

NAME: INDEX NO:

CANDIDATE'S SIGNATURE.....

DATE:

233/2

CHEMISTRY

Paper 2

March/April, 2016

Time: 2 Hours

MOKASA JOINT EVALUATION EXAM

K. C. S. E. (Kenya Certificate of Secondary Education)

233/2

CHEMISTRY

Paper 2

Time: 2 Hours

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided.
- Answer **all** questions in the spaces provided
- Mathematical tables and silent electronic calculators **may** be used for calculations.
- All workings **must** be clearly shown where necessary.
- Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.

For Examiners Use Only

Questions	Maximum Score	Score
1		
2		
3		
4		
5		
6		
7		
8		
TOTAL	80	

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

					S	U		
P	R				T		W	
Q								

a) Which of the above elements has the largest atomic radius? Explain? (1 mark)

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b) Identify the most reactive non-metal. Explain (1 mark)

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c) Write the electron configuration of **ions** of;

(i) Element S (½ mark)

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(ii) Element Q (½ mark)

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d) Compare the atomic radius of P and R (1 mark)

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e) Write the formula of one stable cation with an electron arrangement of 2:8 (1 mark)

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f) Given that the atomic mass of W is 40 write down the composition of its nucleus (1 mark)

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g) Write the formula of the compound formed when P and S react (1 mark)

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h) Give the family to which element R belong (1 mark)

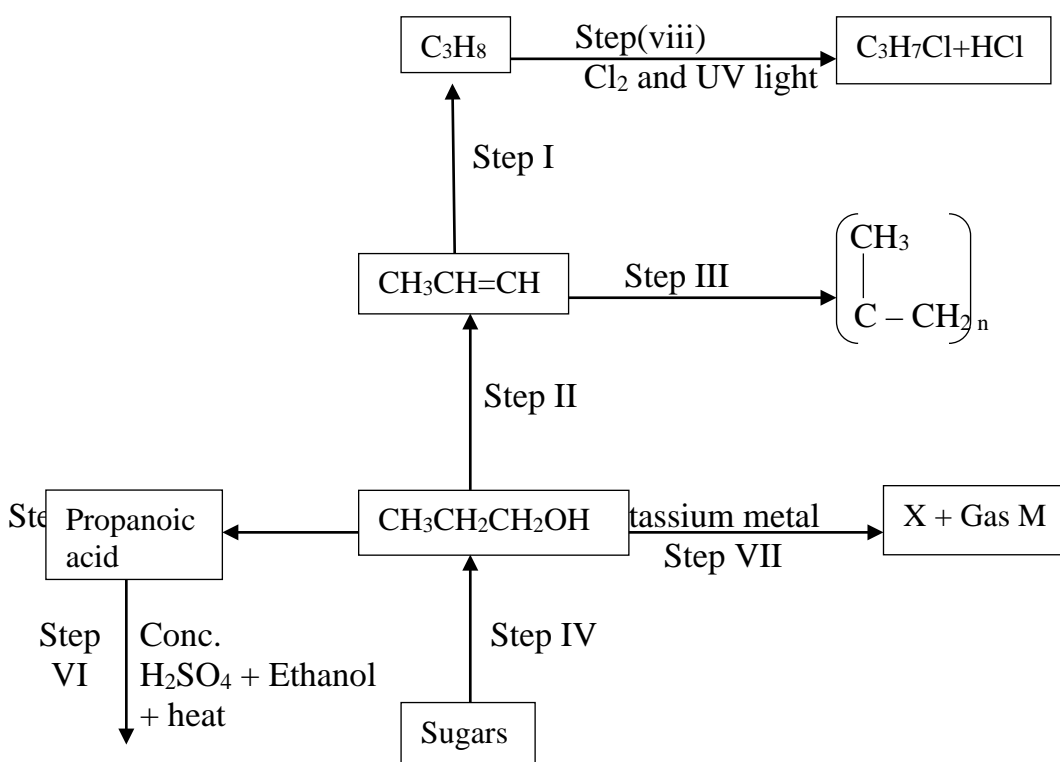
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i) Element X forms an ion with the fomula X^{3-} with electron configuration of 2.8. On the grid above, show the position of element X (1 mark)

j) Compare the electrical conductivity of the compound formed between P and U and element Q (2 marks)

