NAME …….. INDEX NO ……..

Candidates signature ……..

Date ……

GATUNDU SOUTH SUB-COUNTY FORM FOUR 2015 EVALUATION EXAM

233/1

CHEMISTRY

PAPER 1

(THEORY)

TIME; 2HRS

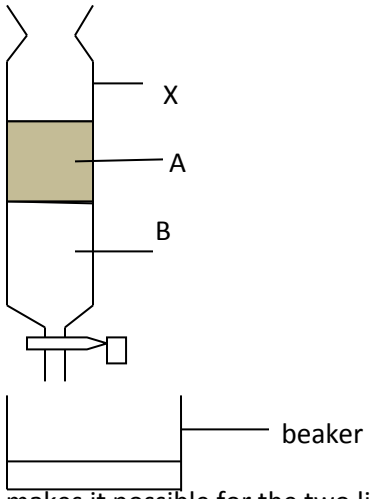
Instructions;

- Answer all the questions in the space provided
- Mathematical tables or electronic calculators may be used
- All working must be clearly shown where necessary
- Candidates may be penalized for not following instructions in this paper

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1-28	80	

THIS PAPER CONSISTS OF 13 PRINTED PAGES

1. The diagram below represents a method of separation used to separate two liquids A and B. use it to answer the questions that follow



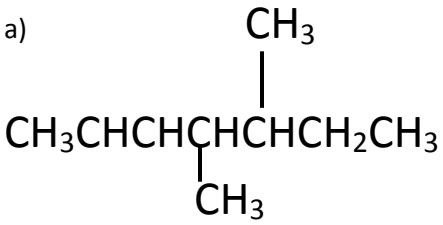
a) Name two properties that makes it possible for the two liquids to be separated. (2mks)

……
……
……

b) Give one alternative method that may be used to separate the two liquids. (1mk)

……
……

2. Name the following organic compounds (2mks)

a) 

……

b) $CH_3COOCH_2CH_2CH_2CH_3$ ……

3. Name the following processes;
   a) When anhydrous calcium chloride is left in an open beaker overnight a solution was formed. (1mk)

      ……

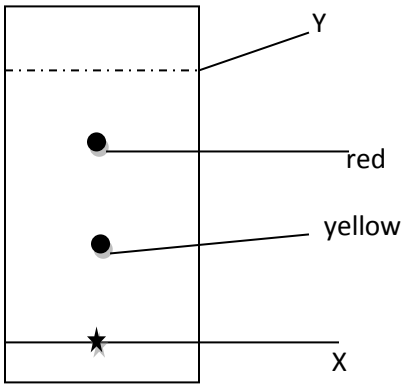
   b) When sodium carbonate decahydrate crystals are left in an open beaker for some days it turned into a powder. (1mk)

   ……

4. In 35 seconds, it was found that 140cm^3 of nitrogen (N_2) had diffused through a strip of porous porcelain. How long will it take 400cm^3 of carbon (IV) oxide to diffuse through the same strip of porous porcelain? (3mks)

   ……
   ……
   ……
   ……
   ……
   ……

5. The chromatogram below shows the constituents of a flower extract. Study it and answer the questions that follow



   a) Explain the different positions of red and yellow pigments. (2mks)

……
……

b) What does lines X and Y represent (1mk)

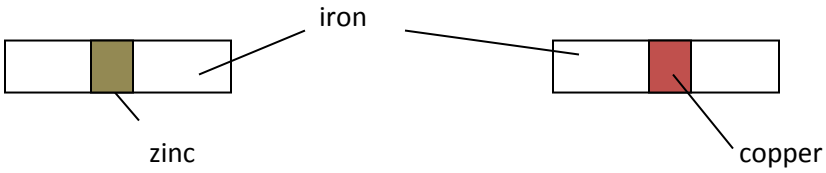
X ……

Y ……

6. Name the chief ore of iron and write its formula (2mks)

……
……
……

7. In an experiment, two pieces of iron sheets were wrapped in each case with zinc and copper metal sheets as shown below. They were left in the open for some months.



(I) (II)

State and explain the observations made in the experiments; (3mk)

