NAME:- MUKESH MEEL

CLASS:- M.Sc. (Previous)

SUBJECT:- IN-ORGANIC- CHEMISTRY

ROLL NO:- 1285828

COLLEGE:- R. K. VIGYAN (PG) COLLEGE

KALVAR, JAIPUR

(1) To prepare cis potassium dioxalate di aqua chromate
$K[Cr(C_2O_4)_2(H_2O)_2] \cdot 2H_2O$

(2) To prepare tetraammine cupric sulphate.
$[Cu(NH_3)_4SO_4] \cdot 2H_2O$

(3.) To prepare potassium trioxalate ferrate
$K_3[Fe(C_2O_4)_3] \cdot 3H_2O$

(4) To prepare hexa-ammine nickel (II) chloride $[Ni(NH_3)_6]Cl_2$

(5.) To prepare prussian blue
$Fe_4[Fe(CN)_6]$

(6.) To prepare Nickel dimethyl glyoximate complex.
$[Ni(DMG)_2]$

(7.) Estimation of copper and Nickel volumetric and gravimetric method analysis

S. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Rema
(8.)	Identify for acidic and basic radicals including reare in the given inorganic mixture				
(9)	Identify four acidic and basic radical including rarer in the given in-organic mixture by dry & wet test.				
(10)	Identify four acidic and basic radical including rare in the given in-organic mixture		Signed		
(11)	Identify four acidic & basic radical inorganic mix.				
(12)	Identify four acidic & basic radical including rarer in the given inorganic mixture.				
(13)	Identify four acidic & basic radical including rarer in the given in-organic mixture.		Signed		

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Object:-

To prepare cis- potassium dioxalato diaqua chromate $K[Cr(C_2O_4)(H_2O)_2]\cdot 2H_2O$.

operaters:- Beaker, glass rod, funnel

Requirements:-

oxalic acid, crystals - 6gm
potassium dichromate crystals - 2gm
Ethond - 40ml

principal:-

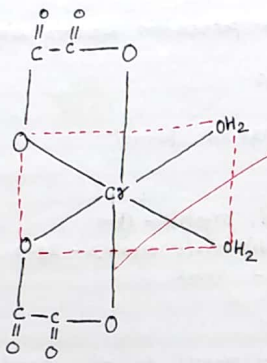
It may be prepard by the reaction of potassium dicromate with oxalic acid.

$$K_2Cr_2O_7 + 7\begin{matrix}COOH\\|\\COOH\end{matrix}\cdot 2H_2O \longrightarrow 2K[Cr(C_2O_4)_2(H_2O)_2]\cdot 2H_2O + 6CO_2 + 13H_2O$$

procedure:-

(1) Take a dry mollur and 6gm of oxalic acid oayslak and 2gm of potassium dicromate crystals in it.

(2) Gently grind the mixture with a perthe till the powders are quite intimately mixed.



cis-isomer of $[Cr(C_2O_4)_2(H_2O)_2]^-$ ion

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(3) Take a china dish (10cm diameter) and moisten it with drain mgy the excess of water.

(4) Introduce the mixture at the centre of the china dish in a compact heap.

(5) cover the china dish with a clock glass.

(6) Heat the contents in the china dish gently on a low flame.

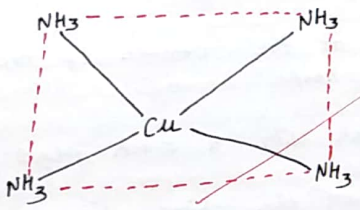
(7) After a few minutes a vigorous reactions will set in accompanid with fracthing due to evolution of carbon dioxide and water vapours.

(8) Soon the reactions will spread through out the mixture which will become deeply coloured liquid.

(9) Without waiting for the thick liquid to cool pure about 20ml ethanol over this liquid.

(10) Using a metallic spatula trilurate the contents until a solid is formed.

(11) In case complete solidification is not achieved decant the liquid and add to it another lot of 20ml of ethanol.



12. Worm and resume trituration until the product is in the form of granular crystals.

13. The crystals will tooke place black in diffused day light and deep purple in artificial light.

Expected yield :-
The yield of cis-potassium diaqua dioxalato chromate (III) 4.1503 gm.

Precaution :-
(i) pestle and mortor must be dry other wise a reaction may set in.

(ii.) Heating should be very gentle otherwise the reaction may go out of control and cause explassion.

(iii.) Since ethanol has to be added to the contents maked flame should be kept a way as for as in possible.

Result :- Apperance Rose colour crystal
yield - 3.1 gm

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object:-

To prepare tetrammonia cupric sulphate $[Cu(NH_3)_4SO_4] \cdot H_2O$

operaters :- Beaker, Glass rod, funnel

Principal:-

It is prepared by adding ammonia to a solution of copper sulphate when cupric hydroate is pracipitated which dissolves in excess of ammonia to give a deep blue solution The hydrated tetrammine cupric sulphate is them precipitated from the solution by adding ethyl alcohol since it is insoluble in alcohol

$$CuSO_4 + 4NH_3 + H_2O \longrightarrow [Cu(NH_3)_4]SO_4 \cdot H_2O$$

tetrammine cupric sulphate (blue)

Reagents:-

copper sulphate = 5 gm
liquir ammonia = 10 ml
Ethyl alcohol = 15 ml
dilute H_2SO_4 = 2·3 ml

procedure:-

The various steps for the preparation of tetrammine cupric sulphate are given below.

