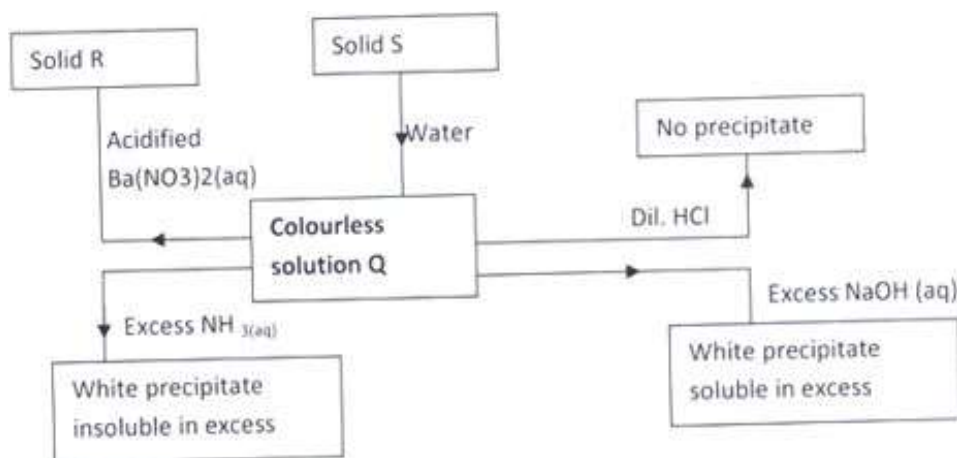


## FORM FOUR CLUSTER KCSE MODEL11

### CHEMISTRY PAPER 2 QUESTIONS

1. a) i) An evacuated flask has a mass of 90.050 g. When filled with gas X at s.t.p the flask weighs 90.121g. If the volume of the flask was 22.2cm<sup>3</sup>. Calculate the relative molecular mass of X. (Molar gas volume at s.t.p =22.4dm<sup>3</sup>)  
ii) Write the equation of the reaction taking place when propane is burnt in excess oxygen. (1 mark) .....
- b) i) A fixed mass of a gas occupies 4 dm<sup>3</sup> at 2270C and 152mmHGg pressure. At what pressure will the volume of the same mass of gas be 2dm<sup>3</sup> if the temperature is lowered to -230C.  
c)i) Study the scheme diagram below and answer the questions that follow.



#### Identify

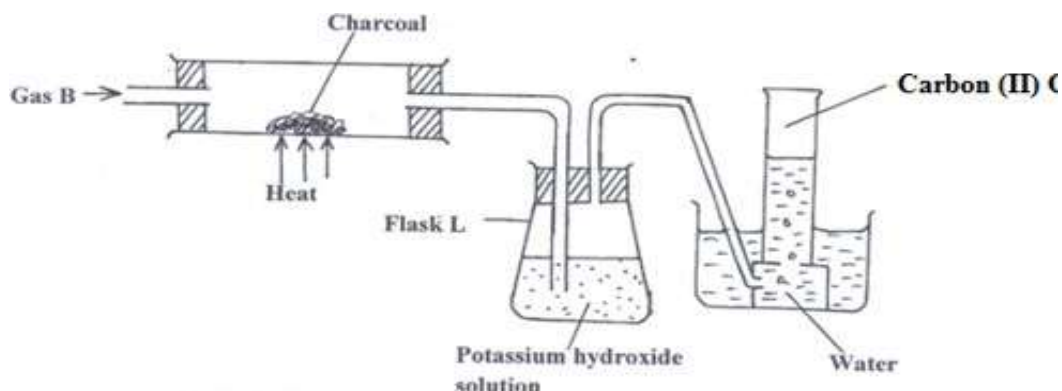
Solution

Q.....

Solid

R.....

2. A student set-up the following apparatus to prepare carbon (II) oxide from charcoal in the laboratory.



a) i) State the purpose of potassium hydroxide solution.

.....  
 .....

ii) Name two substances that react together to produce gas B. ....

.....

b) Write balanced equations for reactions in: i. Combustion tube.

.....

ii. Flask L

.....

c) Describe two simple tests that you would use to distinguish between carbon (IV) oxide and carbon (II) Oxide. ....

.....  
 .....

d) In another experiment, the student reacted charcoal with excess concentrated nitric (V) acid. i. State two observations made:

.....

ii. Write balanced equation for the reaction.

.....

e) Carbon (II) Oxide can also be prepared in the laboratory by reacting ethanedioic acid and another acid substance.