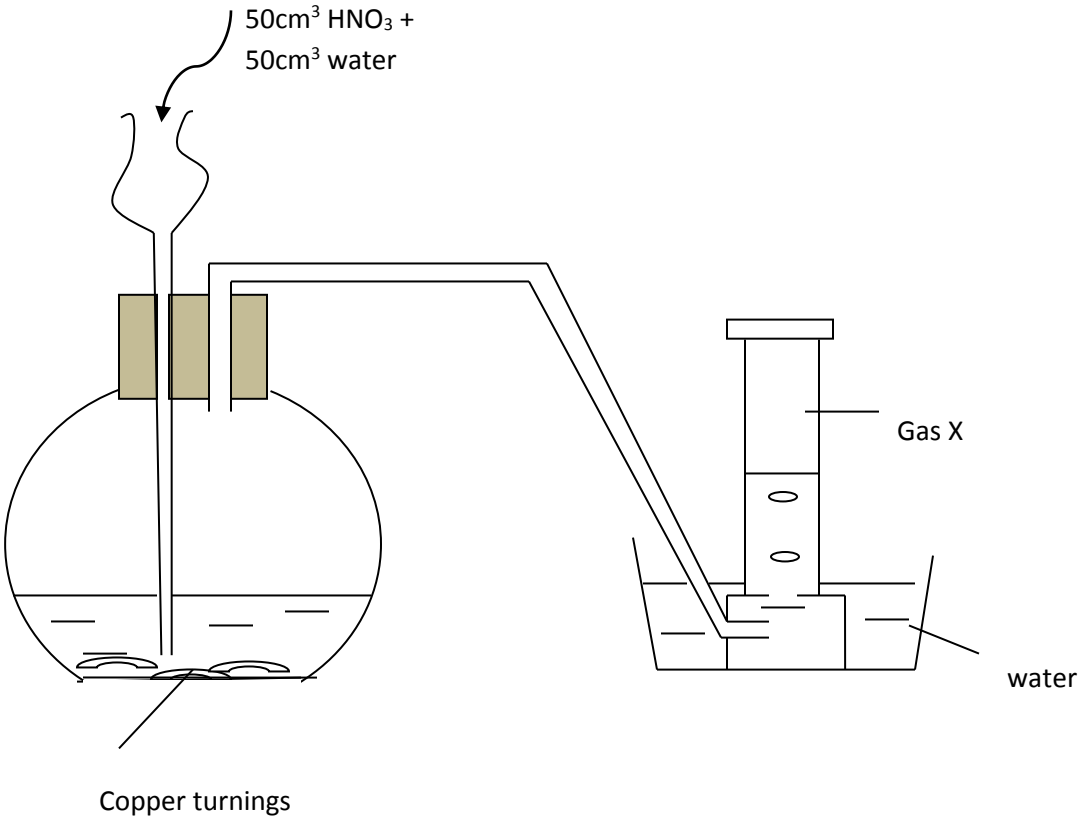
(I) ……
……
……

(II) ……
……
……

8. Compare the atomic sizes of sodium and magnesium. Explain. (2mks)

……
……
……
……

9. The set up below was used to prepare gas X. study it and answer the questions that follow;



a) Name gas X (1mk)

……

b) Write an equation for production of gas X in the set up (1mk)

……..

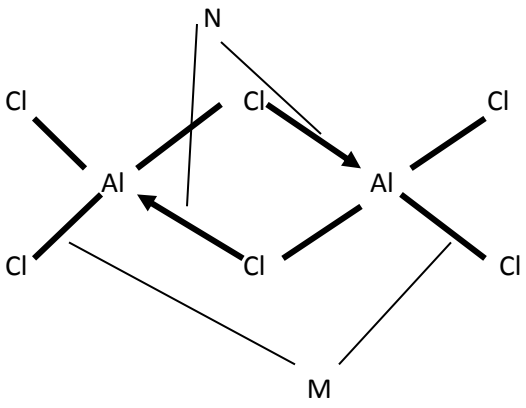
c) It's hard to test whether gas X supports burning using a glowing splint. Explain. (1mk)

……
……
……
……

10. When solid M is dissolved in water, it dissolves and forms a blue solution. Addition of ammonia solution to this solution forms a blue precipitate which dissolves in excess to form a deep blue solution. Write the formula and name of the ion responsible for the deep blue solution. (2mks)

……
……
……

11. The diagram below represents the structure of aluminium chloride.



a) Identify the bonds labeled M and N. (2mk)

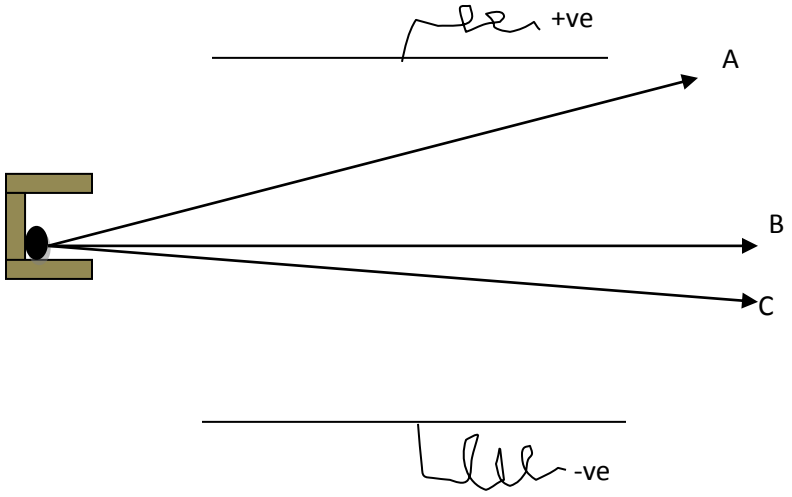
M ……

N ……

b) What Is the difference between bonds M and N (1mk)