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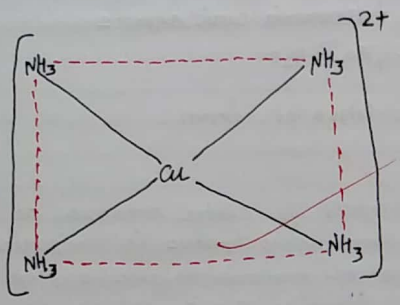

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- Take 5gm of crystalline copper sulphate $CuSO_4 \cdot 5H_2O$ in a 250mL beaker dissolve it in minium quantity of water adding a few drops of sulphuric acid it necessary to clear up the solution.
- Now add liquar ammonia solution to the beaker with constant stirring from a dropping funnel until the blue ppt of cupric hydroxide first formed completely dissolve to yield a clear deep blue solution and there should be a small of ammonia in the beaker.
- Now add alcohol (30mL) dropulise from the dropping funnel to the beaker with constant stirring until the blue colour is nearly discharged Heat the beaker to 60 to 70 with a clock glass over the water both for about 15-16 minutes. After this stop heating and remove the beaker from the water both and allow it to stand Long middle shaped blue crystales of tetrammine cupric sulphate separate out fitter and wash crystals with a few drops of alcohol.
- Dry the crystals on a parous plate or in a desicator weight the dry crystals.

Result :-

The yield of 2.9164 gm which is of blue colour.

precation :-

The crystal being extremly photosensitive be preserved in dar.

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Object :-

To prepare potassium trioxalato ferrate

$[K_3(Fe(C_2O_4)_3] \cdot 3H_2O$

operaters :- Beaker, glass rod, funnel

principal :-

Ferrous oxalate is obtained by mixing ferrous ammonia sulphate and oxalic acid to which potassium oxalate and hydrogen peroxide are added to get the complete potassium trioxalato ferrate (III).

$FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O + H_2C_2O_4 \longrightarrow FeC_2O_4 + H_2SO_4 + (NH_4)_2SO_4 + 6H_2O$

$2FeC_2O_4 + 4K_2C_2O_4 \longrightarrow 2K_3[Fe(C_2O_4)_2] + 2CO_2$

$2K_3[Fe(C_2O_4)_2] + H_2C_2O_4 + H_2O_2 \xrightarrow{6H_2O} 2K_3[Fe(C_2O_4)_3] \cdot 3H_2O + 2H_2O$

Reagents :-

Ferrous ammonium sulphate = 5.5gm
oxalic acid = 1gm
potassium oxalate = 10gm
Hydrogen peroxide (20 volume) = 25ml
H_2SO_4 (4N)
Ethyl alchol = 50%
Acetone

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procedure :-

(1) dissolve 5.5gm ferrous ammonium sulphate in 20ml of hot distilled water which is already having 1ml of 4 NH_2SO_4 in a 250ml beaker.

(2.) stir the solution using a mechanical or a megnetic stirror and add very slowly until of 10% oxalic acid solution to it.

(3.) Remove the beaker from the stirrer and heat it to baiting stirring the solution all the time. with a glass rod.

(4.) A precipite of ferrous oxalate is formed which is allowed to settle down decent the supernatant solution completely. without disturbing the precipitate as for as possible.

(5.) Now add 30ml of hot distilled water to the precipitate and stir it well allow the pirecipitate to settle allown once again and decent the supernatant solution very care fully.

(6.) Dissolve 1gm of potassium oxalate in 30ml of hot dissitiled Water and slowly to ferrous oxalate perecipitate in the beaker.

(7.) Keep the beaker in a steam bath and add slowly and continously 25ml of 20 volume H_2O_2 stirring the solution all the time maintainly Temp. of the solution 40 above 40°C by keeping the beaker in the water bath.

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(8.) The solution may have traces of ferric hydroxide precipitated at this stage therefore keep the beaker on wire gauze and heat the solution to boiling.

(9.) stare it constantly and to the continuously stirred and boiling slutem add very rapidly 10ml of 10% oxalic acid solution.

(10) Then add drop by drop 3ml more of 10% oxalic acid solution to it. Filter the hot solution through a previously weighed sintered bed ~~form~~ funnel or curable NOG_3 At this stage if any crystals are formed they are dissolved in 30ml of warm ethyl alcohol.

(11.) Collect the filtrate and keep it aside for crystalisation in dark.

(12.) Bright green coloured crystals are obtained then filter through the weighed sintered bed crucible was then with 50% ethyl alcohol and then with a small quntity of acetone.

(13.) continues the solution until the crystals become dried dry further and then weighthe crystals is potassium trioxalato ferrate

$$K_3[Fe(CrO_4)_3] \cdot 3H_2O.$$

Result:- yield of potassium trioxalato firrate 6.2934 gm obtained with colour is green.

precaution:- crystals should be prasered in dark.

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object :-

To prepare Hexa - ammine nikel (II) chloride.

$[Ni(NH_3)_6]Cl_2$

Glass ware requirement :-

Beaker, Glass rod, Funnel

Reagents :-

Nickel chloride = 12gm

Ammonia = 24gm

liquor ammonia = 50ml

procedure :-

(1.) Dissolve 12gm of Nikel chloride in 20ml of warm water Filter the solution to remove any insoluble impurities.

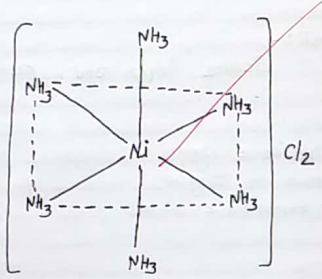
(2.) Add about 24ml of concetrated aqueous ammonia slouly to the rapidly stirred solution until the green ppt of nikel hydroxide has dissolved.

(3.) Allow the mixture to stand at room temp. for 30 minute and the remove the crystals of hexa- ammine. Nikel (II) chloride by filtration on a buchner funnel

Chemical reactions :-

$NiCl_2 \cdot 6H_2O + 6NH_3 \longrightarrow [Ni(NH_3)_6]Cl_2$

(Nickel chloride) (Hexa-ammine Nickel (II))



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(4.) Wash the ppt with ammonia (density - 0.88) about 50ml then wash it with acetone and allow the product to dry at room temp. in air.

