Date .....

Expt. No. ..... Page No. .....

Functional Groups

Experiment - 1

1 Aim : To identify the functional group present in the given sample of organic compound.

2 Preliminary Test :

a Physical State : Liquid

b Colour : colourless

c. Odour : Vinegar like smell

d Solubility : Soluble in water

e Nature : Acidic (blue litmus turns into red) → may be carboxylic or phenolic.

f Burning Test : Aliphatic (organic compound burns with blue non-sooty flame

3 Observation Table :

S.No	Experiment	Observation	Inference
1	Element (nitrogen) test LS + 2 ml freshly prepared $FeSO_4$ sol^n + heat than cool + 2 drop of conc. H_2SO_4	No green or prussion blue colour appears	N absent.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

S.No	Experiment	Observation	Inference
2	Functional grp test		
(a)	Sodium bicarbonate test:		
	Organic compound + $NaHCO_3$	Brisk effervescences produce	Carboxylic acid (-COOH) grp present
(b)	Ester test		
	Organic compound + 1 ml C_2H_5OH + 2 drop conc. H_2SO_4	Fruity smell appear	Carboxylic acid (-COOH) grp present.

4 Result:

In given organic compound functional group carboxylic group (-COOH) is present.

Teacher's Signature : .....

Date .....

Expt. No. ..... Page No. .....

Experiment No. 2

1 Aim: To identify the functional group present in the given sample of organic compound.

2 Preliminary Test:

a Physical State : Solid crystalline
b Colour : colourless
c Odour : Characteristic smell
d Solubility : insoluble in water
e Nature : Acidic (blue litmus turns into red) → maybe carboxylic or phenolic
f Burning Test : Aromatic (organic compound burns with sooty flame.

3. Observation Table:

S.No	Experiment	Observation	Inference
1	Element (nitrogen) test LS + 2 ml freshly prepared $FeSO_4$ sol^n + heat than cool + 2 drop of conc. H_2SO_4	No green or prussion blue colour appears	N absent
2.	Functional grp Test		
(a)	Ferric Chloride Test Organic compound + Neutral $FeCl_3$	Violet colour appears	Phenolic (Ar-OH) grp present.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

S.No	Experiment	Observation	Inference
(b)	Liebermann's Test		
(i)	Organic comp + $NaNO_2$ + heat & cool + few drop conc. H_2SO_4	deep blue or green colour appears	
(ii)	Add water to above sol^n	solution becomes red	
(iii)	Add NaOH to above sol^n	solution turns blue or green again	phenolic (Ar-OH) grp present

4 Result:

In given organic compound functional group phenolic group (Ar-OH) is present.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

Experiment No. 3

1 Aim : To identify the functional group present in the given sample of organic compound

2 Preliminary Test :

a Physical state : Liquid

b Colour : colourless

c Odour : Alcoholic smell

d Solubility : Soluble in water

e Nature : Neutral (Blue or red litmus paper is not affected)

f Burning Test : Aliphatic (organic compound burns with blue non-sooty flame)

3 Observation Table :

S.No	Experiment	Observation	Inference
1	Element (nitrogen) Test LS + 2 ml freshly prepared solution + heat then cool + 2 drops of conc. H_2SO_4	No green or prussion blue colour appears	N present
2	Functional grp test		
(a)	Sodium metal Test Organic compound + a dry piece of Na metal	Brisk effervescence produce	Alcoholic (-OH) grp present

Teacher's Signature : _____

Date ----------

Expt. No. ---------- Page No. ----------

S.No	Experiment	Observation	Inference
(b)	Ceric ammonium nitrate test Organic compound + 2 drops of ceric ammonium nitrate sol^{n}	Red coloured appears	Alcoholic (-OH) grp present.
(c)	Ester Test Organic compound + CH_3COOH + 2 drops of conc. H_2SO_4	Fruity smell	Alcoholic (-OH) grp present.

4. Result:

In given organic compound functional group Aldehyde group (-CHO) is present.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

Experiment No. 4

1 Aim: To identify the functional group present in the given sample of organic compound.

2 Preliminary Test:

a. Physical State : Liquid
b. Colour : colourless
c. Odour : Pungent smell
d. Solubility : Soluble in water
e Nature : Neutral (Blue or red litmus paper is not affected)
f Burning Test : Aliphatic (organic compound burns with non-sooty flame.

3 Observation Table:

S.No	Experiment	Observation	Inference
1	Element (nitrogen) test L.S + 2 ml freshly prepared $FeSO_4$ sol^n + heat then cool + 2 drop conc. H_2SO_4	No green or prussion blue colour appears	N absent
2	Functional grp test		
(a)	2,4 DNP test Organic compound + few drops of 2,4,	Yellow ppt	carbonyl (-CO-) grp present.

Teacher's Signature : _____

Date ----------

Expt. No. ---------- Page No. ----------

S.No	Experiment	Observation	Inference
	dinitro phenyl hydrazine		
(b)	Schiff's test Organic compound + 2 drop of schiff's reagent	Red colouration appears	Aldehyde (-CHO) grp present
(c)	Tollen's Test Organic compound + 2 drops of tollen's reagent than heat	Silver mirror formed	Aldehyde (-CHO) present

Result:
In given organic compound functional group Aldehyde group (-CHO) is present.

Teacher's Signature : _____

Date ----------

Expt. No. ---------- Page No. ----------

Experiment No. 5

1. Aim: To identify the functional group present in the given sample of organic compound.

2. Preliminary Test:

a. Physical State : Liquid
b. Colour : colourless
c. Odour : Pleasant smell
d. Solubility : Soluble in water
e. Nature : Neutral (Blue or red litmus paper is not affected)
f. Burning Test : Aliphatic (organic compound burns with blue non-sooty flame).

3. Observation Table:

S.No	Experiment	Observation	Inference
1	Element (nitrogen) Test		
	LS + 2 ml freshly prepared $FeSO_4$ sol^n + heat then cool + 2 drop of conc. H_2SO_4	No green or prussian blue colour appears	N absent
2	Functional grp test		
(a)	2,4-DNP test		
	Organic compound + few drops of 2,4 dinitrophenyl	Yellow ppt forms	carbonyl (-CO-) grp present

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

S.No	Experiment	Observation	Inference
	hydrazine		
(b)	Sodium nitroprussside test Organic compound + 2 drops of sodium nitroprussside sol^{n} + NaOH	Red colouration appears	Ketonic (-CO-) grp present
(c)	m- dinitrobenzene test Organic Compound + m- dinitrobenzene + NaOH	Violet colouration appears	Ketonic (-CO-) grp present

Result:

In given organic compound functional group Ketonic group (-CO-) is present.

