FORM 3 ENDTERM 3 EXAM

CHEMISTRY
PAPER 2

NAME ………………………………………………….ADM……CLASS……

<u>Answer **ALL** questions in the spaces provided.</u>

1) a)   Give the name of reagent which when reacted with concentrated hydrochloric acid produce chlorine gas.   (1mk)

   b)   A student set out to prepare iron III chloride using the apparatus

        shown in the diagram below.
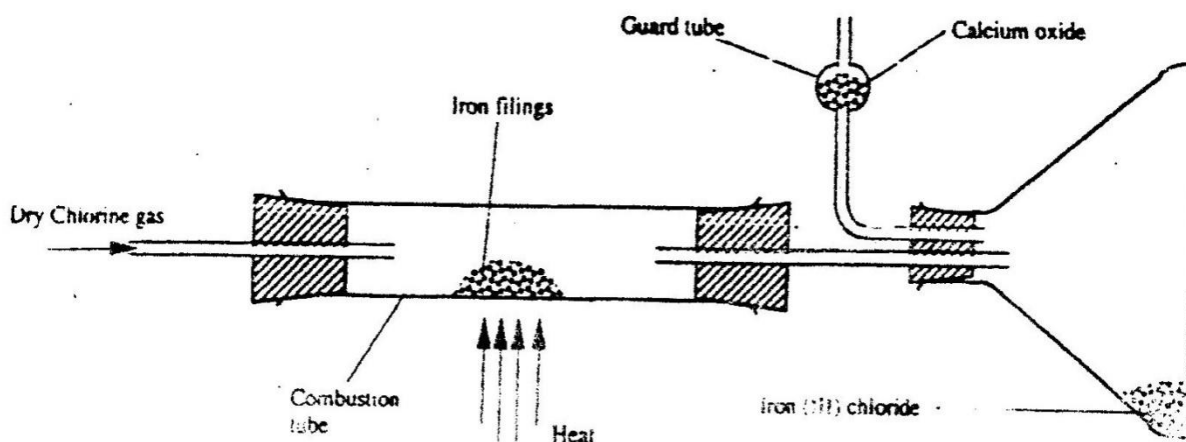
   i)   Explain why:
        I.   It is necessary to pass chlorine gas through the apparatus before heating begins.   (1mk)

        II   Calcium oxide would be preferred to calcium chloride in the guard tube.   (2mk)

   ii) What property of iron (III) chloride makes it possible to be collected as shown in the diagram?
                                                                                                        (1mk)

iii)   Write an equation for one chemical reaction that took place in the guard tube.   (2mk)

iv)   The total mass of iron (III) chloride formed was found to be 0.5g.
       Calculate the volume of chlorine gas the reacted with iron.
       (Fe - = 56.0, Cl = 35.5 and Molar gas volume at 298K is 24,000cm   (2mks)

c)   When hydrogen sulphide gas was passed through a solution of iron (III)
      chloride, the following observation were made:
      i)   The colour of the solution changed from reddish – brown to green and
      ii)   a yellow solid was deposit. Explain these observations.   (2mks)

d)   One of the industrial uses of chlorine gas is manufacture of Hydrochloric acid.

      (i) Give one source of chlorine gas.   (1 mk)

2. Study the table below and answer the questions that follow.

Element	A	B	C	D	E	F	G
Atomic radius (nm)	0.156	0.136	0.125	0.110	0.110	0.104	0.099
Ionic radius (nm)	0.095	0.065	0.050	-	-	0.184	0.181
1st Ionization energy KJ/mol	492	743	790	791	1060	1063	12.54
Mpt (^{o}C)	97.8	650	660	1410	44.2	119	-101
Atomic number	11	12	13	14	15	16	17

I   Explain why

(i)   A has a larger atomic radius than its ionic radius?   (1 mk)

(ii)   G has a smaller atomic radius than its ionic radius?   (1 mk)

II   Comment on the trend of melting points from A to C. Explain.   (2 mks)

III   What is the general trend of the 1st ionization energies for elements A – F. Explain?   (2 mk)

IV   Explain why D has the highest melting point.   (2 mk)

(b)   The grid below is a section of the periodic table. The letters do not represent the actual symbols of the elements. Use it to answer the questions that follow.

								Q
Y				M			N	
K	L					S	O	R
						P		

i)   How does electro negativity vary from N to P? Explain   (2 mks)

ii)   Give the formula of the compound formed between L and P.   (1 mk)

ii)   An oxide of Y was dissolved in water to form a solution. How would you distinguish between this solution and a solution made by dissolving an oxide of S in water. Explain.

