

## CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2016

233/2

## CHEMISTRY

## PAPER 2

## (THEORY)

JULY/AUGUST, 2016

TIME: 2 HOURS

1. (a) The grid given below represents part of the periodic table. Study it and answer the questions that follow. Letters do not represent the actual symbols of the elements.

								A
					B			
	C			D			E	
	F							

- (i) What name is given to the group of elements to which C and F belong?  
 (ii) Which letter represents the element that is the least reactive? (½mk)  
 (iii) What type of bond is formed when B and E react? Explain. (2mks)  
 (iv) Write the formula of the compound formed when D and oxygen gas reacts.  
 (v) On the grid, indicate with a tick (✓) the position of element G which is in the third period of the periodic table and forms  $G^{3+}$  ion. (1mk)
- (b) Study the information in the table below and answer the questions that follow. Letters do not represent the actual symbols of the substances.

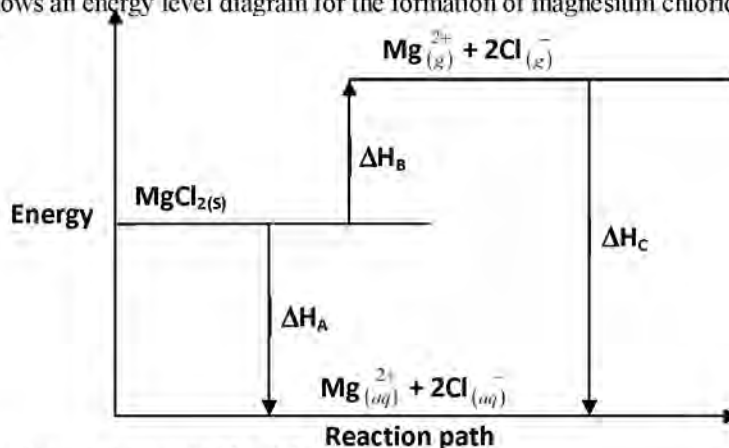
Substance	Melting point (°C)	Boiling point (°C)	Solubility in water	Density at room temp. (g/cm³)
H	-117	78.5	Very soluble	0.8
J	-78	-33	Very soluble	$7.7 \times 10^{-4}$
K	-23	77	Insoluble	1.6
L	-219	-183	Slightly soluble	$1.33 \times 10^{-3}$

- (i) Which substance would dissolve in water and could be separated from the solution by fractional distillation. Give a reason. (2mks)  
 (ii) Which substance is a liquid at room temperature and when mixed with water, two layers would be formed. (1mk)  
 (iii) Which letter represents a substance that is a gas at room temperature and which can be collected. (1mk)  
 I Over water? Explain. (2mks)  
 II By downward displacement of air?  
 (Density of air =  $1.29 \times 10^{-3} \text{ g/cm}^3$  at room temperature). (1mk)

2. A student from Nyeri High School wanted to determine the enthalpy change of combustion when a hydrocarbon with the formula  $C_6H_{14}$  was burnt. The following are the results of the experiment done.

Mass of water = 100g  
 Initial temperature =  $18.0^\circ\text{C}$   
 Final temperature =  $58.0^\circ\text{C}$   
 Mass of the hydrocarbon burned = 0.43g  
 Specific heat capacity of water =  $4.2 \text{ Jg}^{-1}\text{K}^{-1}$