Teacher's Signature : _____

Date ----------

Expt. No. ---------- Page No. ----------

Experiment No. 6

1 Aim : To identify the functional groups present in the given sample of organic compound

i. Preliminary Test :

a Physical State : Liquid

b. Colour : red brown

c. Odour : Pleasant smell

d. Solubility : Insoluble in water

e Nature : Basic (red litmus turns into blue)

f Burning Test : Aromatic (organic compound burns with sooty flame

3 Observation Table :

S.No	Experiment	Observation	Inference
(1)	Element (nitrogen) Test LS + 2 ml freshly prepared $FeSO_4$ solution + heat then cool + 2 drops of conc. H_2SO_4	prussion blue colour appears	N present
2.	Functional grp test		
(a)	Di azo Test Organic compound + 1 ml dil. HCl + aq. sol^n of $NaNO_2$ + cool it +	Organic red dye formed	Amine ($-NH_2$) present

Teacher's Signature : _____

Date ----------

Expt. No. ---------- Page No. ----------

S.No	Experiment	Observation	Inference
	ice cooled β napthol soln		
(b)	Carbylamine Test organic compound + $CHCl_3$ + KOH	Unpleasant odour appears	Amine ($-NH_2$) present

Result :

In given organic compound functional group Amine group ($-NH_2$) is present.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

Experiment No. 7

Aim: Prepare $\frac{M}{20}$ ferrous ammonium sulphate sol^{n} Mohr's salt. With the help of this solution find out the molarity of given $KMnO_4$ solution.

Apparatus: Burette, pipette, conical flask, test tube, $KMnO_4$ solution & ferrous ammonium sulphate, and conc. H_2SO_4.

Theory:
It is a redox titration in which $KMnO_4$ act as an oxidising agent and oxidise Fe^{+2} ions into Fe^{+3} ions in acidic medium. And itself get reduced to Mn^{+2}. 1 mole of $KMnO_4$ oxidises 5 moles of ferrous ammonium sulphate.

Preparation of Standard FAS solution:
Molar mass of FAS = 392
Mass of FAS to prepare 250 cc of $\frac{M}{20}$ sol^{n}.

$$M = \frac{W}{M.wt} \times \frac{1000}{V_{cc}}$$

$$\frac{1}{20} = \frac{W}{392} \times \frac{1000}{250}$$

$$W = 0.49 \times 10 = 4.9\ g$$

Teacher's Signature : _____

* OBSERVATION TABLE :-

S.No.	Volume of FAS taken by pipette	Burette Reading		Volume of $KMnO_4$ solution	Concordant Volume
		Initial	final		
1	20.0 ml	0.0	16.5	16.5 mL	
2	20.0 ml	0.0	16.0	16.0 ml	16.0 ml
3	20.0 ml	0.0	16.0	16.0 mL	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS sol^n

[A] Molarity of unknown $KMnO_4$ sol^n :

$$\frac{M_1V_1}{a} = \frac{M_2V_2}{b}$$

M_1 = Molarity of FAS solution . M/20
M_2 = Molarity of unknown $KMnO_4$ solution = ?
V_1 = Volume of FAS solution = 20 ml
V_2 = Volume of $KMnO_4$ solution = 16 ml
a = no. of moles of FAS = 10
b = no. of moles of $KMnO_4$ = 2

$$\Rightarrow \frac{1}{20} \times \frac{20}{10} = \frac{M_2 \times 16}{2}$$

$$M_2 = \frac{2}{10 \times 16} \Rightarrow 0.0125 \text{ moles / litre}$$

Date .....

Expt. No. ..... Page No. .....

Ionic Reaction :

(a) Reduction Half Reaction :-

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O \quad \text{—(1)}$$

(b) Oxidation Half Reaction :-

$$5\,fe^{+2} \longrightarrow 5\,Fe^{+3} + 5e^- \quad \text{—(2)}$$

Add (1) & (2)

$$MnO_4^- + 8H^+ + 5fe^{+2} \longrightarrow Mn^{+2} + 5fe^{+3} + 4H_2O$$

Molar Equation :-

$$2KMnO_4 + 10\,FeSO_4(NH_4)_2SO_4\,6H_2O + 8H_2SO_4 \longrightarrow K_2SO_4 + MnSO_4 + 5\,fe_2(SO_4)_3 + (NH_4) + 68\,H_2O$$

Indicator and End Point :- $KMnO_4$ act as a self indicator and end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted $KMnO_4$.

Procedure :-

(1) Weight exactly 4.9 g of Mohr salt on a watch glass and prepare 250 ml of $\frac{M}{20}$ FAS solution by dissolving 4.9 g Mohr salt in water.

(2) Rinse and fill the burette with the given $KMnO_4$ solution.

(3) Rinse the pipette with the prepared Mohr salt solution and pipette out 20 ml of it in a washed titration flask.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

(4) Add one test tube (20 ml) full of dil. H_2SO_4 (2M) to solution in titration flask.
(5) Note the initial reading of burette
(6) Now add $KMnO_4$ solution from the burette till a permanent light pink colour is imparted to the solution in the titration flask.
(7) Note the final reading of burette
(8) Repeat the above step for the two concordant reading.

Result:
The molarity of given $KMnO_4$ solution is 0.0125 moles/lit

Precautions:
(1) Use the glass apparatus carefully.
(2) Rinse the burette and pipette properly before use.
(3) Note the reading while putting the set up at eye-level.
(4) $KMnO_4$ solution is coloured, its upper meniscus should be recorded.
(5) Put the appropriate amount of H_2SO_4.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

Experiment No. 8.

Aim : To prepare a solution of ferrous ammonium sulphate containing exactly 17 gm in 1 litre of solution and with the help of this solution determine the molarity and strength of $KMnO_4$ in given sol^n.

Apparatus :- Burette, pipette, conical flask, test tube, $KMnO_4$ sol^n and ferrous ammonium sulphate sol^n & conc. H_2SO_4.

Theory :-
It is a redox titration in which $KMnO_4$ act as a oxidising agent and oxidizes Fe^{+2} ions into Fe^{+3} ions in acidic medium and itself get reduce to Mn^{+2}
1 mole of $KMnO_4$ oxidises 5 mole of FAS.