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



a)i) Name the type of reaction in the following steps
 Step I (1 mark)

Step IV (1 mark)

ii) Name the important reagents and conditions in;
 Step I: (½ mark)

Reagent

Condition

Step V: (½ mark)

Reagent (½ mark)

Condition (½ mark)

- b) Name and draw the structure of compound L (2 marks)

- c) Write an equation for the reaction in Step VII (1 mark)

- d) State the homologous series to which the compound C₃H₈ belongs (1 mark)

- e) State one industrial application of the process in Step I (1 mark)

- f) Explain how one can distinguish between the compounds C₃H₈ and C₃H₆ using a chemical test (2 marks)

3. The following information show standard electrode potentials for some half reactions. Use it to answer the questions that follow.

	E°/Volts
$\text{Ce}^{4+}_{(\text{aq})} + \text{e}^- \longrightarrow \text{Ce}^{3+}_{(\text{aq})}$	+1.61
$\text{Fe}^{3+}_{(\text{aq})} + \text{e}^- \longrightarrow \text{Fe}^{2+}_{(\text{aq})}$	+0.77
$\text{I}_{2(\text{aq})} + 2\text{e}^- \longrightarrow 2\text{I}^{-}_{(\text{aq})}$	+0.54
$\text{Fe}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{Fe}_{(\text{s})}$	-0.44
$\text{Zn}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{Zn}_{(\text{s})}$	-0.76
$\text{J}^{3+}_{(\text{aq})} + 3\text{e}^- \longrightarrow \text{J}_{(\text{s})}$	X

- a) Identify the strongest reducing agent (1 mark)

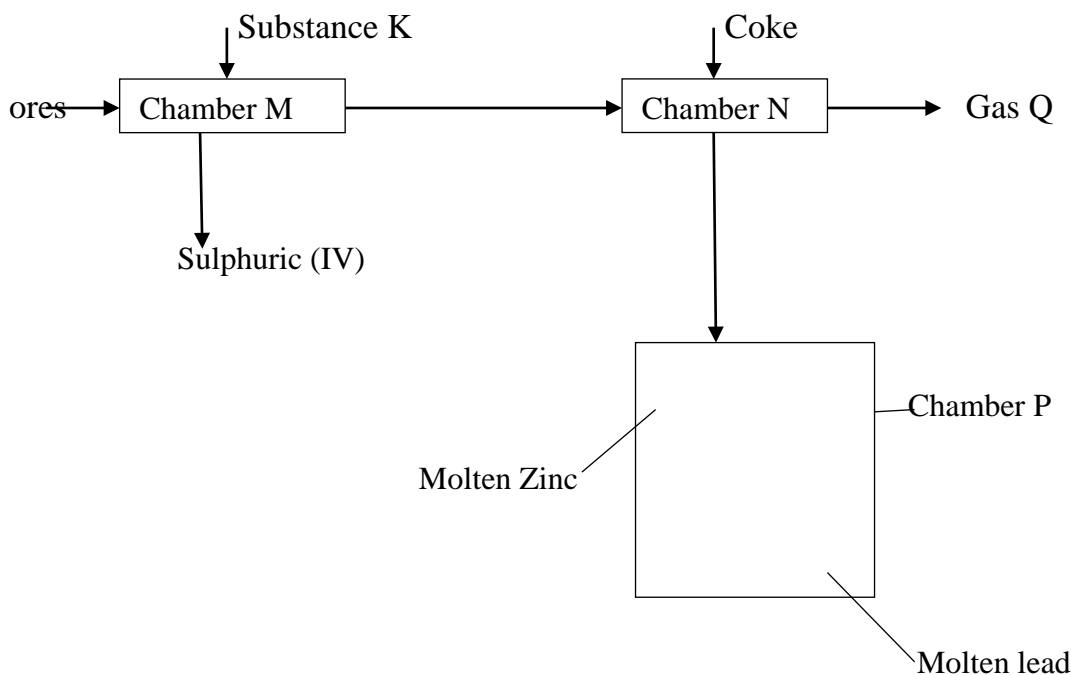
- b) Which substance in the table is suitable to oxidize iodide ions to iodine? (1 mark)

- c) Study the cell representation below and answer the questions that follow.