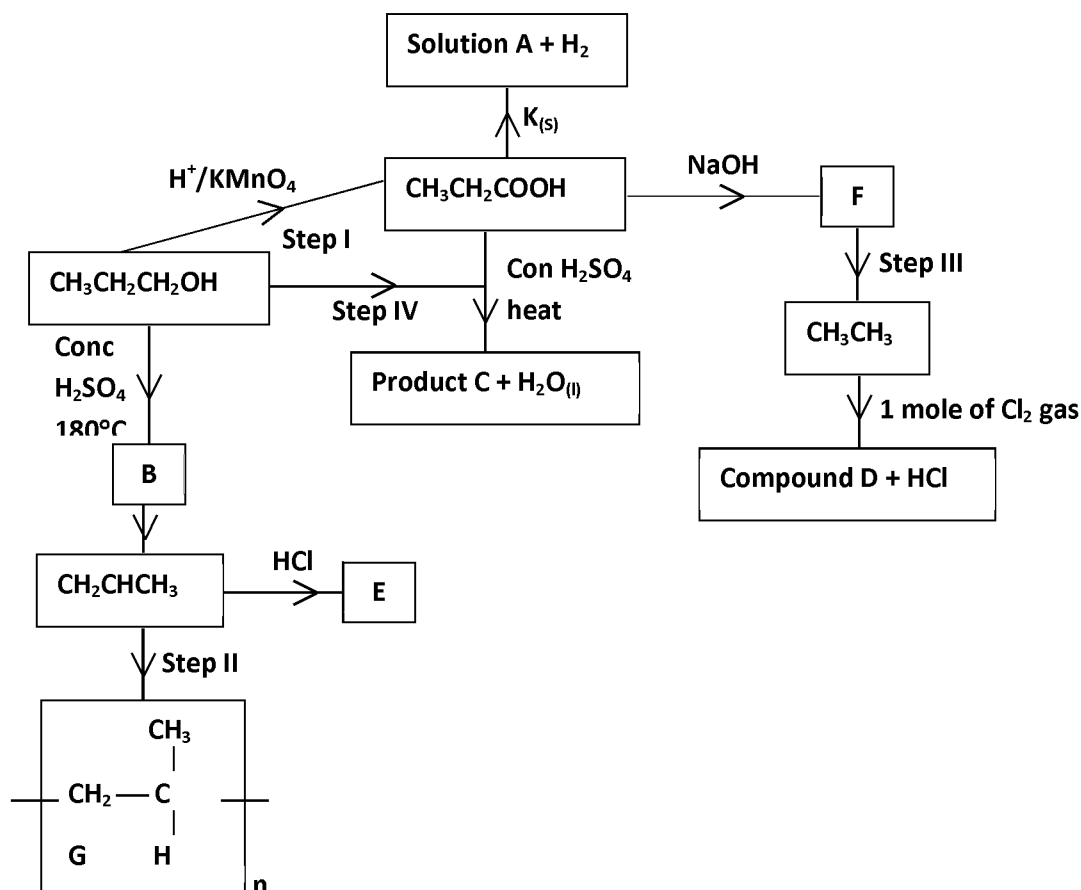
- (a) Write a balanced equation for the combustion of the hydrocarbon. (1mk)  
 (b) (i) Calculate the amount of heat given out in kJ when 0.43g of the hydrocarbon burn in air. (2mks)  
 (ii) Calculate the number of moles of the hydrocarbon that were burnt. (1mk)  
 (iii) Calculate the molar enthalpy of combustion of the hydrocarbon. (2mks)  
 (c) The theoretical value of the heat released when 1 mole of the hydrocarbon is burnt is  $4194.7 \text{ kJ/mol}^{-1}$ . Give two reasons why the value obtained from this experiment is less than the theoretical value. (1mk)  
 (d) The diagram below shows an energy level diagram for the formation of magnesium chloride. Study it and answer the questions that follow.



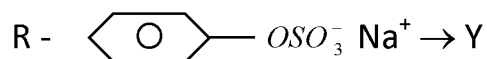
- (i) State the enthalpy changes represented by A, B and C



(b) The scheme below shows a series of reactions starting with propanol.