Result :-

Yield of Hexa-ammine Nickel (II) chloride $[Ni(NH_3)_6]Cl_2$ 4.6132 gm obtained.

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object :-

To prepare prussion blue $Fe_4[Fe(CN)_6]_3$

Glass ware required :-

Beaker, glass rod funnel
wire guase.

Reagents :-

Iron fillings - 0.5gm
potassium ferrocyanide - 45gm
Ethyl alcohol - 15gm/ml
H_2SO_4 (dil) - 50ml

Reactions :-

$$Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$$

$$2FeSO_4 + K_4[Fe(CN)_6] \longrightarrow Fe_2[Fe(CN)_6] + K_2SO_4$$

(Turnbulls blue)

$$Fe[Fe(CN)_6] \xrightarrow[air]{[O]} Fe_4[Fe(CN)_6]_3$$

(prussion blue)

procedure :-

(1) Take 0.5gm of iron filings in water to this add 10ml of dil H_2SO_4 heat in on a wire guage.

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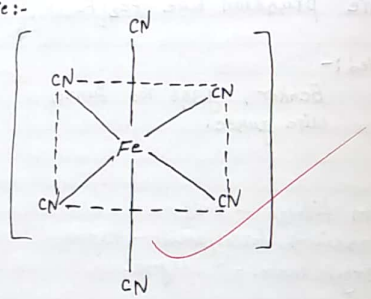
Structure:-



(2.) As soon as the reaction becomes vigorous remove the burner and cool the burner and cool the solution Filter it.

(3.) To the residue add 10ml of add H_2SO_4 and repeat to procedure collect the filterater in a 250 ml beaker.

(4.) To it add a saturated solution of 4.5gm of potassium ferrocynaide heat the sauction until it acquire green colour.

(5.) Keep the green coloured product in air for nearly two hours when it change to blue or you pass the air through the green coloured product.

Result:-

The yield of prussion blue 5.9142 obtained which coloured is blue.

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object:-

To prepare Nikel di methyl glyoximate complex.

$[Ni(DMG)_2]$

principal:-

Nikel dimethyl glyoximate is precipitate by treting salt solution of Nikel sulphate with alchole solution of DMG in presence of ammonia.

Chemical Requirment:-

Nikel sulphate = 5gm
DMG = 2% solution
Ammonia = 1% "
Methyl red Indicater

Glass ware Requirment:-

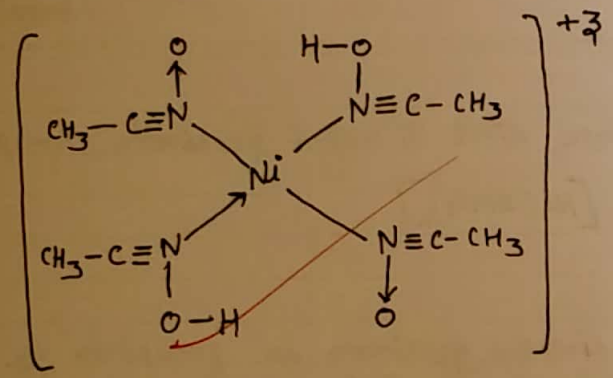
Beaker, Burner Funnel
Glass rod.

procedure:-

(1) We will dissolve 5gm of Nickel sulphate in minimum concenerate of water.

(2.) Then we add 1ml of acetic acid in it after it we add 1ml of methyl red indicator.

Structure:-



$[Ni(DMG)_2]$

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3.) Now we add ammonia solution (1:1) till the colour change from red to yellow heat the solutions to 70° – 80°c.

4.) We add 15ml DMG solutions now add NH_3 solutions till the small of ammonia persist. then we will observe scarlet of $[Ni(DMG)_2]$.

5.) Now we will heat the solution in water both for 30 minutes After 30 mint. we will remove the beaker and keep it for an over night.

6.) Now we will filter the precipitable and wash it with hot water and then with 5ml of absolute alcohol.
Now finally we will dry the ppt and weight it.

Result:-
yield of nikel dimethyl glyoximate 3.4623 gm
Which colour is pink.

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Expt. No. Practical -(7.) Page No. .....

object:-

Estimation of Copper and nickel by volumetric and gravimetric method and analysis.

Theory:-

(a) Theory of estimation of Copper by volumetrically-

Iodine is liberated when copper sulphate solution reacts CKI giving reddish brown colour to the solution the librated Iodine is treated against hypo solution using starch as an indicolour at the end point brown colour turns of white.

Reaction:-

$$2\,Cu_2SO_4 + 4KI \longrightarrow Cu_2I_2 + 2K_2SO_4 + I_2$$

$$2\,Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$$

$$2Cu^{+2} + 2I^- \longrightarrow 2Cu^+ + I_2$$

$$2S_2O_3^{-2} + I_2 \longrightarrow S_4O_6^{-2} + 2I^-$$

(b) Theory for estimation of Copper by gravimetric method-

In a mixed solution of both copper is esmited first as cuprous thiocynate copper is precipited as cuprious thio cynate from a mixed solution of copper and nickel by adding ammonia thio cynate solution in lightly acidic medium in the presence of reducing agent ~~as~~ such as H_2SO_4 to reduce Cu(II) to Cu(I)

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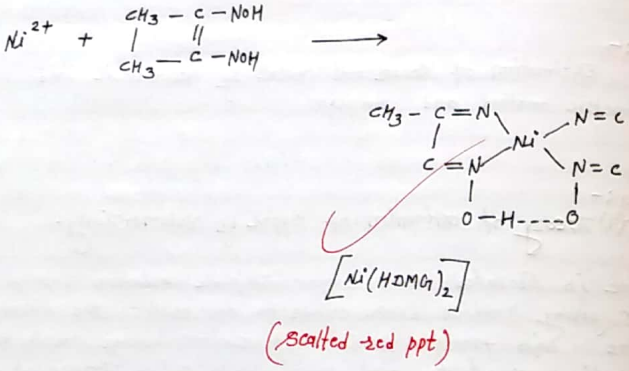

$[Ni(HDMG)_2]$

(Scalted red ppt)

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$2Cu^{+2} + HSO_3^- + H_2O \longrightarrow 2Cu^+ + H_2SO_4 + OH^+$

$2Cu^+ + SCN^- \longrightarrow 2CuSCN$ (White ppt)

(c.) Theory for estimation of nickel by gravimetric.