……
……
……

12. Study the diagram below and answer the questions that follow



a) Name particles A and B

i) A …….
(1mk)

ii) B ……
(1mk)

b) What property of B makes it not to be deflected by magnetic/electric field (1mk)

……
……

13. The table below shows the first ionization energies of elements Y and Z.

element	**Ionization energy kJ/mol**
Y	494
Z	418

a) What is ionization energy? (1mk)

……

……

……

b) Which of the two elements is the most reactive? Explain (2mks)

……

……

……

……

14. The standard enthalpies of combustion of ethyne (C_2H_2), carbon (c) and hydrogen (H_2) are -1300,-394 and -286 kJ/mol respectively. Calculate the enthalpy of formation of ethyne. (3mks)

……

……

……

……

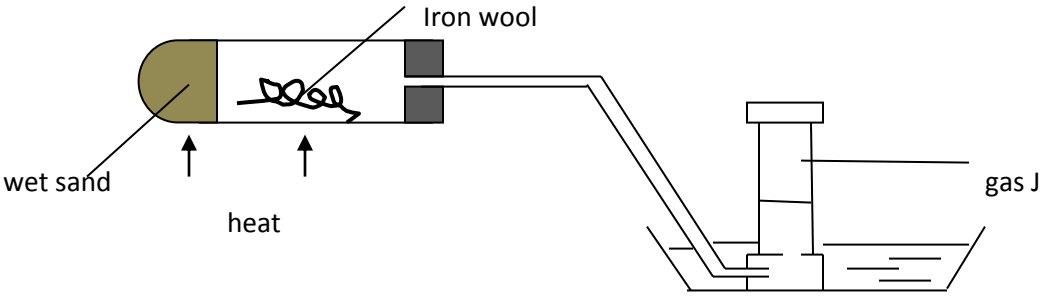
……

……

……

……

15. Study the diagram below and answer the questions that follow.



a) Name gas J (1mk)

……

b) Explain why its important to heat the wet sand before heating the iron wool. (1mk)

……

……

……

c) Name the product formed in the combustion tube. (1mk)

……

16. An element X has a relative atomic mass of 44. When a current of 0.5 A was passed through the molten chloride of X for 32 minutes and 10 seconds, 0.22g of X were deposited at the cathode

Determine the charge on an ion of X (1F=96,500c) (3mks)

……
……
……
……
……

17. Study the reaction below and answer the questions that follow

$2NO_2$ (g) $\rightleftharpoons$ N_2O_4 (g) ΔH = -ve

a) State and explain the observation made when a mixture at equilibrium is heated. (2mks)

……
……
……
……

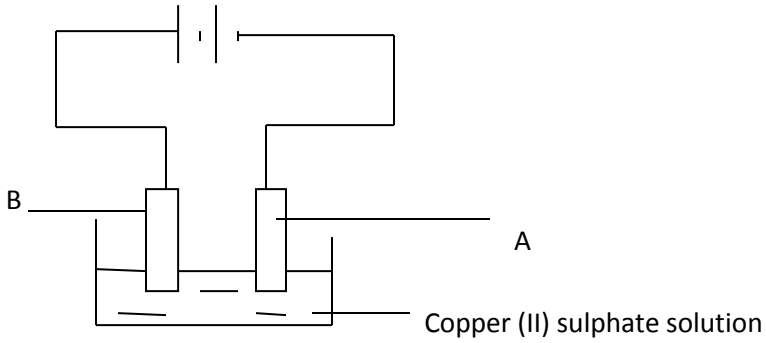
b) If pressure is exerted at the mixture at equilibrium, what observation will be made? (1mk)

……
……

18. State and explain the trend in the boiling points of group (VII) elements down the group. (2mks)

……
……
……
……

19. The diagram below shows electrolysis of dilute copper (II) sulphate solution using copper electrodes;



a) State the observations made at electrode A and B (2mks)

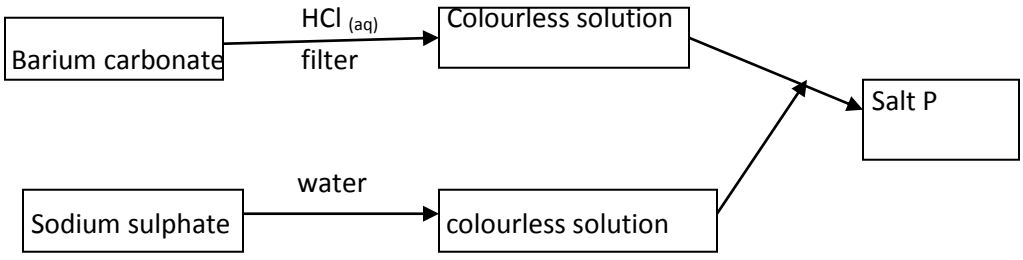
A……
……..