- (i) Identify the anode and the cathode
Anode: (1 mark)
Cathode: (1 mark)
- (ii) If the two half cells in c(i) above are connected externally, write an equation taking place in zinc half cell (1 mark)
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.....
- iii) Calculate the e.m.f. of the cell (1 mark)
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- iv) State the role of KNO_3 (1 mark)
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- v) Explain what happens when $\text{KCl}_{(\text{aq})}$ is used instead of KNO_3 in a case where $\text{Pb}_{(\text{s})}/\text{Pb}^{2+}_{(\text{aq})}$ is one of the half cells (2 marks)
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- vi) Draw an electrochemical cell to represent the cell in c(ii) above (2 marks)
- vii) If the e.m.f. of the cell $\text{J}_{(\text{s})}/\text{J}^{3+}_{(\text{aq})}/\text{I}_{2(\text{s})}/2\text{I}^{-}_{(\text{aq})}$ is +1.32V, calculate the value of $\text{J}^{3+}_{(\text{aq})}/\text{J}_{(\text{s})}$ (1 mark)

4. The flow diagram shows the extractions of lead and zinc metals. Study it and answer the questions that follow.



- a)i) Name the chief ores used in the extraction of;
 Zinc (½ mark)

 Lead (½ mark)

- ii) Identify substances K and Q
 K (½ mark)
 Q (½ mark)
- iii) State the function of coke in chamber N (1 mark)

- iv) Write a chemical equation for the reaction between gas Q and calcium hydroxide solution (1 mark)

- v) What property makes it possible to separate the two metals (1 mark)

- vi) Explain why zinc is preferred for coating iron to copper (1 mark)

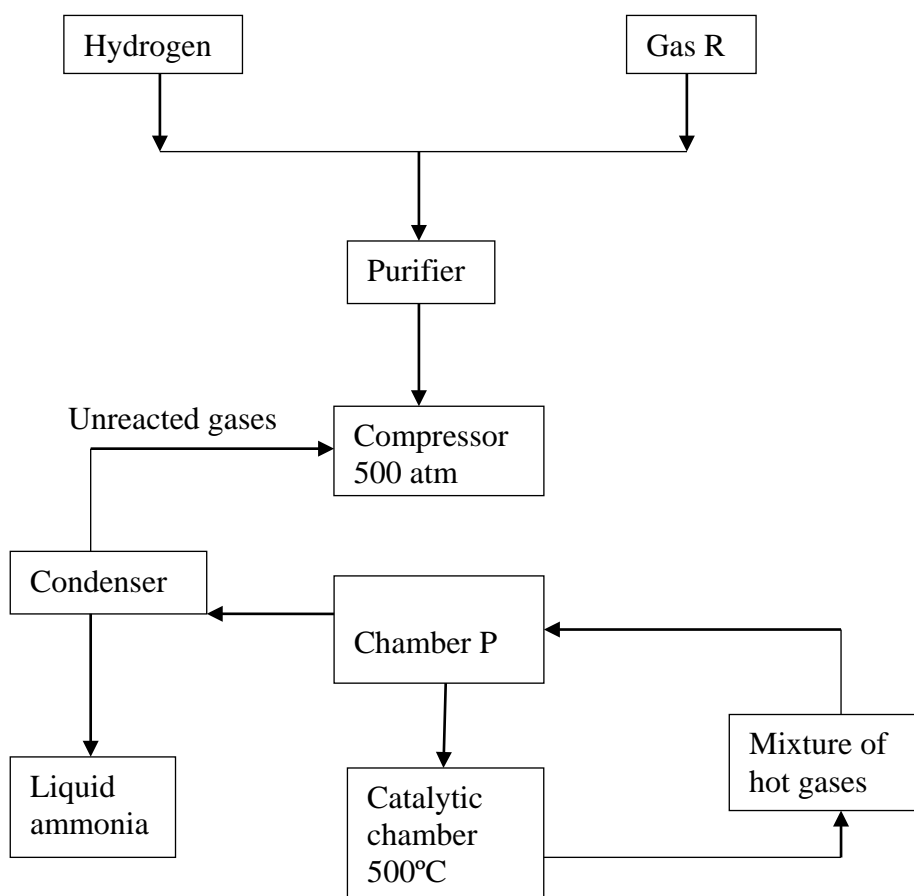
- vii) State two effects that this process would have on the environment (2 marks)

viii) Give one use of zinc (1 mark)

b) The process of obtaining pure zinc is by electrolytic method.
(i) Name the electrolyte used in the electrolytic method (1 mark)