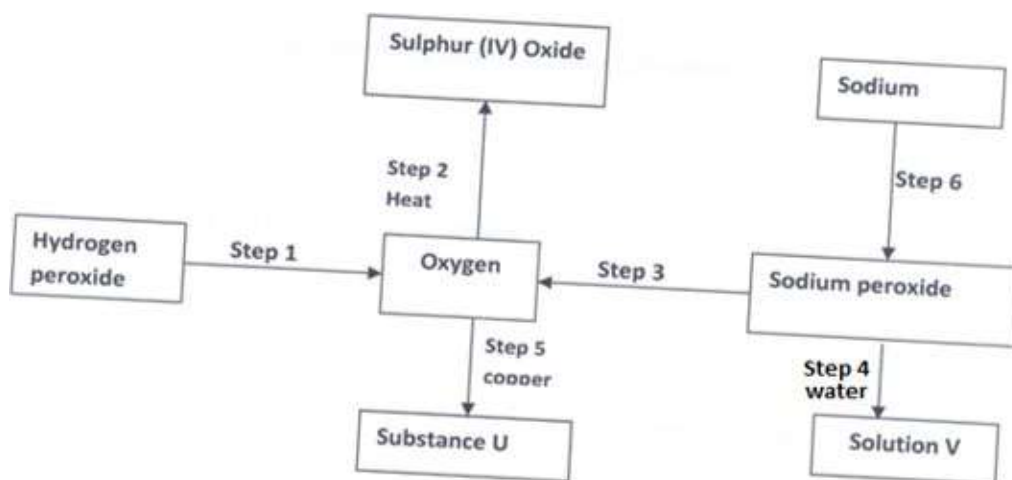
i. Name this substance and its role in this reaction.

.....  
 .....

ii. State two uses of carbon (II) Oxide.

.....  
 .....

3. Study the reaction scheme below and answer the questions that follow.



a) Identify the substances labeled: i. Substance U

.....

ii. Solution V (1 mark)

.....

b) Name the reagents necessary for the reactions in the following steps.

i. Step 1.....

ii. Step 2.....

iii. Step 3.....

iv. Step 6.....

c) Give the condition necessary for the reaction in step 5 to take place. ....

.....

d) Write equations for the reactions in the following steps.

i. Step 1.....

ii. Step 2.....

iii. Step 5.....

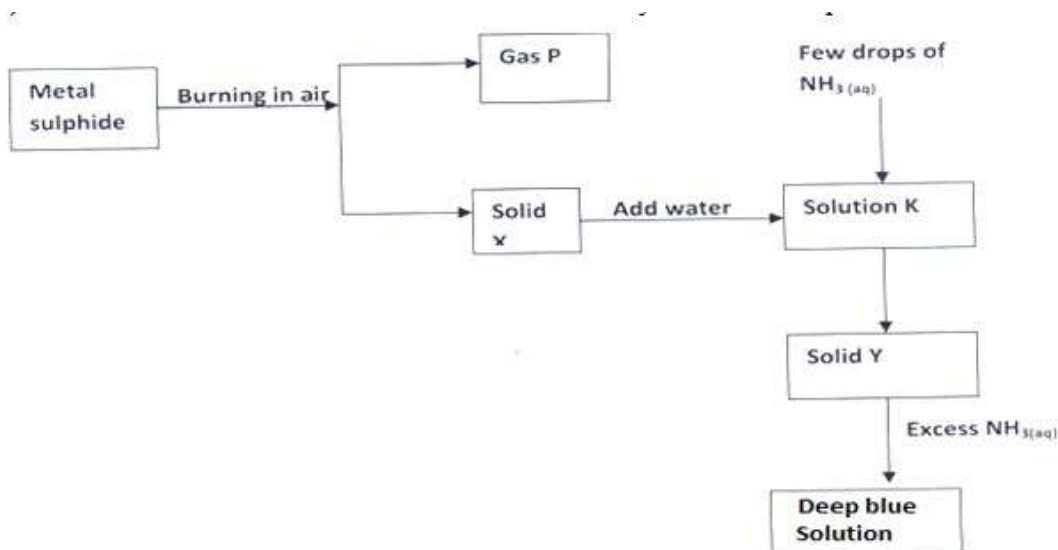
4. a) The results of an experiment to determine the solubility of solid Y in water at 40°C were as follows.

Mass of dish = 16.9g Mass of dish + saturated salt at 40°C = 26.955g

Mass of dish + solid after evaporation to dryness = 17.96g

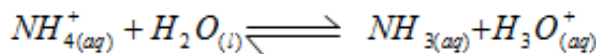
Determine solubility of solid Y using the data above.

b) The scheme below shows some reactions of salt. Study it and answer questions that follow



- i. Write an equation for the reaction to show formation of gas P and solid X.  
 .....
- ii. Give the name and formula of the complex ion responsible for the deep blue colour in the solution.  
 .....

c) Study the equation below and answer the questions that follow:



Identify the reactant that acts as an acid in the reverse process.

