NAME.....Adm No.....C/Class no.....

NYABURURU GIRLS' NATIONAL SCHOOL

Our Lady of lourdes

Date .....

Invigilator .....

Date returned .....

Date revised .....

**233/2**
**CHEMISTRY**
**PAPER 2**
**(THEORY)**
**March Series-2016**
**TIME: 2 HOURS**

**INSTRUCTIONS TO CANDIDATES:**

a) Write your **name** and **index number** in the spaces provided **above**.
b) **Sign** and write the **date** of examination in the spaces provided **above**.
c) Answer **ALL** the questions in the spaces provided.
d) Mathematical tables and silent electronic calculators **may be** used.
e) All working **must be** clearly shown where necessary
f) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing
g) Candidates should answer the questions in English.

**For Examiner's Use Only**

| QUESTION | MAX. SCORE | CANDIDATE SCORE |
|---|---|---|
| Q1 | 13 | |
| Q2 | 20 | |
| Q3 | 12 | |
| Q3 | 14 | |
| Q5 | 10 | |
| Q6 | 11 | |
| TOTAL | 80 | |

*The paper has 10 printed pages*

1. The table below gives some elements of the periodic table and their atomic masses, atomic numbers and melting points. The letters are not the actual symbols of the elements.

| Element | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| Atomic No | 7 | 8 | 19 | 15 | 2 | 9 | 6 | 16 | 12 | 11 |
| Atomic mass | 14 | 16 | 39 | 31 | 4 | 19 | 12 | 32 | 40 | 23 |
| Melting point ($^0$C) | - | - | 63.7 | 44 | -272 | -223 | Vary | 113 | 669 | 98 |

a) **Select two** elements with oxidation states of -3 (1mk)

.....

b) **Which** elements represent:-

i) The most powerful reducing agent. Explain ($^1/_2$mk)

.....

ii) The least reducing agent. Explain ($^1/_2$mk)

.....

.....

c) How does the atomic radius of D compare with that of K. Explain (1mk)

.....

.....

d) How do you compare the electrical conductivity of element D and K. Give your reason (1mk)

.....

.....

e) **Select two** elements which when reacted form a compound that conducts electricity both in molten and aqueous state. (1mk)

.....

f) Select any two elements which when reacted form a compound that dissolves in water to form an acidic solution. (1mk)

.....

g) In which period and group do elements D and G belong? (1mk)

.....

h) Explain why for some elements the atomic mass is not twice the atomic number (1mk)

.....

i) Explain why the melting point of element K is higher than that of element D(2mks)

.....

.....

.....

J) Describe how a solid mixture of the sulphate of element K and lead (II) sulphate can be separated. (3mks)

.....

.....

.....

.....

2. a)A combustion of a hydrocarbon compound gave 4.4g carbon (IV) oxide and 2.25g water.

i) Calculate the mass of carbon and hydrogen in the hydrocarbon sample (2mks)

.....

.....

.....

.....

ii) Calculate the empirical and molecular formula of the hydrocarbon given that it has a relative molecular mass of 58. (C = 12, H = 1) (2mks)

.....

.....

.....

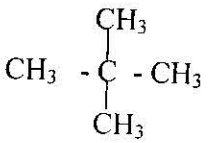
.....

.....

b) (i) What are unsaturated hydrocarbon compounds ? (1mk)

.....

(ii)Give the names of the following organic compounds. (2mk)

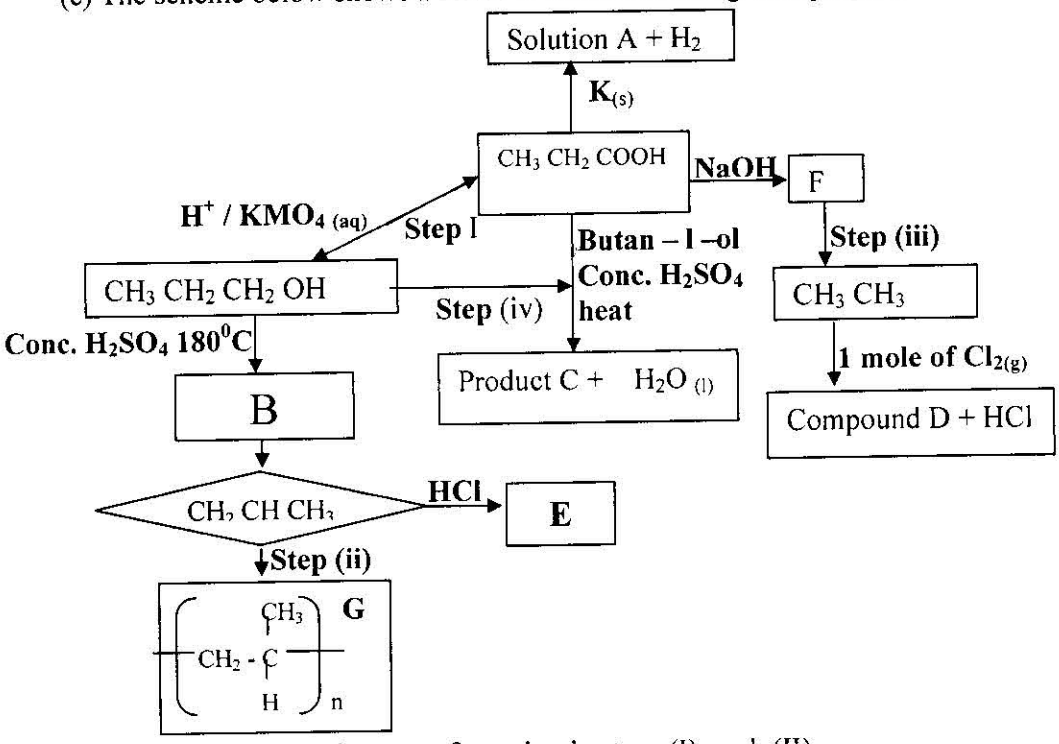
(I) 