B……
……..

b) Write the equation of reaction at electrode A (1mk)

……
……
……

20. The flow chart shows a process of preparation of salt P.



a) Name salt P. ……(1mk)

b) What type of reaction takes place in the formation of salt P. (1mk)

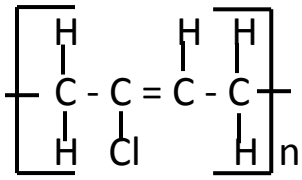
……

c) Write the equation for the reaction that forms salt P. (1mk)

……

……

21. The structure of synthetic rubber is shown below;



a) Determine the relative molecular mass of a polymer made of 250 monomers (2mks)
(c=12,H=1 and Cl=35.5)

……
……
……

b) Give one advantage of natural polymers over synthetic ones. (1mk)

……
……
……

22. 0.92g of ethanol were found to burn in excess air producing a temperature rise of 32.5^{o}C in 200cm^{3} of water(C=12.0,H=1.0, O=16.0) Density of water is 1g/cm^{3}, specific heat capacity of water is 4.2KjKg^{-1}K^{-1}

(a) Write the equation for the combustion of ethanol (1mk)

……

……

(b) Determine the molar heat of combustion of ethanol (2mks)

……
……
……
……..

23.

a) The formula for cane sugar is ($C_{12}H_{22}O_{11}$). Use an equation to show what happens when sugar is added to conc. Sulphuric (VI) acid (1mk)

……
……
……

b) What name is given to the type of reaction above? (1mk)

……

c) Calculate the oxidation state of sulphur in sodium thiosulphate ($Na_2S_2O_3$) (1mk)

……
……
……

24. Iron (III) chloride can be prepared in the laboratory by passing dry chlorine gas over hot steel wool.

a) Name the above method of preparing salts (1mk)

……

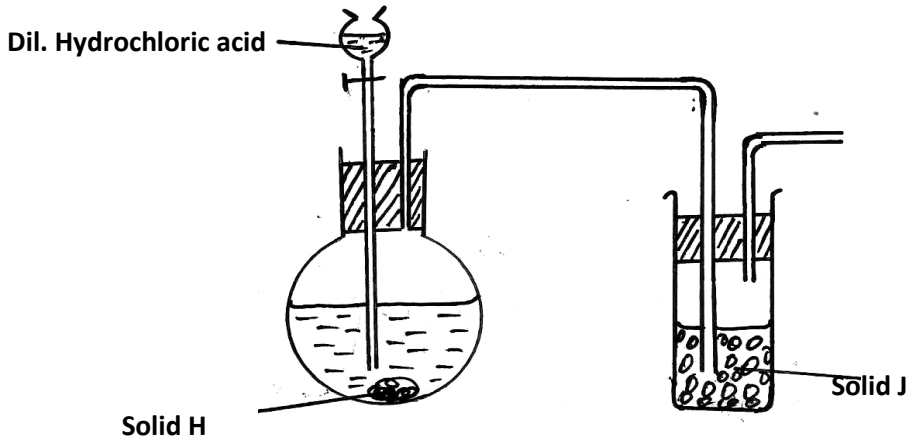
b) Why should we prepare the salt in a dry environment? (1mk)

……

c) A solution of iron (III) chloride in water changes a blue litmus paper to red. Explain. (1mk)

……
……
……

25. The set-up below was used to prepare dry sample of hydrogen Sulphide gas



(a)(i) Complete the diagram to show how the gas was collected (2mks)

(ii) Identify the following

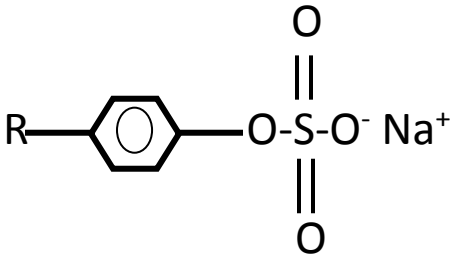
I: Solid H ($^1/_2$mk)

……

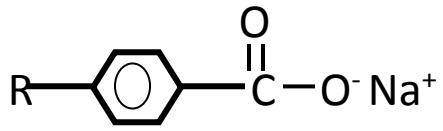
II.Solid J ($^1/_2$mk)

……

26. Study the structures below and answer the questions that follow.



structure A



structure B

a) Which structure represents a detergent suitable for washing in water containing calcium ions? (1mk)

……

b) Give one advantage of continued use of detergent B over A (1mk)

……
……

c) Name the process of manufacturing detergent B (1mk)

……

27. Aluminium is used in making cooking vessels and overhead cables. State the property of aluminium that makes it suitable for the two uses separately.

Cooking vessels…… (½ mk)

Overhead cables ……. (½ mk)

(b) Explain why it is not advisable to clean surfaces of cooking vessels made of aluminium using wood –ash solution (2mks)

……
……
……

28. 10g of an oxide of sodium contains 5.9g sodium. Its molar mass is 78. Determine its molecular formula. (3mks)

……
……
……
……
……
……
……

29. Differentiate between the terms atomic number and mass number (2mks)

……

……

……

NAME..... INDEX NO..... .....