After remaing copper is added to that strighly acidic filtrate followed by slight excess of ammonia solution scarlet red coloured ppt of nikel dimethyl glyoxinate is formed.

$Ni^{+2} + 2H_2DMG \longrightarrow [Ni(HDMG)] + 2H^+$

(Scalet red ppt)

Chemical Required :-

(a) standred solution of capper sulphate = N/25

b) potassium iodide solution - 10gKI + dissolved in 100ml water.

c) starch solution 1gm starch is dissolved in 100ml water.

d) N/25 hypo sodium thiosulphate solution as an intermiliate.

1.) mixture of Ni, Cu [40+40 - volume make up in 250ml]

2.) conc. HCl (2.5ml)

3.) H_2SO_4 - 40ml

4) 10% ammonia thio cynate - 5ml

Calculation for estimation of Cu by volumetrically -

1.) Titration for the standred $CuSO_4$:-

N_1 = Normality of standred $CuSO_4$ = $N/25$

V_1 = Volume of standred $CuSO_4$ = 10ml

N_2 = Normality of hypo solution = ?

V_2 = Volume of hypo used standred $CuSO_4$ = 9.8

$$N_2 = \frac{N_1 V_1}{V_2} = \frac{1}{25} \times \frac{10}{9.8} = \frac{1}{24.5} N$$

2.) Titration for unknown solution $CuSO_4$:-

N_3 = Normality of unknow $CuSO_4$ = ?

V_3 = Vallme of unknow $CuSO_4$ = 10ml

N_4 = Normality of hypo solution = $N_2 = \frac{1}{24.5} N$

V_4 = Volume of hypo solution = 10.1

$$N_3 = \frac{N_4 V_4}{V_3} = \frac{1}{24.5} \times \frac{10.1}{10}$$

$$N_3 = 0.0446 N$$

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procedure :-

Procedure and observation for estimation of copper by volumetric method :-

Burate is washed with water and is rinsed a solution of hypo (N·25) strength it is filled with hypo solution ppt out 10ml of standered copper sulphate soultion and add conical flask which is covered with a watch glass for sometime to coplete the reaction. The colour of solution turn of saddish brown due to librated iodine non-starch added new-hypo soln is slowely added from burate to the solution in conical flask due to react.

Ion of Iodic hypo the solution becomes the violet. The process is repited and concurrent volume (value) to is noted after this the ppt is washed with unknown copper sulphate solution it is then titrated against hypo solution as above method and the con. current value of the volume is noted.

observation - table :-

S.No.	Volume of standred $CuSO_4$	Volume of hypo (ml)			Concurent Volume of hypo (ml)
		Initial	final	actual	
1.	10ml	0.0	9.9	9.9	
2.	10ml	0.0	9.8	9.8	9.8
3.	10ml	0.0	9.8	9.8	

Conc. of unknown $CuSO_4$ in gm/liter -

= Normality × equivalent weight

= 0.042 × 249.69

= 10.2872 gm/liter

Ammount of copper in $CuSO_4$ = $\frac{63.546}{249.69} \times 10.2872$

= 2.618 gm/liter

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S.No.	Volume of unknown $CuSO_4$	Volume of hypo Solution			Concurrent volume at hypo (ml)
		Intial	final	actual	
1.	10ml	0.0	10.2	10.2	
2.	10ml	0.0	10.1	10.1	10.1
3.	10ml	0.0	10.1	10.1	

Procedure and observation for estimation of copper by gravimetric method :-

50ml of mix. of Cu-Ni is taken in a beaker Now 2.5ml Hcl is added to this solution 30ml Fresh H_2SO_4 is added to this now 100ml water is boiled Now 50ml of 10% ammonium thiocynate is added ppt is digested on water bath till 100ml Now is filtered by crucible and buried and weighted filtrate of this used ertimation of nickel.

Procedure and observation for estimation of nickel by gravimentric method :-

Filtrate of process (6) and heat it in china till solution is reached 70-80ml 35ml conc. HNO_3 is added 15ml conc. Hcl is added to above solution is heated neat dryness on stand both completly dried on water bath reduce is dissolved in water and 1-2ml Hcl is added solution is tranfered in beaker now 150ml water is added 2-drop of methyl red is added now 30ml DMG (1:1) is added Now ammonia solution is added.

Calculation for cu estimation by graviметric :-

$CuSCN$ = Cu = $CuSO_4 \cdot 5H_2O$

121.54 = 63.56 = 249.69

weight of copper = $\frac{63.546}{121.54} \times 0.2429$

= 0.1268 gm/lit.

weight of Copper sulphate = $\frac{249.69}{121.64} \times 0.2429$

= 0.498 gm/lit.

Calculation for elimation of nickel by gravelmetric :-

$[Cu H_2 N_2 O_2] Ni$ = Ni = $NiSO_4(NH_4)SO_4 \cdot 6H_2O$

288.92 = 58.69 = $NiSO_4(NH_4)SO_4 \cdot 6H_2O$

weight of nikel = $\frac{58.69}{288.9} \times 0.2461$

= 0.04999 gm/lit.

weight of nickel ammonia sulphate = $\frac{394.98 \times 0.24}{288.9}$

= 0.3364 gm/lit.