.....

(II) $CH_2\ CH\ CH_2\ CH\ CH_2$

.....

(c) The scheme below shows a series of reaction starting with propanol




(i) Name the type of reaction in steps (I) and (II) (1mk)

.....

(ii) Write equation for the reaction that takes place in step III (1mk)

.....

(iii) Name substances **A, B , C , D , E** and **F** (3mks)

**A**.....

**B**.....

**C**.....

**D**.....

**E**.....

**F**.....

(iv) Draw the structural fomular of compound C (1mk)

(c) (i) Name the process in step IV (1mk)

.....

(ii)State the type of reactions involved in formation of compound **B.** (2mks)

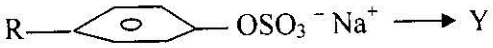
.....

.....

(iii)If the relative molecular mass of **G** is 35,700 determine the value of n (2mks)

(iv)Below are structures of two cleaning agents.

$R - COO^- Na^+ \longrightarrow X$



(I) Identify the cleaning agent suitable for use in water containing $MgCl_2$ (1mk)

.....

(II) State **one** disadvantages of using this cleaning agent (1mk)

.....

.....

3.In an experiment to investigate the solubility of solids P and Q, the following results were obtained.

| Temperature ($^0C$) | 0 | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|
| Solubility of solid P (g/ 100g of water) | 8 | 13 | 24 | 38 | 61 | 98 |
| Solubility of solid Q (g/ 100g of water) | 28 | 32 | 35 | 38 | 42 | 46 |

a) Plot a graph of solubility of P and Q against temperature on the axis(see the grid Next page) (5mks)

b) From your graph determine

i) The solubility of P at room temperature ($25^0C$) (1mk)

.....

ii) The temperature at which the solubility of P is 45g/100g (1mk)

.....

c) If a solution of P containing 35g of solid in 100g of water is cooled from $40^0C$, determine:

i)The temperature at which crystals will first form (1mk)

.....

ii)The mass of the crystals deposited if the solution is cooled to $5^0C$ (1mk)

.....

d) How much of substance Q could be soluble in 80g of water at $50^0C$ (2mks)

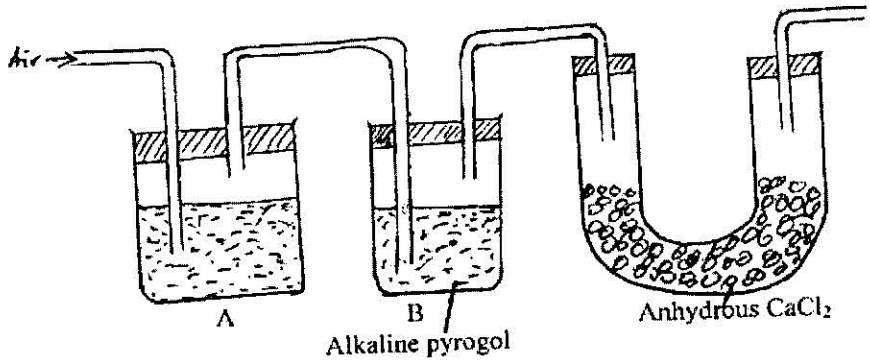
.....

.....

e) State the temperature at which P and Q have the same solubility. (1mk)

.....

4. a) Study the diagram below and answer the questions that follow.




i) Solution in reagent Bottle A is used to absorb $CO_2$ gas, name it and write the equation for the reaction of $CO_2$ and the solution. (2mks)

.....

.....

ii) Name the component removed in reagent bottle B (1mk)

.....

iii) Name 2 impurities of nitrogen collected through this method. (1mk)

.....