DATE.....

SIGN.....

GATUNDU SOUTH FORM FOUR 2015 EVALUATION EXAM

233/2
CHEMISTRY
PAPER II (THEORY)
JULY/AUGUST 2015
TIME: 2 HOURS

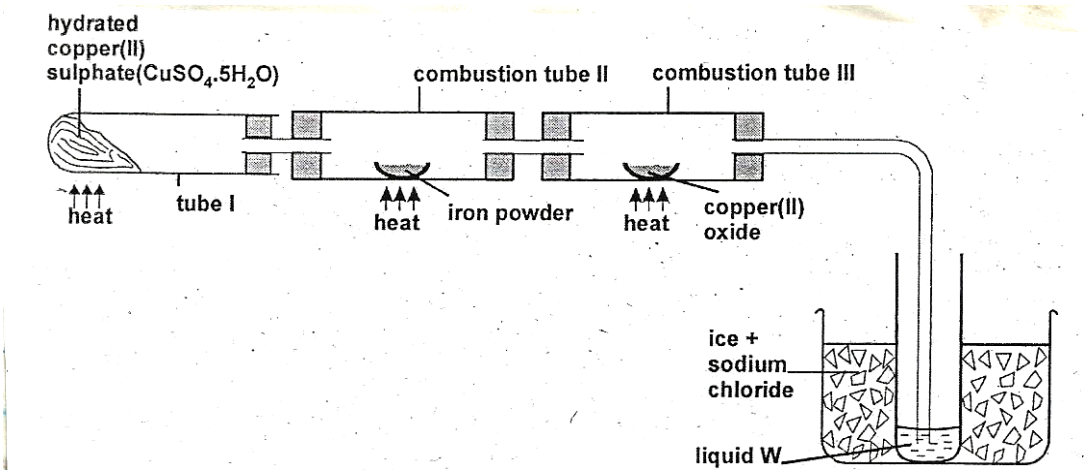
INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Answer ALL questions in the spaces provided.
- Mathematical tables and electronic calculators may be used.
- All working **must** be clearly shown where necessary.

FOR EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATES' SCORE
1	13	
2	13	
3	15	
4	12	
5	13	
6	14	
TOTAL SCORE	80	

1. The diagram below shows the apparatus for the preparation of gas A and investigate on its properties . Study it and answer the questions that follow.



a) (i) Name gas A. …… (1 mark)

(ii)Suggest the property of gas A under investigation. (1 mark)

.....

.....

(iii) Write chemical equations for the reactions in the;

Boiling tube I (1 mark)

.....

.....

Combustion tube II (1 mark)

.....

.....

b) (i) State and explain the observation made in

Tube I. (2 marks)

.....

.....

- Combustion tube II (2 marks)

.....

.....

c) What is the use of hydrated copper (II) sulphate in the experiment. (1 mark)

.....

.....

(ii) Name one other substance that comes out of tube III. (1 mark)

.....

.....

(iii) Name liquid W. (1 mark)

.....

.....

(iv) What is the role of sodium chloride in the ice (freezing mixture) (1 mark)

.....

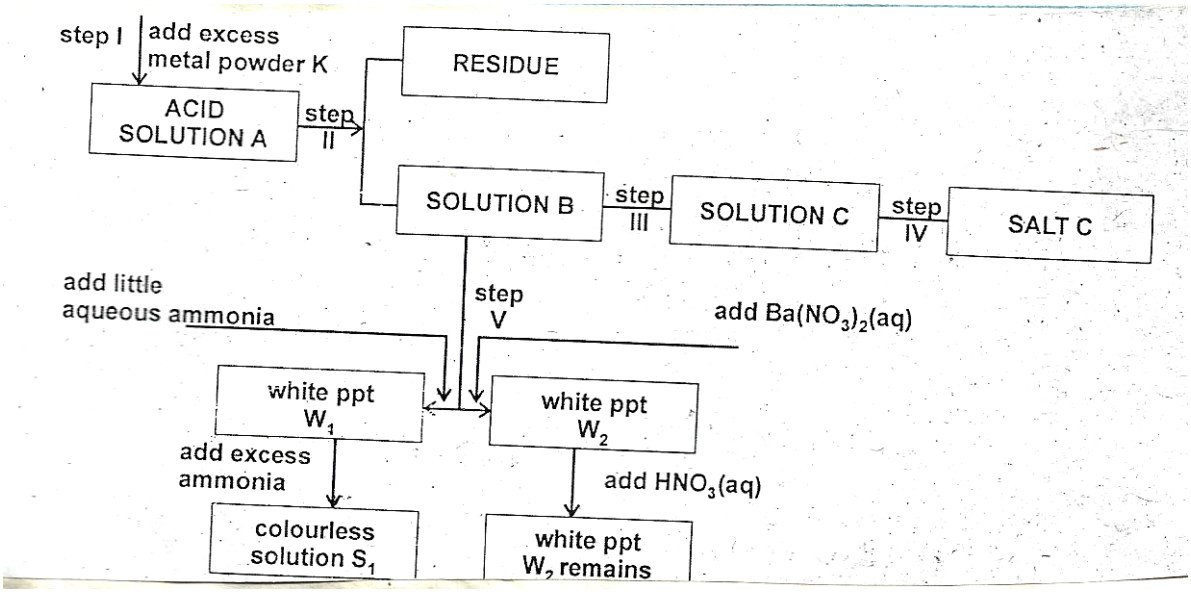
.....