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observation :-

observation of Cu :- Weight of empty crucible = 29.32

Weight of crussible with ppt of $CuSCN$ = 29.5643 gm

weight of ppt = 0.2429 gm.

observation of Ni :- Weight of empty crussible = 29.4129 gm

weight of crssible ppt = $[Ni(HDMG)_2]$ = 23.8

Weight of ppt $[Ni(HDMG)_2]$ = 0.2461 gm

Result :-

The strength of copper it Nickel in given solution is

(1) copper in copper sulphate / volumetrically = 2.6180 gm/lit.

(2.) copper in copper sulphate graviметrically

= 0.1268 gm/lit.

Nickel in Nickel ammonium sulphate gravemetrically.

= 0.0499 gm/lit.

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object :- Identify for acidic (anions) and basic (cations) radicals including zeros in the given in organic mixture by dry and welted test.

Glass ware Required :-

Test tube, holder, burner, filter paper

Test for acidic Radicals :-

Experiment table :-

S.No.	Experiment	observation	Inference
1.)	Action of dil H_2SO_4 mix. + dil H_2SO_4 + Δ	light brown gas envolved	NO_2 - may be
	Na_2CO_3 + HCl + fresh $FeSO_4$	black colour apper.	NO_2 - Confiram
2.)	Action of conc. H_2SO_4 mix. + conc. H_2SO_4	colourless gas envolved with pungent odur	Cl^- - may be
	mixture + conc. H_2SO_4 + Heat	light brown flames envolved	NO_3^- may be
	Removation of nitrite - Sodium carbonate extradt dil H_2SO_4 + NH_4Cl + heat	N_2 is envolved complelly	nitrite is removed
	Ring test :- above solution + fresh $FeSO_4$ + H_2SO_4	brown ring is formed at two liquids	NO_3^- - confirm.

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3.)	other anions at convered at dil H_2SO_4 mix. + 2ml conc. HNO_3 + $(NH_4)_2SO_4$ + Δ	yellow ppt obtained	PO_4^{3-} confirm
4.)	Test for basic Radicals (cations) :-		
	- A - Flame test on burning the paste of mix. in HCl with the help of pt wire	brick red coloured flame	Ca^{+2}
	- Mixture + NaOH + heat	ammonia gas not convalued	zero gase absent
	- primary solutions of mix. dil HCl + Δ	ppt is not obtained	first group obtained (absent)
	- above filtate solution H_2S gas	No - ppt is formed	second group absent
	- Removation of PO_4^{3-} filtrate of IInd group is bailed add conc. H_2SO_4 + bail + NH_4Cl sol^n + 0.5 $Zn(NO_3)_2$ + heat + filtrate + add $(NO_3)_2$ to the above solution	No ppt obtained	PO_4^{3-} is removed
	- To that above solution add solid NH_4Cl + bail + NH_4OH + dil HNO_3 + heat	White gelationset ppt is obtained	Al^{3+} may be

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- ~~Residue~~ Residue + dil HCl + NaOH then add excess of NaOH	White ppt obtained ppt is disappears	Al^{3+} confirm
- Filtrate of III rd group + NH_4Cl + NH_4OH + H_2S gas + Residue + dil. HCl + NaOH + CH_3COOH + $K_4[Fe(CN)_6]$	White ppt obtained White ppt obtained	Zn^{+2} may be Zn^{+2} confirms
- filtrate of IV group + boil + cool + NH_4OH + $(NH_4)_2CO_3$	H_2S is removed White ppt is obtained	Ba^{2+}, Sr^{2+}, Ca^{2+} may be
White ppt + CH_3COOH -		
i) above solution + K_2CrO_4	No ppt obtained	Ba^{2+} absent
ii) above sol^n + $(NH_4)_2SO_4$	No ppt "	Sr^{2+} absent
iii) above solution $(NH_4)_2C_2O_4$	White ppt	Ca^{2+} confirms
Filtrate of V th group + NH_4OH + Na_2HPO_4	No. ppt is obtained	VI th is absent
Test for Rarer Radicals :-		
mixture + dil HCl wash ppt + with hot H_2O + add NH_4OH to residue and filter - ~~bh~~ ate + dil HCl	White ppt obtained No. ppt obtained	Ag^+ / ai may be ai may be

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NH_4OH + KI + Heat 3ml $SnCl_2$ + 4ml conc. HCl	blue ppt is obtained	Cu is present

Result :-

The four acidic and basic radicals.

Acidic radicals :- NO_2^-, NO_3^-, Cl^-, PO_4^{3-}

basic radicals - Al^{3+}, Zn^{2+}, Ca^{2+}, Cu

are present in the given inorganic mixture.

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object:- Identify for acidic (anions) and basic (cations) radicals including rarer in the given inorganic mixture by dry and wet test.

Glass ware required :-

Test tube, halder, burner, filter paper.