Preparation of standard Solution :-
To prepare 1 litre of solution amount
Amount of ferrous ammonium sulphate = 17 g
To prepare 250 ml sol^n amount of FAS = $\frac{17 \times 250}{1000}$

= 4.25 gm

Molecular equation :-

$$2KMnO_4 + 10FeSO_4(NH_4)_2SO_4 \cdot 6H_2O + 8H_2SO_4 \longrightarrow K_2SO_4 + MnSO_4 + 5Fe_2(SO_4)_3 + (NH_4)SO_4 + 68H_2O$$

Teacher's Signature : _____

* OBSERVATION TABLE :-

S.No	Volume of FAS taken by pipette	Burette Reading		Volume of $KMnO_4$ soln used	Concordant Reading.
		Initial	final		
1	20.0 ml	0.0	19.0 ml	19.0 ml	
2	20.0 ml	0.0	18.4 ml	18.4 ml	18.4 ml
3	20.0 ml	0.0	18.4 ml	18.4 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 moles of FAS soln.

[A] Molarity of unknown $KMnO_4$ solution :

$$\frac{M_1V_1}{a} = \frac{M_2V_2}{b}$$

M_1 = Molarity of FAS solution = 17/392
M_2 = Molarity of $KMnO_4$ = ?
V_1 = Volume of FAS solution = 20 ml
V_2 = Volume of $KMnO_4$ solution = 18.4 ml
a = no. of moles of FAS = 10
b = no. of moles of $KMnO_4$ = 2

$$\Rightarrow \frac{17}{392} \times \frac{20}{10} = \frac{M_2 \times 18.4}{2}$$

Date .....

Expt. No. .....

Page No. .....

Ionic Equation :-

(a) Reduction Half Rea^{n} :

$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O$ — (1)

(b) Oxidation Half Rea^{n} :

$5Fe^{+2} \longrightarrow 5Fe^{+3} + 5e^-$ — (2)

Add eq^{n} (1) & (2)

$MnO_4^- + 5Fe^{+2} + 8H^+ \longrightarrow Mn^{+2} + 4H_2O + 5Fe^{+3}$

Indicator and End Point :-

$KMnO_4$ act as self indicator and the end point is indicator by the appearance of a light pink colour produced by the addition of a little excess of unreacted $KMnO_4$.

Procedure :-

(1) Weight exactly 4.25 g of Mohr salt on a watch glass and prepare 250 ml of M/20 FAS solution by dissolving 4.25 g of Mohr salt in water.

(2) Rinse and fill the burette with the given $KMnO_4$ sol^{n}.

(3) Rinse the pipette with the prepared mohr salt solution and pipette out 20 ml of its in a washed titration flask.

(4) Add one test tube (20 ml) full of dil H_2SO_4 (2M) to a solution in titration flask.

(5) Note the initial reading of burette.

(6) Now add $KMnO_4$ solution from burette till a permanent light pink colour is imparted to the sol^{n} in titration flask.

Teacher's Signature : _____

$M_2 = 0.0094$ mole / litre

[13] Strength of $KMnO_4$ solution = Molarity of $KMnO_4$ x Molecular Weight

$= 0.0094 \times 158$

$= M_2 \times 158$ g / mole

$= 1.4852$ g

Date .....

Expt. No. .....

Page No. .....

(7) Note the final reading of burette.
(8) Repeat the above steps for the two concordant readings.

Result :
The strength of given $KMnO_4$ sol^n is 1.4852 g/litre.

Precautions :-
(1) Use the glass apparatus carefully.
(2) Rinse the burette and pipette properly before use
(3) Note the reading while putting the set up at eye-level.
(4) $KMnO_4$ sol^n is coloured its upper-meniscus should be recorded.
(5) Put the appropriate amount of H_2SO_4.

Teacher's Signature : _____

Date .....

Expt. No. .....

Page No. .....

Experiment No. 9

Aim : Find out the percentage purity of impure $KMnO_4$ sample 2g of which have been dissolved in 1 litre of sol^n. For this purpose you have to prepare a standard sol^n of crystalline FAS of molarity M/20.

Apparatus :- Burette, pipette, conical flask, test tube, $KMnO_4$ sol^n and ferrous ammonium sulphate sol^n of conc. H_2SO_4.

Theory :-

It is a redox titration in which $KMnO_4$ act as self indicator and oxidises Fe^{+2} ions into Fe^{+3} ions in acidic medium and itself get reduce to Mn^{+2}.

1 mole of $KMnO_4$ oxidises 5 mole of FAS.

Preparation of standard FAS solution :-

To prepare 2.1 litre of sol^n amount of FAS = 17g

To prepare 250 ml of sol^n amount of FAS = $\frac{17}{1000} \times 250 = \frac{17}{4}$

= 4.25 gram

Ionic equation :-

(a) Reduction Half Rea^n :

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O \longrightarrow (1)$$

(b) Oxidation Half Rea^n :

$$5Fe^{2+} \longrightarrow 5Fe^{3+} + 5e^- \longrightarrow (2)$$

Teacher's Signature : _____

* OBSERVATION TABLES :-

S.No	Volume of FAS taken by pipette	Burette Reading		Volume of $KMnO_4$ used	Concordant Volume
		Initial	final		
1	20 ml	0.0	18.8 ml	18.8 ml	
2	20 ml	0.0	18.6 ml	18.6 ml	18.6 ml
3	20 ml	0.0	18.6 ml	18.6 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS solution

[A] Molarity of $KMnO_4$ solution :

$$\frac{M_1V_1}{a} = \frac{M_2V_2}{b}$$

M_1 = Molarity of FAS sol^n = M/20
M_2 = Molarity of $KMnO_4$ sol^n = ?
V_1 = Volume of FAS sol^n = 20 ml
V_2 = Volume of $KMnO_4$ sol^n = 18.6 ml
a = no. of moles of FAS = 10
b = no. of moles of $KMnO_4$ = 2

$$\Rightarrow \frac{1}{20} \times \frac{20}{10} = \frac{M_2 \times 18.6}{2}$$

Date ----------

Expt. No. ---------- Page No. ----------

Add eq^{n} ① & ②

$MnO_4^- + 5Fe^{+2} + 8H^+ \longrightarrow Mn^{+2} + 4H_2O + 5Fe^{+3}$

Molecular Equation :-

$2KMnO_4 + 10FeSO_4(NH_4)SO_4 \cdot 6H_2O + 8H_2SO_4 \longrightarrow K_2SO_4 + MnSO_4 + 5Fe(SO_4)_3 + (NH_4)_2SO_4 + 68H_2O$

Indicator and End Point :-

$KMnO_4$ act as self indicator and the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted $KMnO_4$.