(v) Explain why hydrogen gas has been replaced by helium in filling of aeroplane tyres. (1 mark)

.....

.....

2. The flow diagram below shows the reactions involved in the process for the preparation and reactions of salt C. Study it and answer the questions that follow.



a) Identify (3 marks)

(i) Metal K
.....

(ii) Acid A
.....

(iii) Salt C
.....

b) In step III the solution B is transferred into an evaporation dish and heated in a water bath until it is saturated.

(i) What is a saturated solution? (1 mark)
.....

.....

(ii) Why is heating done over a water bath? (1 mark)
.....

.....

(iii) How would one determine whether a solution is saturated? (1 mark)
.....

.....

c) Explain why metal powder K is used in excess. (1 mark)

.....

.....

d) Name step (II) and state its importance. (1 mark)

.....

.....

e) Identify (3 marks)

(i) White precipitate W_1
.....

.....

(ii) White precipitate W_2
.....

.....

(iii) Colourless solution S_1
.....

.....

f) Write equations for step I and for the formation of S1

Equation step I (1 mark)

.....

.....

Formation of S_1 (1 mark)

.....

.....

3. a. (i) Sulphur is allotropic. What does this mean? (1 mark)

.....

.....

(ii) Give two differences between rhombic and monoclinic sulphur. (2 marks)

.....

.....

.....

.....

(iii) State and explain using an equation the observations made when sulphur reacts with hot concentrated nitric (v) acid. (3 marks)

Observations

.....

.....

.....

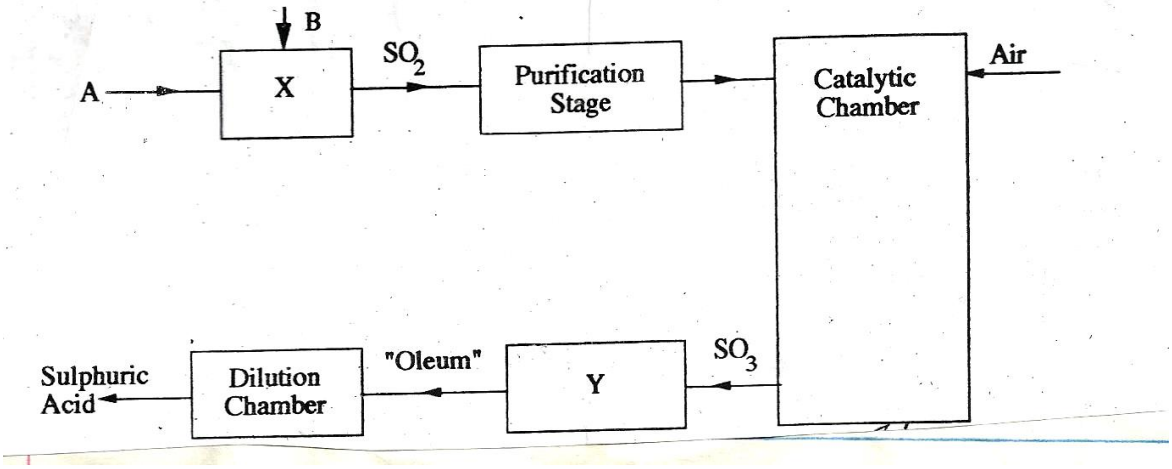
Equation

.....

.....

.....

The flow chart below shows how sulphuric acid is manufactured in a large scale. Study it and then answer the questions that follow.



I. (i) Name the raw materials A and B. (2 marks)

A.....

B.....

(ii) Name the chambers X and Y. (2 marks)

.....

.....

II. (i) Name two impurities that are removed during the purification stage. (2 marks)

.....

.....

.....

(ii) Why must the impurities in (i) above be removed. (1 mark)

.....

.....

III. (i) Name the catalyst used in this process. (1 mark)

.....

.....

(ii) The equation below shows what happens in the catalytic chamber.

$$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_3 \qquad \Delta H = -197KJ/Mol$$

State the two conditions that are necessary for maximum production of SO_3 (1 mark)

.....

.....

4. a) Define the term standard heat of formation of a substance. (1 mark)

.....