(2 mks

3. (a)   The table below gives formulae and volumes occupied by 1g of some gases at STP, study it and answer the questions that follow:

Formulae of gas	Ne	C_2H_2	Ar	NO_2	SO_2	SO_3
Relative molecular mass	20	26	40	46	64	80
Volume occupied by 1g (cm^3)	1120	861	560	485	350	280

i).   Plot a graph of volume of gas (Y-axis) against the relative molecular mass (3mks)

ii). Use the graph to predict the volume occupied by 1g of Carbon (ii) oxide and use your answer to calculate the molar gas volume at STP (C = 12, 0 = 16)   (3 mks)

b) i)   State Graham's law of diffusion?   (1mk)

ii)   Apart from density or mass of a gas state one other factor that affects the rate of diffusion

(lmk)

iii)   Calculate the relative molecular mass of gas V (RMM of X = 34) Gas V takes 60 seconds to diffuse through a porous plug. A gas X diffuses through the same plug in 90 second   (2mks)

4). Study the structure below and answer questions that follow

(a) *What* observation is made when the molecule above is heated to a temperature of $113^{o}C$?
(2mks)

(b) *Write an equation* for the reaction of atom of the above structure with hydrogen. (2mk)

II. Study the scheme below and answer questions that follow.

(a)

    i)   *Name*

Gas *K*   (1mk)

Gas *M*   (1mk)
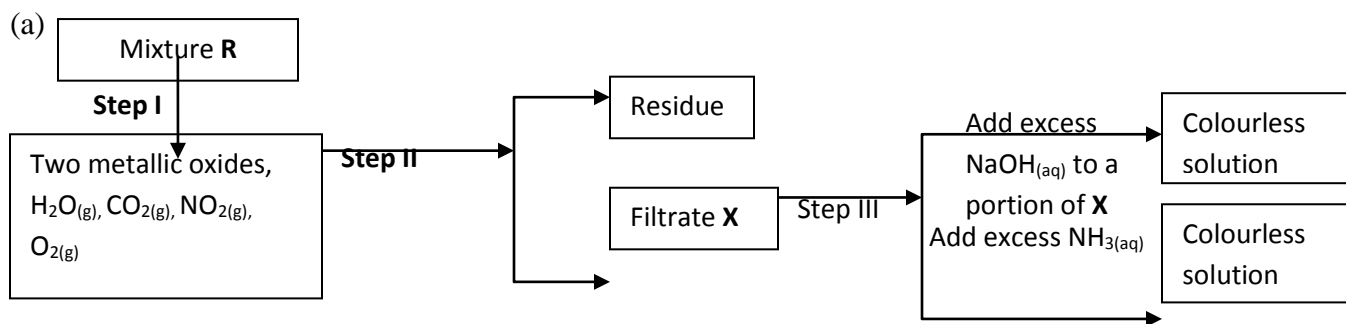
    ii)   *State* the observation made in

Step I   (1mk)

Step II   (1mk)

iii) *State the conditions* necessary for step II to occur.   (2mks)

(b)Write an equation to show how pollution effect of sulphur (IV) oxide is controlled in contact process. (2mks

5. The flow charts below show an analysis of a mixture **R** that contains two salts. Study the

analysis and answer the questions that follow: -

(a)

```
┌──────────────┐
│  Mixture R   │
└──────┬───────┘
   Step I
       ↓
┌──────────────────────┐  Step II   ┌──────────────┐
│ Two metallic oxides, │ ────────→  │   Residue    │
│ H₂O(g), CO₂(g), NO₂(g),│          └──────────────┘
│ O₂(g)                │           ┌──────────────┐
└──────────────────────┘           │  Filtrate X  │  Step III
                                   └──────────────┘
```