Procedure :-

(1) Weight exactly 4.9 g of Mohr salt on a watch glass and prepared 250 ml of M/20 FAS sol^{n} by dissolving 4.9 g of Mohr salt in water.
(2) Rinse and fill the burette with the given $KMnO_4$ sol^{n}.
(3) Rinse the pipette with the prepared Mohr salt sol^{n} and pipette out 20 ml of it in a washed titration flask.
(4) Add one test tube (2 ml) full of dil H_2SO_4 (2M) to sol^{n} in titration flask.
(5) Note the initial reading of burette.
(6) Now add $KMnO_4$ sol^{n} from burette till a permanent light pink colour is imparted to the sol^{n} in titration flask.
(7) Note the final reading of burette.
(8) Repeat the above steps for the two concordant reading.

Teacher's Signature : _____

$\therefore M_2 = 1/93 \Rightarrow 0.01074$ mole / litre.

[B] Strength of given $KMnO_4$ sol^n = Molarity of $KMnO_4$ × Molar mass of weight

$= 0.01074 \times 158$

$= 1.69692$ g

[C] Percentage purity of given $KMnO_4$ sol^n:

$$= \frac{\text{Strength of } KMnO_4 \text{ (observed)}}{\text{Strength of } KMnO_4 \text{ (given)}} \times 100$$

$$= \frac{1.69692}{2} \%$$

$= 84.8\%$

Date _____

Expt. No. _____ Page No. _____

Result :

The percentage purity of unknown $KMnO_4$ solution is 84.8 %

Precautions :-

(1) Use the glass apparatus carefully.
(2) Rinse the burette and pipette properly before use.
(3) Note the reading while putting the set up at eye-level
(4) $KMnO_4$ sol^n is coloured its upper-meniscus should be recorded.
(5) Put the appropariate amount of H_2SO_4.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

Experiment No. 10

Aim : Find out the strength of $KMnO_4$ sol^n for this purpose you have to prepare a standard sol^n of crystalline FAS containing 19.606 g of salt per litre.

Apparatus :- Burette, pipette, conical flask, test tube, $KMnO_4$ sol^n and ferrous ammonium sulphate sol^n & conc. H_2SO_4.

Theory :-
It is a redox titration in which $KMnO_4$ act as oxidising agent and oxidises Fe^{+2} ions into Fe^{+3} ions in acidic medium and itself gets reduce to Mn^{+2}
1 mole of $KMnO_4$ oxidises 5 mole of FAS.

Preparation of FAS solution :-
Amount of FAS required in 1 litre = 19.606 g
For 250 ml of sol^n amount of FAS = $\frac{19.606}{1000} \times 250$

$= 4.901$ g

Ionic equation :-

(a) Reduction Half Reaction :

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O \quad -(1)$$

(b) Oxidation Half Rea^n :

$$5Fe^{+2} \longrightarrow 5Fe^{+3} + 5e^- \quad -(2)$$

Teacher's Signature : _____

* OBSERVATION TABLE :

S.No	Volume of FAS taken by pipette	Burette Reading		Volume of $KMnO_4$ used	Concordant Reading.
		Initial	final		
1	20 ml	0.0	23.8 ml	23.8 ml	
2	20 ml	0.0	23.3 ml	23.3 ml	23.3 ml
3	20 ml	0.0	23.3 ml	23.3 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS solution

[A] Molarity of unknown $KMnO_4$ solution :

$$\frac{M_1 V_1}{a} = \frac{M_2 V_2}{b}$$

M_1 = Molarity of FAS sol^n = 19.606/392
M_2 = Molarity of $KMnO_4$ sol^n = ?
V_1 = Volume of FAS = 20 ml
V_2 = Volume of $KMnO_4$ = 23.3 ml
a = no. of moles of FAS = 10
b = no. of moles of $KMnO_4$ = 2

$$\frac{19.606}{392} \times \frac{20}{10} = \frac{M_2 \times 23.3}{2} = 0.0085 \text{ mole/litre.}$$

Date .....

Expt. No. ..... Page No. .....

Add eqⁿ ① & ②

$MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{+2} + 5Fe^{+3} + 4H_2O$

Molecular equation :-

$2\,KMnO_4 + 10\,FeSO_4(NH_4)SO_4 \cdot 6H_2O + 8H_2SO_4 \longrightarrow$

$K_2SO_4 + MnSO_4 + 5\,Fe_2(SO_4)_3 + (NH_4)SO_4 + 68H_2O$

Indicator and end Point :-

$KMnO_4$ act as self indicator and the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted $KMnO_4$.

Procedure :-

(1) Weight exactly 4.9 g of Mohr salt on a watch glass & prepare 250 ml of M/20 FAS solⁿ by dissolving 4.9 g of Mohr salt in water.

(2) Rinse and fill the burette with the given $KMnO_4$ solⁿ

(3) Rinse the pipette with the prepared Mohr salt solⁿ & pipette out 250 ml of it in a washed Titration flask.

(4) Add one test tube full of dil H_2SO_4 (2M) to the solⁿ in titration flask

(5) Note the initial reading of burette

(6) Now add $KMnO_4$ solⁿ from burette till a permanent light pink colour is imparted to the solⁿ in the titration flask.

(7) Note the final reading of burette.

Teacher's Signature : _____

[B] Strength of unknown $KMnO_4$ solution:

= Molarity of $KMnO_4$ × Molecular weight of $KMnO_4$.

= 0.0085 × 158

= 1.343 g/liter

Date ----------

Expt. No. ---------- Page No. ----------

(8) Repeat the above step for the two concordant reading.

Result:

The strength of unknown $KMnO_4$ soln is 1.343 gram.

Precautions:

(1) Use the glass apparatus carefully.
(2) Rinse the burette and pipette properly before use.
(3) Note the reading while putting the set up at eye-level.
(4) $KMnO_4$ is coloured so its upper meniscus should be recorded.
(5) Put the appropriate amount of H_2SO_4.

Date .....

Expt. No. ..... Page No. .....

Experiment No. 11.

Aim: Prepare a standard sol^n of M/20 oxalic acid with the help of this solution determine the molarity and strength of given $KMnO_4$ solution.

Apparatus:- Burette, pipette, conical flask, test tube, $KMnO_4$, oxalic acid, conc. H_2SO_4.

Theory:
It is a redox titration in which $KMnO_4$ act as an oxidising agent and oxidises $C_2O_4^{2-}$ ions into CO_2 in acidic medium and itself reduce to Mn^{+2} ions.
2 mole of $KMnO_4$ oxidise 5 mole of oxalic acid.