.....

b) Butane cannot be prepared directly from it's elements and so it's standard heat of formation ($\Delta H^{o}f$) must be obtained indirectly.
Write down an equation;

(i) For the formation of butane from it's elements in their normal physical states at standard condition of temperature and pressure. (1 mark)

.....

.....

(ii) For the combustion of 1 mole of butane. (1 mark)

.....

.....

c) (i) State the Hess's law. (1 mark)

.....

.....

If the following heats of combustion are given.

ΔH_c^{o} carbon(s) = -393Kj/Mol
ΔH_c^{o} $H_{2(g)}$ = 286Kj/Mol
ΔH_c C_4H_{10} = -2877 Kj/Mol

II. Draw an energy cycle diagram linking the heat of formation of butane with its heat of combustion and the heat of combustion of constituent elements. (2 marks)

III. Calculate the heat of formation of butane ΔH^{θ}_f (C_4H_{10}) (2 marks)

d) Use the equations below to answer the questions that follow.

$MX_{(s)} \longrightarrow M^{n+}_{(g)} + X^{p-}_{(g)}$

$M^{n+}_{(g)} \xrightarrow{\text{water}} M^{n+}_{(aq)}$

$X^{p-}_{(g)} \xrightarrow{\text{water}} X^{p-}_{(aq)}$

(i) Name the types of enthalpy changes represented by

ΔH_1 .....(1 mark)

ΔH_2 .....(1 mark)

(ii) Given that enthalpy change of ΔH_1 is +690Kj/Mol, and ΔH_2 and ΔH_3 are -322Kj and -364Kj respectively, Calculate the enthalpy change of solution of $MX_{(s)}$. (2 marks)

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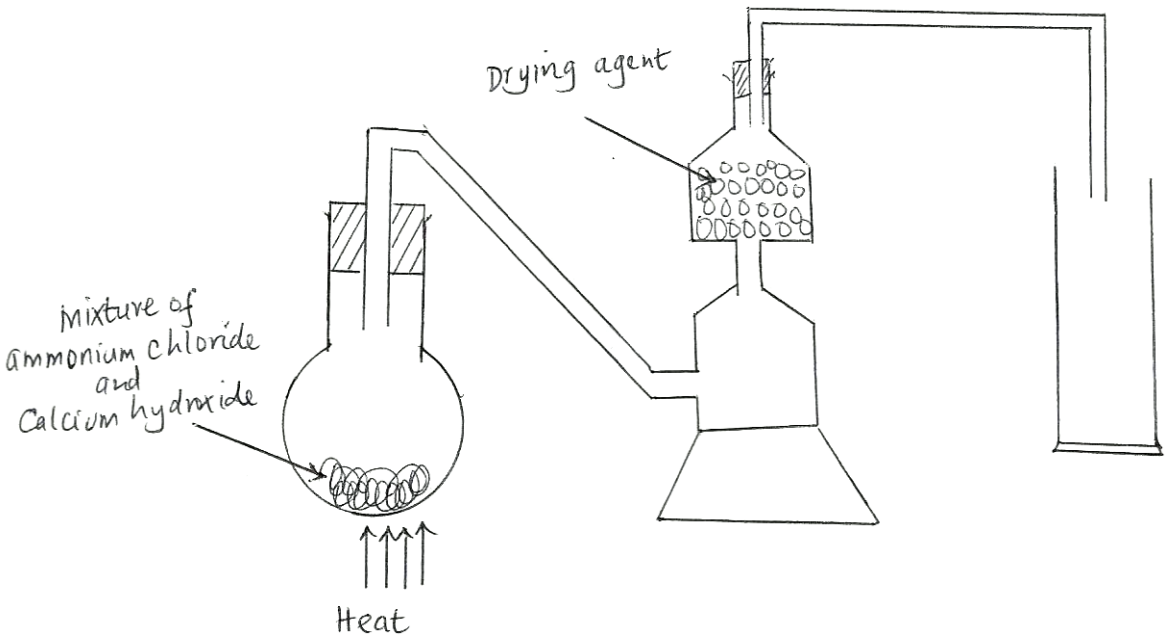
.....

.....

.....

5. A student set up the apparatus as shown in the diagram below to prepare and collect dry ammonia gas.



a) Identify two mistakes in the set up and give a reason for each mistake. (2 marks)

.....

b) Name a suitable drying agent for ammonia. (1 mark)

.....

.....

c) Write an equation for the reaction that occurred when a mixture of ammonium chloride and calcium hydroxide was heated. (2 marks)

.....