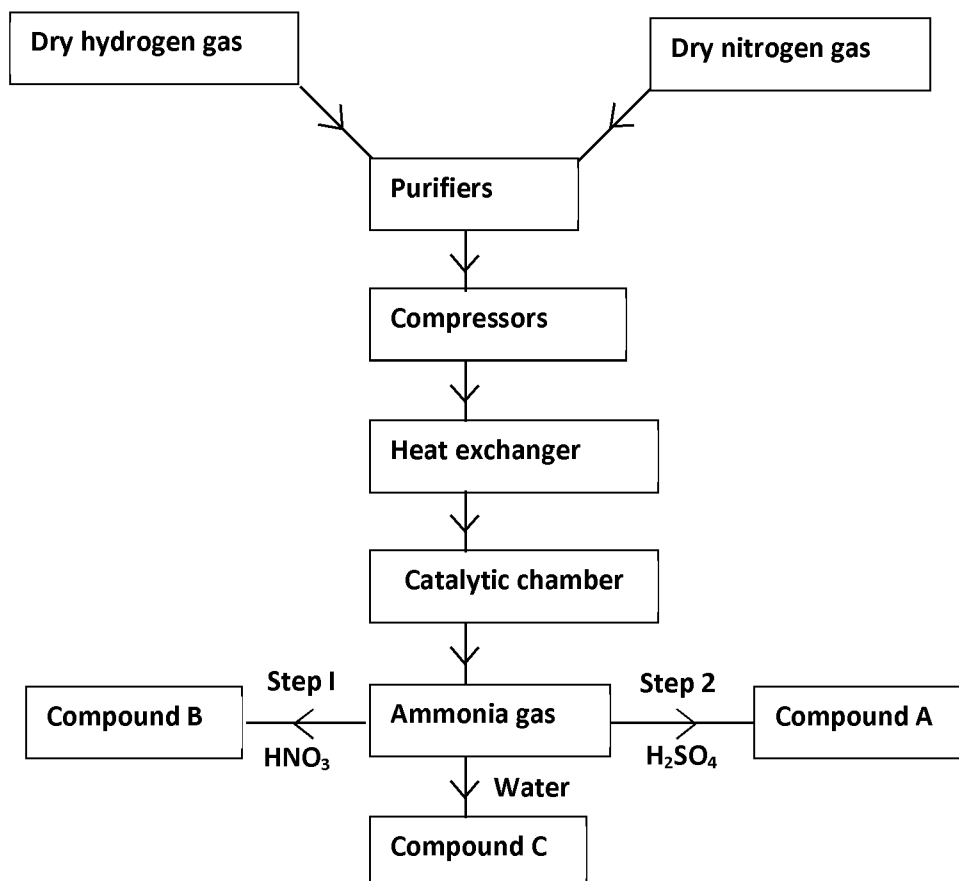


- Name the type of reaction in Steps **I** and **II**. (1mk)
- Write equation for the reaction that takes place in Step **III**. (1mk)
- Name substances **A**, **D**, **E** and **F**. (2mks)
- Draw the structural formula of compound **C**. (1mk)
- Give **one** disadvantage of continued use of substance **G**. (1mk)
- State the type of reaction involved in formation of compounds **B** and **D**. (1mk)
- If the relative molecular mass of **G** is 35, 700, determine the value of  $n$ . (2mks)
- Below are structures of two cleansing agents.

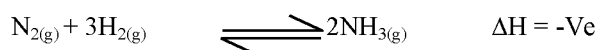


- Identify the cleaning agent suitable for use in water containing  $\text{MgSO}_4$ . (1mk)
- State **one** disadvantage of using this cleaning agent. (1mk)

5. The flow chart below shows the large scale manufacture of ammonia gas and some ammonium compounds. Study it and answer the questions that follow.