(ii) Describe an experiment carried out to determine the presence of zinc metal in a sample of soil using dilute sulphuric (vi) acid and aqueous ammonia (2 marks)

5. The flow chart below show the large scale manufacture of ammonia by haber process. Study it and answer the questions that follow.



- a) Identify gas R [for free papers visit www.freekcsepastpapers.com](http://www.freekcsepastpapers.com) (1 mark)

- b) i) Name two sources of hydrogen gas used in the process (2 marks)

- ii) Explain the reason why the mixture of hydrogen gas and gas R are passed through the purifier (2 marks)

- iii) Name a suitable catalyst used in the catalytic chamber (1 mark)

- c)i) Identify chamber P (½ mark)

- ii) Explain why mixture of hot gases is passed through chamber P (1 mark)

- iii) Write an equation for the main reaction in the catalytic chamber (1 mark)

- d) Explain using equations the following observation
 Hot platinum wire glows on coming into contact with fumes of Ammonia (2 marks)

- e) State two industrial uses of ammonia (1 mark)

6. a) Define the term molar heat of formation (1 mark)

- b) Use the following standard enthalpies of combustion to answer the questions that follow.
 $\Delta H^{\circ}_c(\text{carbon}) = -393\text{kJmol}^{-1}$
 $\Delta H^{\circ}_c(\text{H}_{2\text{g}}) = -286\text{kJmol}^{-1}$
 $\Delta H_c(\text{C}_4\text{H}_{10}) = -1290\text{kJmol}^{-1}$

- (i) Write the equation for the formation of butane (1 mark)

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- (ii) Draw an energy level diagram that links heat of formation of butane with its heat of combustion and the heats of combustion of carbon and hydrogen (3 marks)

- (iii) Calculate the standard heat of formation of butane (2 marks)

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- c) Determine the heating value of butane (1 mark)

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- d) Use the bond energies below to calculate the enthalpy change for the formation of chloromethane from methane gas and chlorine gas

