified water was electrolysed using the set-up below.



(a) Identify electrodes H and J

(1 Mark)

H: \_\_\_\_\_

J: \_\_\_\_\_

(b) Describe how gas F can be identified

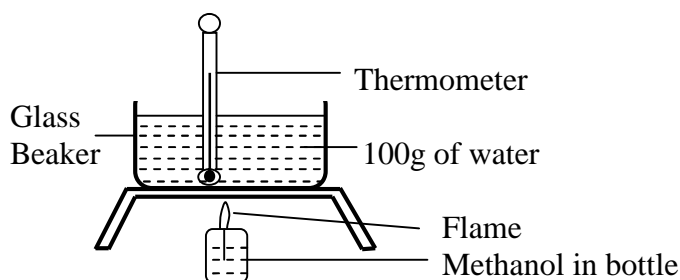
(2 Marks)

(c) In the above experiment 5A of electricity was passed through the acidified water for 3 minutes 21 seconds. Calculate the volume of gas G produced at room temperature and pressure.

(Molar gas at r.t.p =  $24,000\text{cm}^3$ ,  $1\text{F} = 96,500\text{C}$ )

(3 Marks)

6. The following set up by a form four student was intended to measure the heat of combustion of methanol. Study it to answer the following questions.



The results are as follows below

Initial temperature of water = 21.50C

Final temperature of water = 30.00C

Initial mass of bottle + methanol = 85.10g

Final mass of bottle + methanol = 84.78g

Specific heat capacity of water = 4.2kJ/kg/°c

(a) Use the results above to calculate the molar heat of combustion of methanol, CH<sub>3</sub>OH

(C = 12, O = 16, H = 1)

(3 Marks)

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(b) From the calculation in (a) above, is this reaction endothermic or exothermic?

(1 Mark)

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(c) The accurate (theoretical) volume of heat of combustion of methanol is -638kJ/mole. How does this volume compare with the one in (a) above?

(2 Marks)

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(d) Write the thermochemical equation for the combustion of methanol

(1 Mark)

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(e) Draw an energy level diagram for the above reaction.

(3 Marks)

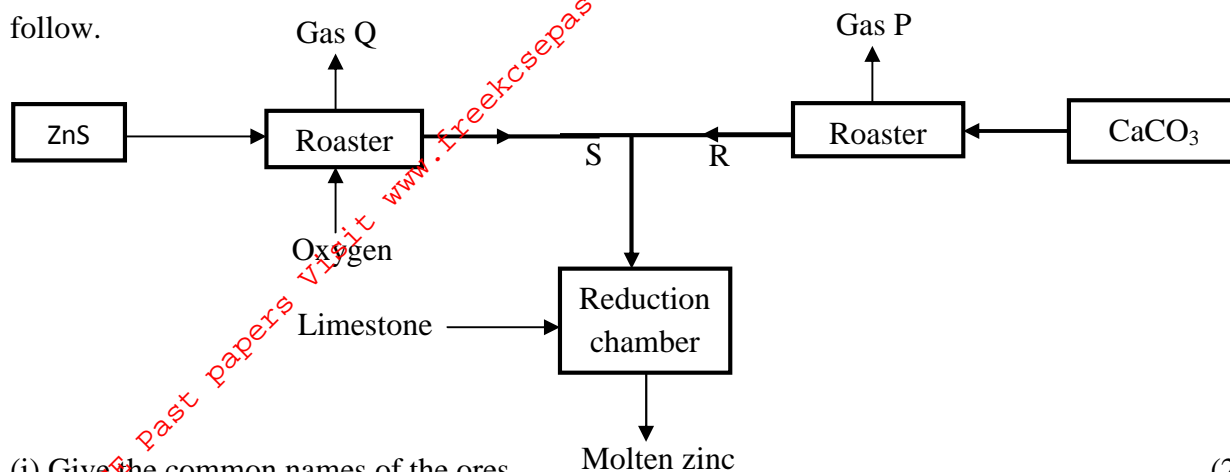
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7. The flow chart below shows the extraction of zinc from zinc ore. Study it and answer the questions that follow.



- (i) Give the common names of the ores. (2 Marks)

(a) ZnS \_\_\_\_\_

(b) CaCO<sub>3</sub> \_\_\_\_\_

- (ii) Name the gases P and Q (2marks)

(a) P \_\_\_\_\_

(b) Q \_\_\_\_\_

- (iii) Name the solids R and S (2marks)

(a) R \_\_\_\_\_

(b) S \_\_\_\_\_

- (iv) Write a chemical equation for the reaction that produces zinc metal

- (v) Which is the purpose of adding limestone in the reaction chamber. (1 Mark)

- (vi) Give 2 uses of zinc metal (2 Marks)

- (vii) Name two other industries that can be established alongside the zinc extraction plant. (2 Marks)