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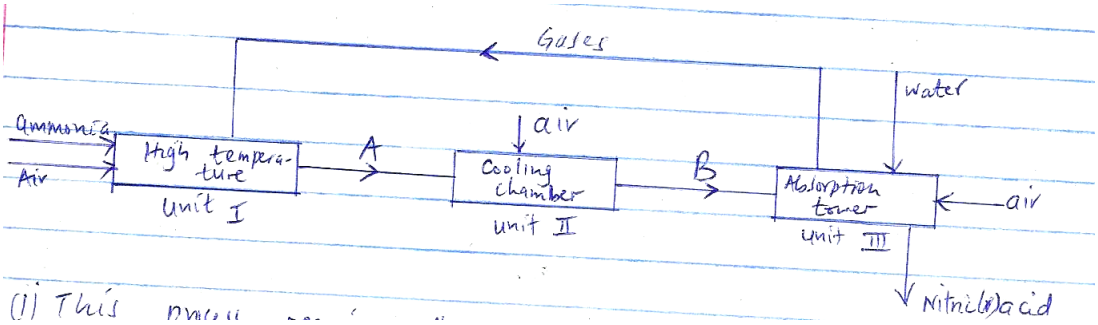
.....

.....

d) Ammonia gas is used in the manufacture of nitric (v) acid as shown below;



(i) This process requires the use of a catalyst. What is the name of catalyst used and in which unit is the catalyst used? (2mks)

- Catalyst –

- Unit;-

(ii) Identify compounds A and B. (2 marks)

A …….

B …….

(iii) Ammonia and nitric (v) acid are used in the manufacture of ammonium nitrate fertilizer. Calculate the amount of nitric (v) acid required to manufacture 1000kg of ammonium nitrate using excess ammonia (N = 14.0, H = 1, O=16) (3 marks)

(iv) Nitric (v) acid is packed in dark containers. Explain. (1 mark)

6. During the extraction of copper from copper pyrites ($CuFeS_2$) some of the processes include
   a) Crushing the ore
   b) Mixing the crushed ore with water and oil and then bubbling air through it.
   c) Roasting the ore

A. (i) Name two other ores that can be used. (2 marks)

.....

.....

(ii)Name the process marked (b) above and give its use. (2mks)

Name -

Use -

(iii) Write an equation for the roasting of copper pyrites. (1 mark)

B. (i) Pure copper is obtained from impure copper by electrolysis. Name the; (3 marks)

Anode ……

Cathode…….

Electrolyte…….

(ii)Write equations for the reactions at (2 marks)

I Anode…….

II Cathode……..

(iv)Calculate the time taken for a current of 10 amps to deposit 32g of pure copper (Cu=64, IF = 96500c) (3 marks)

C. Give one use of copper metal (1 mark)

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GATUNDU SOUTH FORM FOUR 2015 EVALUATION EXAM

233/3
CHEMISTRY
PAPER 3
JULY/AUGUST 2015

CONFIDENTIAL

In addition to the apparatus and fittings found in the laboratory, each student will require the following:

1. About $80cm^3$ of solution A
2. About $100cm^3$ of solution B
3. About $70cm^3$ of solution C
4. 1 pipette
5. 1 burette
6. 3 conical flasks (250ml)
7. A 250ml volumetric flask
8. 1 thermometer (-10^oC to 110^oC)
9. 8 test tubes
10. 2 boiling tubes
11. 10ml measuring cylinder
12. 7 labels
13. a test-tube holder
14. Solid G (about 0.3g)
15. Solid T (about 0.3g)
16. Glass rod
17. Metallic spatula
18. Solid sodium hydrogen carbonate (about 0.2g)
19. 500 ml distilled water

Access To:

1. Bunsen burner
2. methyl orange indicator supplied with a dropper
3. Bromine water supplied with a dropper
4. 2M sodium hydroxide supplied with a dropper
5. Aqueous Barium nitrate supplied with a dropper
6. 2M Nitric (v) acid supplied with a dropper
7. universal indicator supplied with a dropper
8. PH scale chart.
9. Acidified potassium manganate (vii) supplied with a dropper.
10. Acidified potassium dichromate (vi) supplied with a dropper.

NB:

- Solution A is prepared by dissolving 55ml of concentrated sulphuric (vi) acid in one litre of solution.
- Solution B is prepared by dissolving 8g of anhydrous sodium carbonate in one litre of solution
- Sodium C is prepared by dissolving 80g of sodium hydroxide in one litre of solution.
- Bromine water is prepared by dissolving $1cm^3$ of 20 volumes bromine water in $100cm^3$ of solution.
- Acidified potassium manganate (vii) is prepared by dissolving 3.16g of $KMnO_4$ in $600cm^3$ of

$2MH_2SO_4$ and made to one litre solution.

- Acidified potassium Dichromate (vi) is prepare by dissolving 6g of $K_2Cr_2O_7$ in $600cm^3$ of $2MH_2SO_4$ and made to one litre solution.
- 2M bench reagent of Sodium hydroxide is prepared by dissolving 80g of sodium hydroxide in one litre of solution.
- Nitric (v) acid (2) is prepared by dissolving 126Ml in one litre of solution.
- Barium nitrate solution is prepared by dissolving 0.05g in one litre of solution.
- Solid G = hydrated sodium carbonate
- Solid T = Maleic acid.

.....END.....