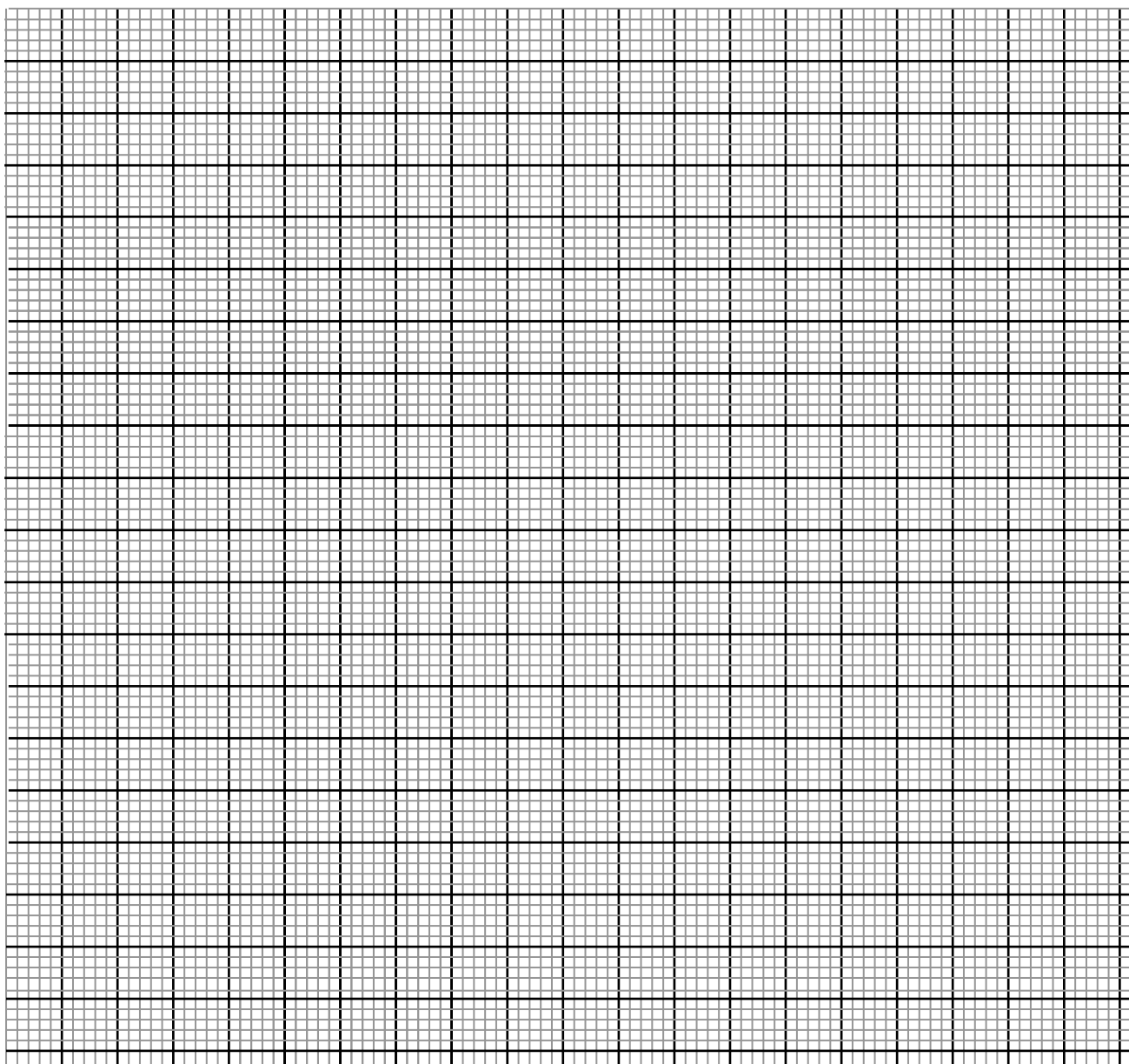
Bond	Bond energy in kJmol^{-1}
H-Cl	431
Cl-Cl	242
C-H	413

(3 marks)

7. I. The solution in grams of sodium nitrate in 100g of water is given for various temperature in degree celcius

Temperature	0	10	20	30	40	50	60	80	90	100
Solubility	73	80	88	96	104	114	124	148	162	180

a) Draw a graph of solubility of sodium nitrate against temperature (3 marks)



b) From the graph determine the solubility of sodium nitrate at 70°C (1 mark)

c) 100 grams of a saturated solution of sodium nitrate at was cooled from 80°C to 10°C. What mass will crystallize out (2 marks)

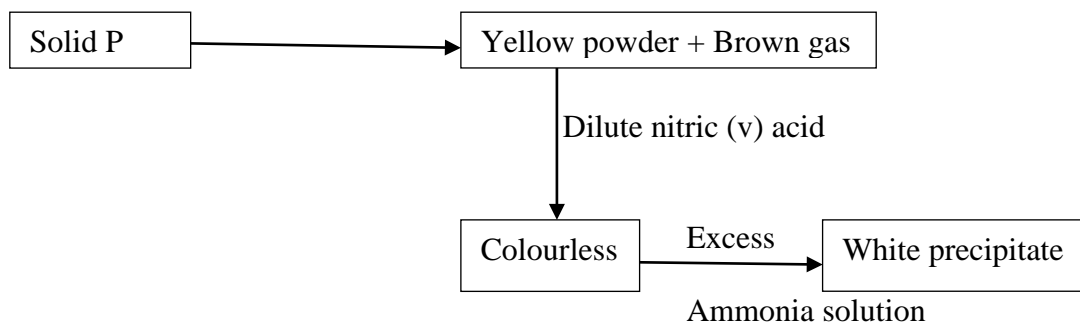
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II Study the flow chart below and answer the questions that follow.



(i) Write the chemical formula of;

a) Solid P

(1 mark)

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b) The white precipitate

(1 mark)

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III Starting with copper(II) carbonate, describe how a solid sample of copper (II) sulphate crystals would be prepared

(3 marks)