Preparation of Standard Solution of oxalic acid:
Molar Mass of oxalic acid = 126

$$M = \frac{\text{weight of solute} \times 1000}{\text{Molecular weight} \times \text{vol}^n \text{ of sol}^n}$$

$$\frac{1}{50} = \frac{W_B}{126} \times \frac{4 \cancel{1000}}{\cancel{250}}$$

$$W_B = \frac{126}{4 \times 50} = \frac{126}{200} = 0.63 \text{ g}$$

Ionic Equation:-

(a) Reduction Half Rea^n:

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O \quad \text{—①}$$

Teacher's Signature : _____

* OBSERVATION TABLE :

S.No	Volume of oxalic acid taken by pipette	Burette Reading		Volume of oxalic acid	Concordant Reading
		Initial	final		
1	20 ml	0.0	22.7 ml	22.7 ml	
2	20 ml	0.0	22.5 ml	22.5 ml	22.5 ml
3	20 ml	0.0	22.5 ml	22.5 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS sol^n

[A] Molarity of unknown $KMnO_4$ sol^n :

$$\frac{M_1V_1}{a} = \frac{M_2V_2}{b}$$

M_1 = Molarity of standard oxalic acid = 1/50
M_2 = Molarity of $KMnO_4$ solution ?
V_1 = Volume of oxalic acid taken by pipette = 20 ml
V_2 = Volume of $KMnO_4$ solution = 22.5 ml
a = no. of moles of oxalic acid = 5
b = no. of moles of $KMnO_4$ = 2

$$\frac{1}{50} \times \frac{20}{5} = \frac{M_2 \times 22.5}{2}$$

Date .....

Expt. No. .....

Page No. .....

(b) Oxidation Half Reaⁿ:

$C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-$ — (2)

(1) eqⁿ multiply by 2 & (2) eqⁿ multiply by 5

$2MnO_4^- + 16H^+ + 10e^- \longrightarrow 2Mn^{+2} + 8H_2O$ — (3)

$5C_2O_4^- \longrightarrow 10CO_2 + 10e^-$ — (4)

Add eqⁿ (3) & (4)

$2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \longrightarrow 2Mn^{+2} + 8H_2O + 10CO_2$

Molecular equation :-

$2KMnO_4 + 5H_2C_2O_4 \cdot 2H_2O + 3H_2SO_4 \xrightarrow{60^\circ \text{ to } 70^\circ C} K_2SO_4 + 2MnSO_4 + 10CO_2 + 18H_2O$

Indicator and End Point :-

$KMnO_4$ act as self indicator and the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted $KMnO_4$.

Procedure :-

(1) Weight 0.63 g of oxalic acid crystals on a watch glass and dissolve it in water to prepare 250 ml of M/20 oxalic acid solⁿ.

(2) Rinse and fill the burette with the $KMnO_4$ solⁿ

(3) Rinse & fill the pipette with the prepared oxalic acid solⁿ and pipette out 20.0 ml of it in a titration flask.

Teacher's Signature : _____

$$M_2 = \frac{4}{22.5 \times 25} = 0.0071 \text{ mole / litre.}$$

[B] Strength of $KMnO_4$ solution = Molarity of $KMnO_4$ solution × Molecular mass

$= M_2 \times M.wt$

$= 0.0071 \times 158$

$= 1.22$ g / litre.

Date .....

Expt. No. ..... Page No. .....

(4) Add one test tube of dil. H_2SO_4 to the sol^n in titration flask.
(5) Note the initial reading of burette.
(6) Now add the $KMnO_4$ sol^n from the burette till a permanent light pink colour is imparted to the sol^n in the titration flask on addition of a last single drop of $KMnO_4$ sol^n.
(7) Note the final reading of burette
(8) Repeat the above step for the two concordant reading.

Result :
The molarity of given $KMnO_4$ sol^n is 0.0071 molarity
The strength of given $KMnO_4$ sol^n is 1.122 g/litre.

Precautions :-
(1) Use the glass apparatus carefully.
(2) Rinse the burette & pipette carefully & properly before use
(3) Note the reading while putting the set up at eye-level
(4) $KMnO_4$ sol^n is coloured so its upper meniscus should be recorded.
(5) Put the appropriate amount of H_2SO_4.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. .....

Experiment No. 12.

Aim: Prepare an M/20 oxalic acid sol^n with the help of this sol^n determine the percentage purity sample of $KMnO_4$ 4g of which is dissolved in 1 litre of given sol^n.

Apparatus :- Burette, pipette, concial flask, Test Tube, $KMnO_4$, oxalic acid, conc. H_2SO_4.

Theory :-
It is a redox titration in which $KMnO_4$ act as an oxidising agent & oxidises $C_2O_4^{2-}$ ions into CO_2 in acidic medium & itself reduce to Mn^{+2} ions.
2 mole of $KMnO_4$ oxidise 5 mole of ($C_2O_4^{2-}$) oxalic acid.

Preparation of standard solution of Oxalic acid :-

Molar mass of oxalic acid = 126

$$\frac{1}{50} = \frac{w}{126} \quad \frac{\cancel{100}^{4}}{25\cancel{0}}$$

$$w = \frac{126}{50 \times 4} = 0.63\ g$$

Ionic equation :-

(a) Reduction Half Reaⁿ :

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O \quad - (1)$$

(b) Oxidation Half Reaⁿ :

$$C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^- \quad - (2)$$

Teacher's Signature : _____

* OBSERVATION TABLE :

S.No	Volume of oxalic acid taken by pipette	Burette Reading		Volume of oxalic acid used	Concordant Volume
		Initial	final		
1	20 ml	0.0	19.5 ml	19.5 ml	
2	20 ml	0.0	19.1 ml	19.1 ml	19.1 ml
3	20 ml	0.0	19.1 ml	19.1 ml	

* CALCULATION :-

Two moles of $KMnO_4$ react with 10 mole of FAS solution

[A] Molarity of $KMnO_4$ solution :

$$\frac{M_1V_1}{a} = \frac{M_2V_2}{b}$$

M_1 = Molarity of oxalic acid = M/20
M_2 = Molarity of $KMnO_4$ sol^n = ?
V_1 = Volume of oxalic acid by pipette = 20 ml
V_2 = Volume of $KMnO_4$ sol^n = 19.1 ml
a = no. of moles of oxalic acid = 5
b = no. of moles of $KMnO_4$ = 2.

$$\frac{1}{20} \times \frac{20}{5} = \frac{M_2 \times 19.1}{2}$$

Date .....