.....

b) Ammonia undergoes catalytic oxidation forming on a an oxide which if further oxidized to form Nitric(V) acid as shown below

$$4NH_{3(g)} + 5O_{2(g)} \longrightarrow 4NO_{(g)} + 6H_20_{(l)}$$

$$4NO_{(g)} + 2H_2O_{(l)} + 3O_2(g) \longrightarrow 4HNO_3(aq)$$

i) If 3200 $cm^3$ of $NH_3$ were oxidised, calculate the volume of Nitric (V) acid produced (MGV = 24$dm^3$, N=14, H = 1, O = 16) (2mks)

.....

.....

.....

.....

.....

ii) Urea ($CO(NH_2)_2$) and $NH_4NO_3$ are nitrogenous fertilizes. Which is the most recommended fertilizer? Show your working. (2mks)

.....

.....

.....

.....

c) Magnesium reacts in air forming too substances.

i) Name two substances. (2mks)

.....

.....

iii) When litmus paper is added a solution of one of the product b(i) above, the litmus paper turns blue. Using a chemical equation explain the observation (2mks)

.....

.....

.....

iv) What is "laughing gas"? (1mk)

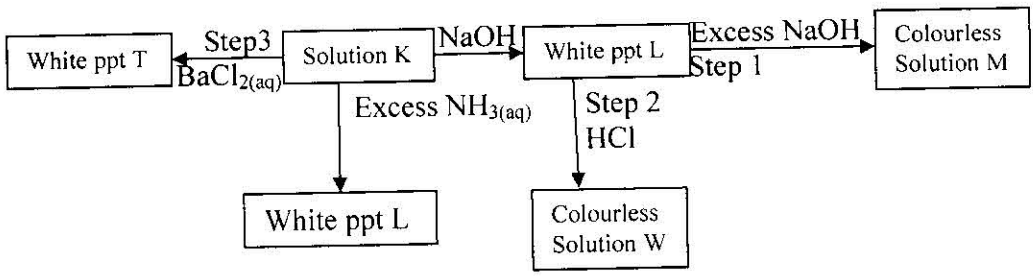
.....

v) Explain the chemistry of laughing gas (1mk)

.....

.....

5. Study the flow chart below and use it to answer the questions that follow.




a) Identify the cation and anion in solution K.

i) Cation ..... (1mk)

ii)Anion..... (1mk)

b) i) Name precipitate L..... (lmk)

ii) Write the ionic equation for the formation of precipitate L. (1mk)

.....

c) i) Name the type of reaction in step 2. (lmk)

.....

ii) Write a balanced equation for the reaction in step 2. (1mk)

.....

iii) Name any other solution that can be used in step 2 above. (1mk)

.....

d) Write the formula for the complex ion in solution M. (1mk)

.....

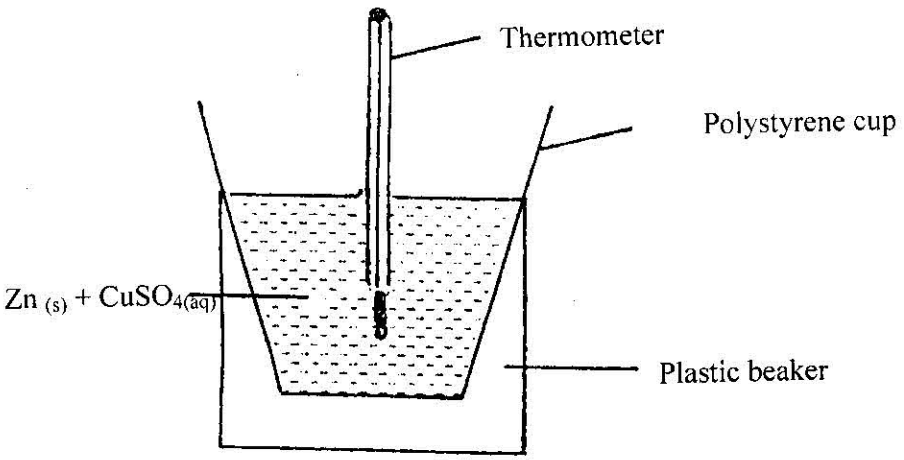
e) i) Write the ionic equation for the reaction in step 3. (1mk)

.....

ii) Write the chemical equation in step 3. (1mk)

.....

6. The apparatus below were used to determine the molar heat of displacement of copper.




1.0g zinc powder was added $50cm^3$ of 0.2M copper (II) sulphate solution and the mixture stirred gently. The temperature of the mixture rose from $20^0C$ to $27^0C$.

i) Explain why polystyrene cup was used instead of a glass beaker. (2mk)

.....

.....

ii) Write a chemical equation for the above reaction. (1mk)

.....

iii) Calculate the number of moles of copper (II) sulphate in the solution. (1mk)

.....

.....

.....

iv) Calculate the molar heat of displacement of copper (Specific heat capacity of solution = 4.2kJ/kg/K density of solution = $1gcm^3$) (2mks)

.....

.....

.....

.....

v) Why is the molar heat of displacement obtained in (iv) above lower than the actual value? (2mk)

.....

.....

.....

vi) Draw an energy level diagram for the reaction above. (3mks)

Last printed page