Test for acid radicals :-

Experiment	observation	Inference
1.) Action of dil H_2SO_4 mixture + dil H_2SO_4 + heat	CO_2 gas envolved colourless gas envolved	CO_3^{2+} may be SO_3^{2-} may be
Combination test :- for CO_3^{2-}, SO_3^{2-} mixture + $K_2Cr_2O_7$ + dil H_2SO_4 then gas pass in water	orange sol^n CO_2 trans ait in milky indicator	SO_3^{2-} is confirm CO_3^{2-} is confirm
2.) Action of conc. H_2SO_4 mixture + conc. H_2SO_4 + heat	light brown gas envolved	NO_3^- may be
Aquas sol^n of mix. + fresh $FeSO_4$ + conc. H_2SO_4	brown ring is formed at the function of two liquids	NO_3^- - confirm
+ mix. + conc H_2SO_4 + Δ + sodium carbonate extoac + CH_3COOH + $CaCl_2$ - solution	colourless gas I' freshly drops in the test tube obtained white ppt obtained	F^- - may be F^- - confirms

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Test for basic Radicals :-

1.) Flame test :- on burning the paste of mix. in HCl through pt wire	ordinary flame appear	Interence may be
2.) Wet test :-		
- mixture + NaOH + Heat	ammonia gas	NH_4^+ may be
on taking a glass red welted with conc. HCl to the manth of test tube	White fumes are formed	NH_4^+ confirm
- primary solution + dil HCl + Δ	No - ppt is obtained	first group absent
above solution + pass H_2S gas	No - ppt	second group absent
- Renovation F^- filtrate of 2nd group take in parceline dish sdicad + 2ml HCl and dried it 2-3 times reriduc + dil HCl and make solution.	HF vapour come out side	F is Removed
- above solution + dil HNO_3 + Δ + solid NH_4Cl + Δ + NH_4OH	Green ppt is obtained	Cr^{3+} may be

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Residue + Br_2 water + NaOH + Δ + CH_3COOH + red Acetate + NaOH	yellow ppt which dissolved ppt	Cr^{+3} confirm
- Filterate of third group + NH_4Cl + Δ + NH_4OH + H_2S	No ppt obtained	fourth group absent
- Filtrate of 3rd group + boil then cool + NH_4OH + $(NH_4)_2CO_3$	H_2S gas is moved ppt is not obtained	I group absent
- Filtrate of third group + NH_4OH + NaNpoy	white ppt is obtained	Mg^{+2} may be
- Residure + HCl + NaOH + lith yellow reagent + Δ	pink ppt is obtained	Mg^{2+} confirm
Test for Rarer Radicals:-		
Residue + conc. HCl + water + pass H_2S gas	ppt is obtained	As may be
- Wash residue with dil HCl + ammonium solution + Δ filterit.	No - ppt is obtained	
- Filtrate + dil HCl + sodium potassium Xanthate	Red colour sol solution	Mo - confirm

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Result :-

The four acidic and basic radicals -

Acidic :- SO_3^{-2}, CO_3^{-2}, NO_3^-, F^-

basic :- NH_4^+, Cr^{+3}, Mg^{+2}, Mn^{+2}

are present in the given in-organic mixture.

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object:-

Identify four acidic (anions) and four basic (cations) radicals including rarer in the given in-organic mixture by dry and wetted test.

Glass ware required:- Test tube, holder burner, filter paper.

Test for acidic radicals:-

S.N.	Experiment	observation	Inference
1.)	Action of dil H_2SO_4 mixture + dil H_2SO_4 + Δ	colourless gas with smell of burning sur sulphor	SO_3^{2-} - may be
	on Keeping wetted filter paper with dil H_2SO_4 and $K_2Cr_2O_7$	turns filter paper in green	SO_3^{2-} confirm
2.)	Action of conc. H_2SO_4 mixture + conc. H_2SO_4 + sodium extanct.	violet gas envolved	I^- may be
	dil HNO_3 + acidic + $AgNO_3$ + NH_4OH	yellow ppt obtained	I^- confirm
	mixture + conc. H_2SO_4	Insoluble pungate gas	Cl^- may be
	- Removation of I^- sodium carbonate extract + dil H_2SO_4 + $NaNO_2$ + heat	violet fumes are complete enovited	I is removed

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combination test :- mixture + $K_2Cr_2O_7$ + conc. H_2SO_4 + Δ ⟶	yellow coloured	
gases passium NaOH sol^n + CH_3COOH + $(CH_3COO)_2Pb$ -	ppt is obtained	Cl^- confirm
(3) Action of other anions which not convert dil H_2SO_4		
- conc. H_2SO_4 + take mix. + conc. H_2SO_4 + CH_3COOH + Δ + ignite the vaporous	a green edged flame is appeared	BO_3^{-3} confirm
Test for basic radicals :-		
1. Flame test :→ on moistening the pasted of ~~conc~~ HCl through pt wire.	Crassy green Flame appear	Ba^{2+} may be
2) Wet test :-		
mixture + NaOH + Δ	ammonia gas is not envolved	zero group absent
- primary solution + dil HCl + heat	No-ppt is obtained	first group absent
- above solution dil HCl + pass H_2S gas Residuce + yellow ammonium sulphate + NaOH	ppt is obtained ppt is dissolved in yellow ammonium sol^n	IInd group may be
- + add dil HCl + filter + add conc. HCl + NH_4OH + oxalic acid + pass H_2S gas	ppt is obtained soluble in dil HCl orange ppt obtained	Sb^{+3}, Sn^{+2} may be Sb^{+3} confirm

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Removation of BO_3^{-3} take china dish filtrat of IInd group + Δ + conc. H_2SO_4 Repeat it 2-3 times residuce + dil HCl	completly dried again dry it	BO_3^{-3} is removed
- above solution + boil + dil HNO_3 + NH_4Cl + heat + NH_4OH	H_2S gas is removed No-ppt is obtained	III group absent
- above solution + NH_4Cl + NH_4OH + pass H_2S gas	White ppt is obtained	Zn^{+2} may be
- Residuce + dil HCl + NaOH + CH_3COOH + $K_4[Fe(CN)_6]$	White ppt obtained	Zn^{+2} confirm.
- Filtrate of 4th group + boil + cool + NH_4OH + $(NH_4)_2CO_3$	H_2S gas is removed	Ba^{2+}, Sr^{2+}, Ca^{2+} may be
- White ppt is + CH_3COOH + divided in 3-part	yellow ppt obtained	Ba^{2+} confirm
- above sol^n + $K_2Cr_2O_4$ filtrate of ~~III~~ V group + NH_4OH + Na_2HPO_4	obtained No-ppt is obtained	confirm VI group absent
Test for basic radicals :- Filtrate of IIIrd group + Δ + NH_4OH	H_2S gas removed ppt is obtained brown colour	V may be

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Residue + dil HCl + 10% H_2O_2 + Δ + dil HNO_3 + $Pb(NO_3)_2$ + CH_3COONH_4 + Residue + dil HNO_3 + alcohol + H_2O_2	red colour in lower layer	I - confirm

Result :-

The four acidic radicals SO_3^{2-}, I^-, Cl^-, BO_3^{-3} and basic radicals Sb^{+3}, Zn^{+2}, Ba^{+2}, V^{+2} are present in the given in-organic mixture.