Expt. No. ..... Page No. .....

eqn (1) Multiply by 2.

$2MnO_4^- + 16H^+ + 10e^- \longrightarrow 2Mn^{+2} + 8H_2O$ — (3)

eqn (2) Multiply by 5.

$5C_2O_4^{2-} \longrightarrow 10CO_2 + 10e^-$ — (4)

Add eqn (3) & (4)

$2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \longrightarrow 2Mn^{+2} + 10CO_2 + 8H_2O$

Molecular equation :

$2KMnO_4 + 5H_2C_2O_4 \cdot 2H_2O + 3H_2SO_4 \xrightarrow{60^\circ \text{ to } 70^\circ C} K_2SO_4 + 2MnSO_4 + 10CO_2 + 18H_2O$

Indicator and end Point :

$KMnO_4$ act as self indicator & the end point is indicated by the appearance of a light pink colour produced by the addition of a little excess of unreacted $KMnO_4$.

Procedure :-

(1) Weight 0.63 g of oxalic acid crystals on a watch glass & dissolve it in water to prepare 250 ml of M/20 oxalic acid solution.

(2) Rinse & fill the burette with $KMnO_4$ soln.

(3) Rinse & fill the pipette with prepared oxalic acid soln & pipette out 20.0 ml of it in a Titration flask.

(4) Add one test tube full of dil H_2SO_4 to soln in Titration flask.

(5) Note the initial reading of burette.

(6) Now add the $KMnO_4$ soln from burette till a permanent light pink colour is imparted to the soln

Teacher's Signature : _____

$$M_2 = \frac{2}{19.1 \times 5} = 0.0209 \text{ mole / litre}$$

[B] Strength of $KMnO_4$ solution = Molarity of $KMnO_4$ × Molar mass of $KMnO_4$

$= M_2 \times 158$

$= 0.0209 \times 158$

$= 3.302$ g / litre.

[C] Percentage purity of $KMnO_4$ sol^n :

$$= \frac{\text{Strength of } KMnO_4 \text{ sol}^n \text{ (observed)}}{\text{Strength of } KMnO_4 \text{ sol}^n \text{ (given)}} \times 100$$

$$= \frac{3.302}{4} \times 100\ \%.$$

$= 82.55\ \%.$

Date ----------

Expt. No. ---------- Page No. ----------

in the titration flask on addition of a last single drop of $KMnO_4$ sol^n.

(7) Note the final reading of burette.

(8) Repeat the above steps for the two concordant reading.

Result :

The percentage purity of given $KMnO_4$ sol^n is 82.55%

Precautions :

(1) Use the glass apparatus carefully.

(2) Rinse the burette & pipette carefully & properly before use.

(3) Note the reading while putting the set up at eye-level.

(4) $KMnO_4$ sol^n is coloured so its upper meniscus should be recorded.

(5) Put the appropriate amount of H_2SO_4.

Teacher's Signature : _____

Date .....

Expt. No. ..... Page No. 30

Experiment No. 13

Aim: To analyse the acidic and basic radical in given salt.

OBSERVATION TABLE :-

S.No	Experiment	Observation	Inference
[A]	Acidic Radical		
1.	Salt + dil. H_2SO_4	Colourless, odourless gas (CO_2) is evolved with brisk effervescence.	dil H_2SO_4 group present CO_3 may be.
(a)	The gas is passed in lime water	it turns milky	CO_3^{2-} present
(b)	On passing the gas for some more time (excess)	Milkiness disappear	CO_3^{2-} confirm
[B]	Basic Radical		
1	Salt + NaOH solution and heat	A gas is evolved with ammonia like smell	Zero group present NH_4^+ may be
(a)	A glass rod dipped in conc. HCl is brought at the mouth of test tube	with dense fumes appear	NH_4^+ present
(b)	On passing the gas through nesseler reagent	Red. brown ppt formed	NH_4^+ confirm.

Teacher's Signature : _____

Date .....

Expt. No. .....

RESULT:-

In given salt acidic radical is carbonate (CO_3^{2-}) and basic radical is ammonium.

Teacher's Signature : .....

Expt. No. _____ Date _____

Page No. 32

Experiment No. 14

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic Radical		
1.	Salt + dil. H_2SO_4	No reaction	dil H_2SO_4 group absent.
2.	Salt + Conc. H_2SO_4	No reaction	Conc. H_2SO_4 group absent.
3.	Salt + dil HCl + $BaCl_2$ solution	white ppt. form	SO_4^{2-} present
(a)	Above ppt + conc. HCl or HNO_3	white ppt. remain undissolved.	SO_4^{2-} confirm
(b)	Salt solution + CH_3COOH + $(CH_3COO)_2Pb$	white ppt. formed	SO_4^{2-} confirm
[B]	Basic Radical		
1	Salt + NaOH solution and heat	A gas is evolved with ammonia like smell.	Zero group present NH_4^+ may be
(a)	A glass rod shaped in conc. HCl is brought at mouth of test tube.	White dense fumes appears.	NH_4^+ present

Teacher's Signature : _____

Expt. No. ---------- Date ----------

Page No. 33

(b)	On passing the glass	Red brown ppt form	NH_4^+ confirm

RESULT:

In the given salt acidic radical sulphate (SO_4^{2-}) and basic radical ammonium (NH_4^+) are present.

Teacher's Signature : ----------

Date ----------

Expt. No. ----------

Experiment No. 15

Aim: To analyse acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil. H_2SO_4	No reaction	dil H_2SO_4 group absent.
2	Salt + conc. H_2SO_4	Colourless gas with vinegar like smell.	conc. H_2SO_4 group present CH_3COO^- may be.
(a)	Add 1 ml C_2H_5OH	Fruity odour smell due to ester formation appears	CH_3COO^- confirm
(b)	Salt solution + neutral $FeCl_3$ (ferric chloride)	Deep red colour appears which turn into brown red ppt on boiling	CH_3COO^- confirm
(c)	Palm Test ⇒ salt + oxalic acid + three drop of H_2O and rub with thumb	smell of vinegar	CH_3COO^- confirm.

Teacher's Signature : _____

Date _____

Expt. No. _____ Page No. 35

[B]	Basic radical		
1	Salt + NaOH solution and heat	No smell of ammonia	Zero group NH_4^+ present.
2	0.5 (Original solution) + dil HCl Dissolve the ppt in hot water and divide the solution into two parts	white ppt obtain	I group present Pb^{2+} may be
(a)	I part + KI solution	Yellow ppt obtain	Pb^{2+} confirm.
(b)	II part + $K_2Cr_2O_4$ solution	Yellow ppt obtain	Pb^{2+} confirm.