Add excess NaOH(aq) to a portion of **X** → Colourless solution
Add excess NH₃(aq) → Colourless solution
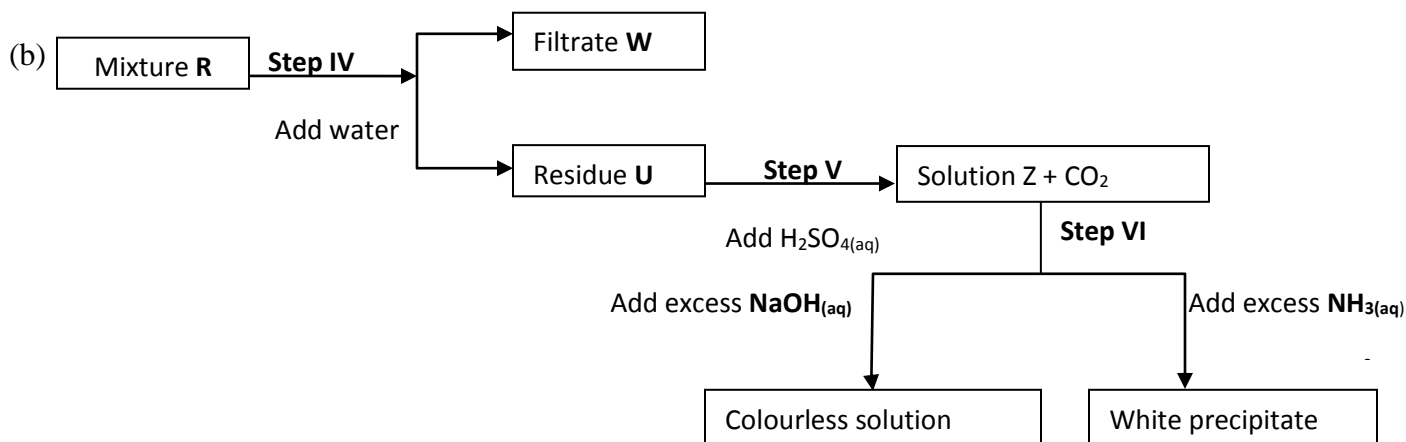
(i) State:-
   (I) The condition in **step I**   (1 Mark)

   (II) The process in **step II**   (1 Mark)

(ii) A small portion of mixture **R** is added to dilute nitric (V) acid in a test-tube. What would be observed?   (1 Mark)

(iii) Write an equation for the reaction between the cation in filtrate **X** and sodium hydroxide Solution
       (1 Mark)

(iv) Explain how water vapour in **step I** could be identified   (1 Mark)

(b)

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┌────────────┐  Step IV              ┌──────────────┐
│ Mixture R  │ ─────────→            │  Filtrate W  │
└────────────┘  Add water            └──────────────┘
                                     ┌──────────────┐  Step V   ┌──────────────────┐
                                     │  Residue U   │ ────────→ │ Solution Z + CO₂ │
                                     └──────────────┘           └──────────────────┘
                                        Add H₂SO₄(aq)              Step VI
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Add excess **NaOH(aq)** → Colourless solution
Add excess **NH₃(aq)** → White precipitate

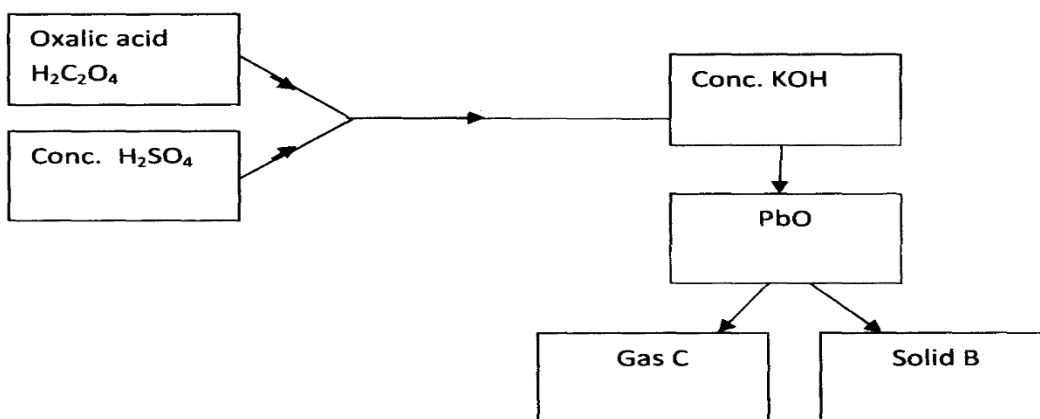State and explain the conclusion that can be made from **step IV** only   (2 Mark)

Name the anion present in residue **U**. Explain   (2 Mark)

   (iii) From the flow chart in **(a)** and **(b)**;
         Write the formulae of cations present in mixture **R**   (2 Mark)