Explain your answer. ....

d) i) What is meant by hard water?

.....

ii) Using an ionic equation, explain how sodium carbonate removes permanent hardness of water.

5. 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 .....

b) Write down an equation for the formation of ammonia from the raw materials. ....

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

i. High pressure

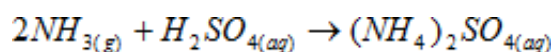
.....

.....  
ii. Low temperature  
.....  
.....

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

e) Explain the effect of the iron catalyst on the yield of ammonia in the Haber Process. ....  
.....  
.....

f) 0.34dm<sup>3</sup> of ammonia gas at s.t.p reacted with dilute sulphuric (VI) acid to form ammonium sulphate according to the following equation

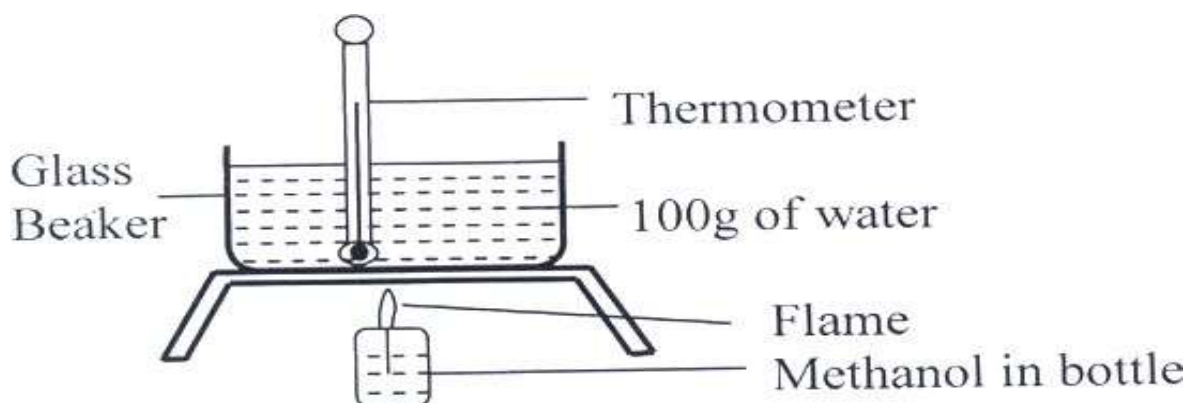


Determine the mass of the ammonium sulphate produced.

(N=14,H=1,S=32,O=16; molar gas volume at s.t.p =22.4dm<sup>3</sup>)

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:

Initial temperature of water = 21.50°C

Final temperature of water = 30.00°C

Initial mass of bottle + methanol = 85.10 g

Final mass of bottle + methanol = 84.78 g

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)

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

c) The accurate (theoretical) value of heat of combustion of methanol is -638kJ/mole.

How does this value compare with the one in (a) above?

.....  
 .....  
 .....

d) Write the thermo chemical equation for the combustion of methanol. ....  
 .....  
 .....

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

7. Section below represents part of a periodic table. Study it and answer the questions that follow.

The letters are not the actual symbols of the elements.

				Q				
X				H		O	T	W
Y			A				V	
Z							S	

i. Which element will require the largest amount of energy to remove one of the outermost electrons in group  
 .....

ii. Select the least reactive non-metal.

.....  
 iii. Which of the elements has the largest tendency of forming covalent bonds in nature? Explain your answer  
 .....

iv. Ions of element M (M<sup>2-</sup>) have an electronic configuration of 2.8.8. Place element M on the grid above.

v. Write the electronic arrangement of element W hence give one use.  
 .....  
 .....

b) Study the table below and answer questions that follow.

Formula of Chlorides	<u>NaCl</u>	<u>MgCl<sub>2</sub></u>	AlCl <sub>3</sub>	SiCl <sub>4</sub>	PCl <sub>3</sub>	SCl <sub>2</sub>	
M.P (°C)	801	714				-80	
Formula of oxides	Na <sub>2</sub> O	<u>MgO</u>	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	P <sub>4</sub> O <sub>10</sub>	SO <sub>2</sub>	Cl <sub>2</sub> O <sub>7</sub>
M.P(°C)	1190	3080	2050	1730	560	-73	-90

i. Using dots (.) and crosses (x) to represent electrons, draw a diagram to show bonding in the following compounds.

I. PCl<sub>3</sub>

II. NaCl

ii. Why is the melting point of AlCl<sub>3</sub> not indicated in the tube above?

.....

iii. Explain the large difference in the melting points of the compounds of formula MgO and P<sub>4</sub>O<sub>10</sub>.

.....  
 .....