RESULT:

In the given salt the basic radical is Pb^{2+} and acidic radical is CH_3COO^-.

Teacher's Signature : _____

Date ----------

Expt. No. ---------- Page No. 38

Experiment No. 16

Aim: To analyse the acidic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent.
2	Salt + conc. H_2SO_4	Brown fumes evolve	conc. H_2SO_4 present NO_3^- may be.
(a)	Add copper turning (piece of filter paper) in above solution and heat.	Brown fumes become dense	NO_3^- confirm.
(b)	Salt sol^n + freshly prepared $FeSO_4$ + conc. H_2SO_4 by the side of test tube.	Dark brown ring form	NO_3^- confirm
[B]	Basic radical		
1	Salt + NaOH sol^n	No NH_3 like smell	Zero group absent.
2.	O.S + dil HCl	no white ppt form	I group absent
3.	Pass H_2S gas in above sol^n	No black brown ppt	II group absent.

Teacher's Signature : _____

Expt. No. ---------- Date ----------

Page No. 39

		or yellow ppt obtain	
4	O.S + a drop of conc. HNO_3 + heat then cool + $NH_4Cl_{(s)}$ + NH_4OH in excess Dissolve the white ppt in dil HCl & dissolve it into 3 parts.	white gelatinous ppt form	III group present Al^{+3} may be
(a)	I part + few drop of blue litmus sol^n + NH_4OH sol^n along the side of test tube	a blue floating mass in the colourless sol^n obtain	Al^{+3} confirm
(b)	II part + NaOH sol^n	white gelatinous ppt. Soluble in excess of NaOH	Al^{+3} confirm
(c)	Cobalt nitrate test	Blue colour ash is obtain	Al^{+3} confirm

RESULT :

In given salt acidic radical is NO_3^- basic radical is Al^{+3} are present.

Teacher's Signature : _____

Expt. No. ---------- Date ----------

Page No. 40

Experiment No. 17

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
i.	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent.
ii.	Salt + conc. H_2SO_4	Colourless, odourless gas with a pungent smell	conc. H_2SO_4 group present Cl^- may be Cl^- confirm
(a)	A rod dipped in NH_4OH is brought near the mouth of test tube	white dense fumes appear	
(b)	Add an pinch of MnO_2 in the above solution and heat	Greenish-yellow gas evolved	Cl^- confirm
(C)	Chromyl chloride test		
(i)	Salt + $K_2Cr_2O_7$(s) + conc. H_2SO_4 and heat	orange red vapour appear	
(ii)	Above sol^n + CH_3COOH + $(CH_3COO)_2Pb$	yellow ppt appear	Cl^- confirm
[B]	Basic radical		
i.	Salt + NaOH sol^n and heat	$NaNO_3$ like smell	Zero group absent

Teacher's Signature : _____

Expt. No. ---------- Date ----------

Page No. 41

2. O.S + dil HCl	No white ppt form	I group absent
3. Pass H_2S gas in above sol^n	No black brown ppt	II group absent.
4. O.S + a drop of conc. HNO_3 + heat then cool + NH_4Cl (s) + NH_4OH excess	No ppt form	III group absent
5. Pass H_2S gas in above sol^n	NO ppt form	IV group absent.
6. O.S + NH_4Cl + NH_4OH sol^n + $(NH_4)_2CO_3$ sol^n.	White ppt formed	V group present Ba^{+2}, Sr^{+2}, Ca^{+2} may be
Dissolve the ppt in CH_3COOH and divide the sol^n in three parts.		
(I) I part + K_2CrO_4	Yellow ppt form	Ba^{+2} present
(II) Flame test	Grassy green flame obtain	Ba^{+2} confirm

RESULT:

In the given salt acidic radical is Cl^- and basic radical is Ba^{+2}.

Teacher's Signature : _____

Date .....

Expt. No. .....

Experiment No. 18

Aim: In the given salt the acidic and basic radical is to be analysed.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1.	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent
2.	Salt + conc. H_2SO_4	Brown fumes evolved	conc. H_2SO_4 group present NO_3^- may be
(a)	Add copper turning (a piece of filter paper) in the above sol^n and heat	Brown fumes becomes dense	NO_3^- confirm
(b)	Salt sol^n + freshly prepared $FeSO_4$ + conc. H_2SO_4 by the side of the test tube	Dark brown ring formed	NO_3^- confirm
[B]	Basic radical		
1.	Salt + NaOH sol^n and heat	No NH_3 like smell	Zero group absent
2.	O.S + dil. HCl	No white ppt form	I group absent
3.	Pass the H_2S gas in above sol^n	No black and yellow ppt formed	II group absent.

Teacher's Signature : _____

Expt. No. ---------- Date ----------

Page No. 43

4.	O.S + a drop of conc. HNO_3 + heat and cool + $NH_4Cl_{(s)}$ + NH_4OH in excess.	White gelatinous ppt form	III group present Al^{+3} may be.
5.	Pass H_2S gas in above sol^n and dissolve the sol^n into three part	No ppt formed	IV group absent
6.	O.S + NH_4Cl + NH_4OH + $(NH_4)_2CO_3$ sol^n	white ppt formed	V. group present Ba^{+2}, Sr^{2+} or Ca^{2+} may be.
	Dissolve the ppt in CH_3COOH and divide the sol^n in three parts		
(i)	I part + $K_2Cr_2O_4$	No yellow ppt form	Ba^{+2} absent
(ii)	II part + $(NH_4)_2SO_4$	No white ppt	Sr^{+2} absent
(iii)	III part + $(NH_4)_2C_2O_4$ (Ammonium oxalate)	white ppt form	Ca^{2+} present
(iv)	flame test	Brick red flame obtained	Ca^{+2} confirm

RESULT:

In the given salt acidic radical is NO_3^- and basic radical is Ca^{+2}.

Teacher's Signature : ----------

Expt. No. ---------- Date ----------

Page No. 44

Experiment No. 19

Aim: To analyse the acidic and basic radical in given salt.