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object:-

Identify acidic (anions) and basic (cations) radicals including rarer in the given in-organic mixture.

Glass ware required:-

Test tube holder, burner filter paper.

Test for acidic radicals:-

Experiment	observation	Inference
1.) Action of dil H_2SO_4 mixture + dil H_2SO_4	vinegar like odour	CH_3COO^- may be
Sodium carbonate extract + H_2SO_4 + diphenil ammonie solution	Deep blue colour appear	CH_3COO^- confirm
2.) Action of conc. H_2SO_4 mix. conc. H_2SO_4 sodium carbonate extract + dil CH_3COOH	colourless gas	$C_2O_4^{2-}$ may be
	White ppt obtained	$C_2O_4^{2-}$ confirms
mixture + conc. H_2SO_4 + Δ	pungent brown gas envolved	Br^- may be
primary solution + dil HCl + Heat above sol^n + dil HCl + H_2S gas pass	No- ppt is obtained	Ist group absent
	ppt is obtained	IInd group may be

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Residue + yellow ammonium sulphate + NaOH + Δ	ppt is insoluble	IInd group may be
+ add HNO_3 + heat + dil H_2SO_4 + C_2H_5OH + NH_4OH	No-ppt is obtained	Al^{2+} may be
+ CH_3COOH + $K_4[Fe(CN)_6]$	chocolatey coloured ppt	Al^{2+} confirm.
- Removation of $C_2O_4^{-2}$:- filtrate of II group in china dish heat till	dried	
then cauleddld + conc. HNO_3 + Heattle repeat it 2-3 times then residue + dil HCl	Residue and H_2O formed	$C_2O_4^{-2}$ is removed
+ NH_4Cl + Δ + NH_4OH	No-ppt	absent
- filtrate of IInd group + NH_4OH + pass H_2S gas	brick red coloured ppt is obtained	V group may be
+ add dil HCl	soluble	Mn^{2+}, Zn^{2+} may be
- Residue + dil HNO_3 + PbO_2 + cool	Violet colour sol^n appear	Mn^{+2} confirm
- filtrate of IVth group + Δ + cool + NH_4OH + $(NH_4)_2CO_3$	H_2S gas is removed White ppt is obtained	Ba^{+2}, Sr^{+2}, Ca^{2+} may be

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Residue + CH_3COOH :-		
- above solution + K_2CrO_4	No - ppt obtain	Ba^{2+} - absent
- above solution $(NH_4)_2SO_4$	No - ppt obtain	Ba^{2+} - absent Sr^{2+} - confirm
- filtrate of Vth group + NH_4OH + Na_2HPO_4	No - ppt is obtained	VIth group is absent
Test for rares radicals :-		
mixture of soln + NaCl + ferric periodate + water filtrate tube only one drop flame test	White ppt is obtained	Li^+ confirms

Result :-

Four acidic radicals - CH_3COO^-, Cl^-, Br^-, $C_2O_4^{2-}$ and basic radicals - Cu^{2+}, Mn^{2+}, Sr^{2+} and Li are present in the given inorganic mixture.

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object :-

Identify acidic (anions) and basic (cation) in the given in-organic mixture including rarer by dry and wetted test.

Glass ware required :-

Test tube, holder, burner, filter paper

	Experiment	Observation	Inference
1.)	Action of dil H_2SO_4 mixture + dil H_2SO_4	colourless CO_2 gas envoled	CO_3^{2-} may be
	+ mixture + dil H_2SO_4 + heat	colourless gas with small of burning sulphar	SO_3^{2-} may be
	combination test :-		
	for CO_3^{2-}, SO_3^{2-} mixture + $K_2Cr_2O_7$ + dil H_2SO_4	orange solution obtained	SO_3^{2-} confirm
	+ envolved gas pass in time water	CO_2 gas turns it in milky indicate	CO_3^{2-} confirm
	Action of conc. H_2SO_4		
	mix. + conc. H_2SO_4 + Δ + mix. conc. H_2SO_4 + copper chips + Δ	light-brown vapours evolvation gas increase	NO_3^- may be NO_3^- - confirm
	+ mix + conc. H_2SO_4 + Δ	colourless gas evolved	$C_2O_4^{-2}$ may be

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Sodium carbonate – extract + dil CH_3COOH + $CaCl_2$	White ppt obtained	$C_2O_4^{2-}$ confirm
Test for basic radicals :-		
flame test :- on burning the paste of mix. HCl through pt. wire	brick red flame appears	Ca^{+2} may be
Wet test :-		
mixture + NaOH + heat	ammonia gas is not colved	NH_4^+ absent
primary solution + pass dil HCl + Δ + H_2S gas + above solution	No-ppt is obtained	first group absent
	ppt is obtained	IInd group may be
Filter the ppt + yellow ammonium sulphide + NaOH + heat	ppt dissolved in yellow amm. sul.	II B group may be
+ add. dil HCl	Coloured ppt obtained	As^{+3}, Sb^{+3}, Sn^{+2} may be
add conc. HCl	ppt is obtained	As^{+3} may be
Reduce + HNO_3 + $(NH_4)_2MoO_4$	yellow ppt is obtained	As^{+3} confirm
Removation of $C_2O_4^{-2}$ -		
filtrate of IInd group take in china dish heat till dried + cool + conc. HNO_3 + Δ + till dry it 2-3 times reduct dil HCl	Red residue CO_2 and H_2O formed	$C_2O_4^{-2}$ is removed