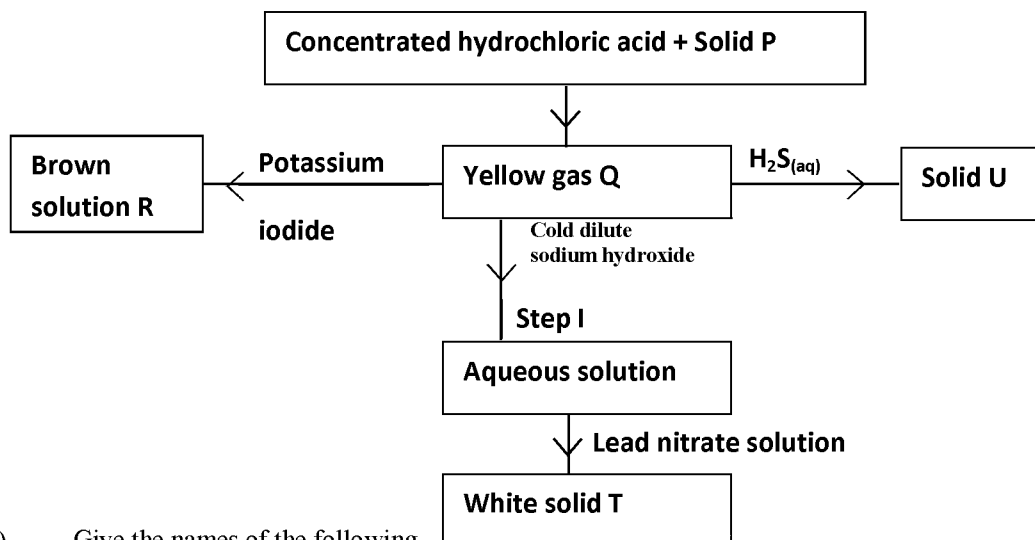
- (a) What are the sources of the following raw materials?  
 (i) Hydrogen gas. (½mk)  
 (ii) Nitrogen gas. (½mk)
- (b) What optimum conditions are needed during the manufacture of ammonia in the :  
 (i) Compressor. (1mk)  
 (ii) Catalytic chamber. (1mk)
- (c) Why should the gas be passed through the compressor. (1mk)
- (d) Write an equation for the reaction that occurs in Step I. (1mk)
- (e) Give **one** use of Compound B. (1mk)
- (f) Calculate the percentage of nitrogen in Compound A. (2mks)
- (g) I What observation would be made if Compound C was added to a sample suspected to contain copper (II) ions dropwise then in excess? (2mks)  
 II Name the compound formed when Compound C is added in excess. (1mk)
- (h) Study the equation below and use it to answer questions that follow.



What would be the effect on the yield of ammonia gas when:

- I pressure is increased. (1mk)  
 II Temperature is decreased. (1mk)

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

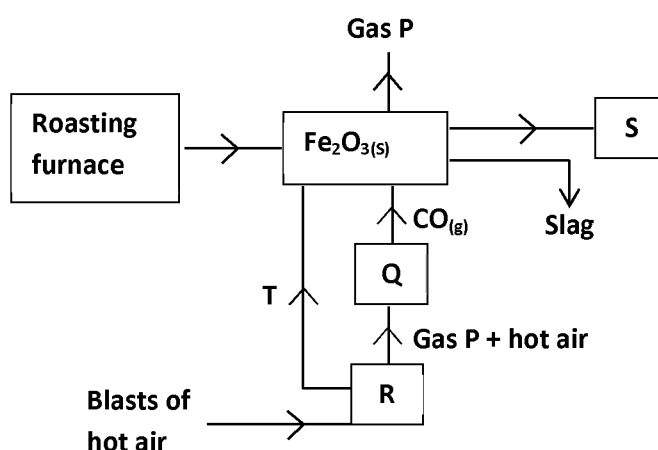


- (a) Give the names of the following. (3mks)
- Solid **P**
  - Solid **U**
  - Solid **T**
- (b) Write the equation for the reaction taking place in Step I. (1mk)
- (c) Write the equation for the reaction between concentrated hydrochloric acid and solid P. (1mk)
- (d) Explain what would happen if hot concentrated sodium hydroxide was used in place of cold dilute sodium hydroxide. (1mk)
- (e) State **two** differences between bleaching by chlorine and bleaching by sulphur (IV) oxide. (2mks)

Chlorine	Sulphur (IV) oxide

- (f) When chlorine water is left under sunlight, the yellow fades to form a colourless solution. Use a chemical equation to explain this observation. (1mk)
- (g) Explain **two** pollution effects caused by chlorine and its compounds to the environment. (2mks)

7. The flow chart below is for the extraction of iron metal. Study it then answer the questions that follow.



- (a) Identify: (3mks)
- Gas **P**
  - Solid **Q**
  - Solid **R**
- (b) Name the main ore used during extraction of iron. (1mk)
- (c) Identify **one** substance present in the slag. (1mk)
- (d) Write the equation for the reaction that takes place leading to formation of solid S. (1mk)
- (e) Give the role of solid **R** in the process. (1mk)