6.   a)   The flow chart below shows the preparation of carbon (II) oxide and its reactions

         i.)   Name the type of reaction taking place between $H_2C_2O_4$ and Conc. H_2SO_4 (lmk)

         ii).   Why is gaseous mixture passed through Conc. KOH?   (lmk)


         iii).   Write an equation for the production of B and C   (lmk)

b). The figure below is used to investigate the effect of carbon (ii) oxide on copper (ii) oxide. Study it and answer the questions that follow Copper (ii) oxide
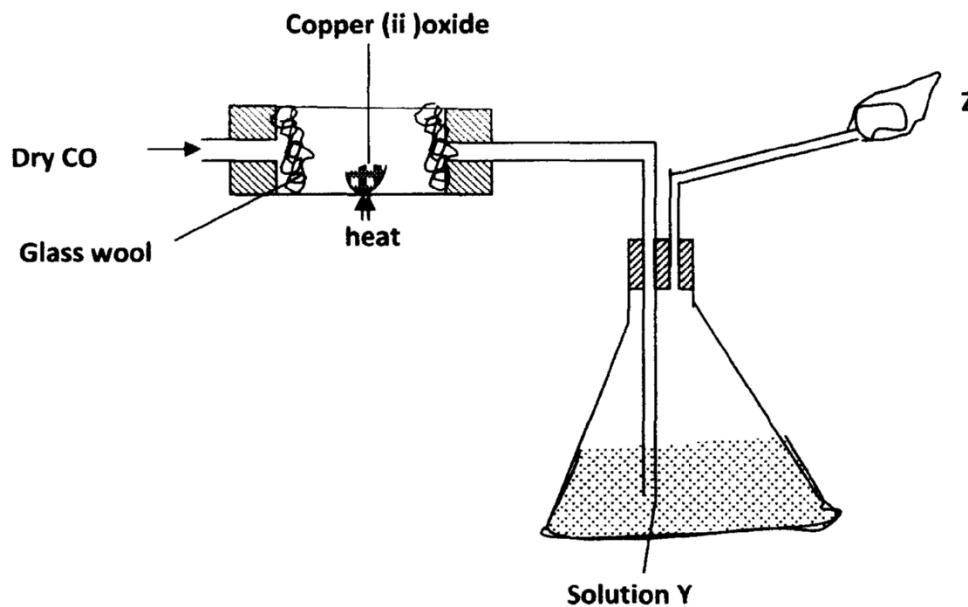
i) What will be observed in the combustion tube at the end of the experiment? (lmk)

ii) Identify Y and give its use   (2mks)

iii) Why is it necessary to burn the excess gas at Z   (2mks)

iv) Write the equation for the reaction taking place at Z   (lmk)

v) What is the use of glass wool?   (lmk)

vi Give two uses of carbon (II) oxide   (2mks)

7. The diagram below represents a set up that can be used to prepare and collect nitrogen (iv) oxide.
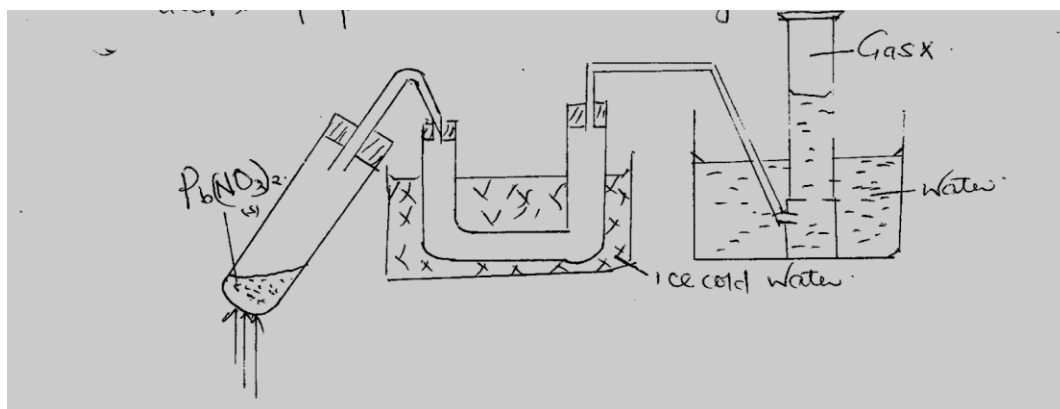
a. Write a chemical equation for the reaction that takes place in the boiling tube. (1 mk)

b. Name gas x.   (1 mk)

c. What observations are made on final residue in the boiling after reaction on heating and cooling the residue.   (1mk)

d. When a piece of burning magnesium is lowered into a gas jar containing gas x it continues to burn.
   i.   Explain the observation 2mks

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

e. What precaution should be taken when preparing gas x

f. Explain why it is not advisable to use copper (II) nitrate instead of lead (II) nitrate.   (1mk)

g. What property of gas x makes it possible to be collected by the method above.(1mk)

h. State one use of gas x?.   (1 mk)