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above solution + heat + conc. HNO_3 + Δ + NH_4Cl + Δ + NH_4OH	H_2S gas is removed ppt is obtained of brown colour	Fe^{+3} may be
Residue + dil HCl + KCNS	Red colour sol^n obtained	Fe^{+3} confirm
- Filtrate of IIIrd group + NH_4Cl + NH_4OH + H_2S gas	No-ppt is obtained	IV group is absent
- Filtrate of IIIrd group + Δ + H_2SO_4 gas is removed + boil + cold	H_2S gas removed	
+ NH_4OH + $(NH_4)_2CO_3$	white ppt	Ba^{2+}, Sr^{2+}, Ca^{+2} may be
Residue + CH_3COOH acid -		
above + K_2CrO_4	No-ppt obtained	Ba^{+2} - absent
above sol^n + $(NH_4)_2SO_4$	No-ppt	Sr^{+2} - absent
above sol^n + $(NH_4)_2C_2O_4$	white ppt obtained	Ca^{+2} - confirm
filtrate of Vth group + NH_4OH + Na_2HPO_4	No-ppt is obtained	VIth group absent
Test for rare radicals :-		
Filtrate of IInd group + NH_4OH	white ppt is obtained	Ti, Zr, Be may be

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Residue + dil HCl + 10% H_2O_3 + Boil	ppt is obtained	
Wash ppt with NH_4NO_3 + H_2O_2 + sodium sulphate solution.	white ppt obtained	Zr - confirm

Result :-

The four acidic and basic radicals -

acidic radicals :- CO_3^{2-}, SO_3^{2-}, NO_3^-, $C_2O_4^{2-}$

basic radicals :- As^{+3}, Fe^{+3}, Zr^{+4}, Ca^{2+} present in given In-organic mixture.

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object:-

Identify acidic (anions) and basic (cations) radicals including rarer in the inorganic mixture.

Test for acidic radicals:-

	Experiment	observation	Inference.
1.	Action of dil H_2SO_4 mixture + dil H_2SO_4 + Δ	light brown gas evolved	NO_2^- may be
	sodium carbonate extact + HCl + fresh $FeSO_4$	Black colour solution appered	NO_2^- confirm
2.)	Action of conc. H_2SO_4 mixture + conc. H_2SO_4 + Δ	light brown vapour formed	NO_2^- may be
	Removation of Nitrite - sodium corbonate extracts + dil H_2SO_4 + NH_4Cl + Δ	N_2 - is evolved completly	Nitrite is remove
	Ring test:- above solution + fresh $FeSO_4$ + conc. H_2SO_4	brown ring is formed of the function of two liquid	NO_3^- confirm
	other anions which not covered conc. H_2SO_4 + dil H_2SO_4		

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mixture + 2ml conc. HNO_3 + 12 $(NH_4)_2MnO_4$ + Δ	yellow ppt is obtained	PO_4^{3-} confirm
- Sodium carbonate extract + dil HNO_3 + $BaCl_2$	white ppt is obtained	SO_4^{2-} may be
- filtrate + conc. HNO_3 + boil	vertical remains insoluble formed	SO_4^{2-} confirms
Test for basic radicals :-		
1) Flame test :- on a burning the paste of mixture in HCl with the help of pt wire	blue coloured flame	Cu^{+2} may be
mixture + NaOH + Δ	ammonia gas envoled	NH_4^+ may be
on taking a glass red litted with conc. HCl to the mouth of test tube	white flame are formed	NH_4^+ confirms
primary solution + dil HCl + Δ	No- ppt is obtained	I st group absent
+ above sol^n + dil HCl + H_2S gas is passed	ppt is obtained	II nd group may be
+ add HNO_3 → Δ + dil H_2SO_4 + C_2H_5OH + NH_4OH	No- ppt obtained	Cu^{+2} may be

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+ CH_3COOH + $K_4[Fe(CN)_6]$	chocklety coloured ppt	Cu^{+2} confirm.
Removation of PO_4^{-3} :-		
- Filtrate of II nd group boil + conc. HNO_3 + NH_4Cl + boil + NH_4OH	H_2S gas is removed	
	No - ppt is obtained	III rd group absent
- above sol^n + NH_4OH + pass H_2S gas	brick red coloured ppt	
+ add dil HCl + boil + NaOH	soluble H_2S is removed ppt is obtained	Mn^{2+}, Zn^{+2} may be
- above residue + dil HNO_3 + conc. HNO_3 + Δ + PbO_3 + cool	Violet colour sol^n appears	Mn^{+2} confirm
- Filtrate of IV th group + boil + cool + NH_4OH + $(NH_4)_2CO_3$	H_2S gas is removed No - ppt obtained	I th group absent
- above solution + NH_4OH + Na_2HPO_4	No - ppt is obtained	IV group absent
Test for rares Radicals :-		

Reredue + conc. HCl + H_2O + pass H_2S gas wash rerduce with dil. HCl + ammonia + Δ + filter-	ppt is obtained	Ar or mo may be
	No - ppt is obtained	mo - may be
- Filtrate + dil HCl + sodium potassium xanthate	red colored solution	Mo - confirm

Result :-

The four acidic radicals are NO_2^-, NO_3^-, SO_4^{2-} PO_4^{3-} and basic radicals are NH_4^+, Cu^{2+}, Mn^{2+} and mo present in the given mixture.

Student

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