OBSERVATION TABLE :-

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent
2.	Salt + conc. H_2SO_4	No reaction	Conc. H_2SO_4 group absent
3.	Salt + dil HCl + $BaCl_2$ sol^n	white ppt. form	SO_4^{2-} present
(a)	Above white ppt + conc. HCl or HNO_3	white ppt remain undissolved	SO_4^{2-} confirm
(b)	Salt sol^n + CH_3COOH + $(CH_3COO)_2Pb$	white ppt formed	SO_4^{2-} confirm
[B]	Basic radical		
1	Salt + NaOH and heat	NO NH_3 like smell	Zero group absent
2	O.S + dil HCl	No white ppt form	I group absent
3.	Pass H_2S gas in above sol^n	No black and yellow ppt form	II group absent

Teacher's Signature : _____

Expt. No. _____ Date _____

Page No. 45

4.	O.S + a drop of conc. HNO_3 + heat & then cool + NH_2Cl + NH_4OH in excess	White gelatinous ppt not obtain	III group absent
5.	Pass H_2S gas in above sol^n	No ppt formed	IV group absent
6	O.S + $(NH_4)_2CO_3$ sol^n	No ppt formed	V group absent
7.	O.S + $NH_4Cl_{(s)}$ + heat and cool + NH_4OH sol^n + Na_2HPO_4	White ppt form	VI group present Mg^{2+} may be
(a)	Above white ppt + NaOH sol^n + Titan yellow reagent	pink ppt obtain	Mg^{2+} confirm
(b)	Cobalt - Nitrate test	Pink coloured ash obtained	Mg^{2+} confirm

RESULT :-

In the given salt acidic radical is SO_4^{2-} and basic radical is Mg^{2+}.

Teacher's Signature : _____

Experiment Name / No.: _____ Camlin Page No. Date / /

Experiment No. 20

Aim: To analyse the acidic and basic radical in given salt.

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic Radical		
1	Salt + dil H_2SO_4	No reaction	dil. H_2SO_4 group absent
2.	Salt + conc. H_2SO_4	Colourless gas with pungent smell	conc. H_2SO_4 group present Cl^- may be Cl^- present
(a)	A rod dipped in NH_4OH is brought near the mouth of the test tube	white dense fumes appear	
(b)	Chromyl Chloride test:		
(i)	Salt + $K_2Cr_2O_{7(s)}$ + conc. H_2SO_4 and heat	orange red vapour appear	
(ii)	Pass the red vapour in NaOH sol^n	NaOH sol^n turns yellow	
(iii)	Above sol^n + CH_3COOH + $(CH_3COO)_2Pb$	yellow ppt appears	Cl^- confirm

Teacher's Signature: _____

Experiment Name / No.: _____ Camlin Page No. Date / /

[B]	Basic radical		
1	Salt + NaOH sol^n and heat	NO NH_3 like smell	Zero group absent
2	O.S + dil HCl	No white ppt obtain	I group absent
3.	Pass H_2S gas in above sol^n	yellow ppt form	II group present As^{+3} may be
(a)	Boil the yellow ppt into yellow ammonium sulphide sol^n	yellow ppt dissolve	As^{+3} present
(b)	Above sol^n + conc. HNO_3 + ammonium molybdate sol^n	Canary yellow ppt form	As^{+3} confirm

RESULT:

Acidic radical and basic radical in the given salt are Cl^- and As^{+3}.

Teacher's Signature: _____

Experiment Name / No.: _____ Camlin Page No. Date / /

Experiment No. 21

Aim: To analyse the acidic and basic radical in the given salt

OBSERVATION TABLE:

S.No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	Colourless, odourless gas evolve with brisk effervescence	dil. H_2SO_4 group present CO_3^{2-} may be.
(a)	The gas is passed in lime water	It turns milky	CO_3^{2-} present
(b)	On passing the gas for some more time (excess)	Milkiness disappears	CO_3^{2-} confirm
[B]	Basic radical		
1.	Salt + NaOH and heat	No smell of NH_3	Zero group NH_4^+ absent.
2.	O.S + dil HCl	No white ppt form	I group absent
3.	Pass H_2S gas in above sol^n	No black or yellow ppt form	II group absent.

Teacher's Signature _____

Experiment Name / No.: _____ Camlin Page No. Date / /

4	O.S + a drop of conc. HNO_3 + heat than cool + $NH_4Cl_{(s)}$ + NH_4OH (excess)	No ppt form	III group absent
5			
5.	Pass H_2S gas in above sol^n	white ppt form	IV group present Zn^{+2} may be.
	Dissolve the white ppt in dil. HCl and divide the sol^n into two parts.		
10			
(a)	I part + NaOH sol^n.	white ppt form which is soluble in excess of NaOH	Zn^{+2} confirm
(b)	II part + NH_4OH sol^n + $K_4[Fe(CN)_6]$	a bluish white ppt appear	Zn^{+2} confirm
15 (c)	Cobalt Nitrate test	Green coloured ash is obtain	Zn^{+2} confirm

20

RESULT:

In the given salt acidic radical is CO_3^{2-} and basic radical is Zn^{+2} are present.

25

Teacher's Signature: _____

Experiment Name / No.: _____ Camlin Page No. Date / /

Experiment No. 22

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

S.No.	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil H_2SO_4	No reaction	dil H_2SO_4 group absent
2	Salt + conc. H_2SO_4	Brown fumes evolve	conc. H_2SO_4 group present NO_3^- may be
(a)	Add copper turnings in above sol^n and heat	Brown fumes becomes dense	NO_3^- confirm
(b)	Salt + sol^n + freshly prepared $FeSO_4$ + conc H_2SO_4 by the side of test tube	Dark brown ring form	NO_3^- confirm
[B]	Basic radical		
1	Salt + NaOH sol^n and heat	No smell of NH_3	Zero group NH_4^+ absent

Teacher's Signature: _____

Experiment Name / No.: _____ Camlin Page No. Date / /

2	O.S + dil HCl	white ppt form	I group present Pb^{+2} may be
(a)	Dissolve the ppt into hot water and divide the sol^{n} into two parts		
(b)	I part + KI sol^{n}	Yellow ppt obtain	Pb^{+2} confirm
(c)	II part + K_2CrO_4 sol^{n}	Yellow ppt obtain soluble in NaOH	Pb^{+2} confirm

RESULT:

In the given salt acidic radical is NO_3^- and basic radical is Pb^{+2}.

Experiment Name / No.:

Camlin | Page No.
Date / /

Experiment No. 23

Aim: To analyse the acidic and basic radical in the given salt.

OBSERVATION TABLE:

Sr No	Experiment	Observation	Inference
[A]	Acidic radical		
1	Salt + dil. H_2SO_4	No reaction	dil H_2SO_4 group absent
2.	Salt + conc. H_2SO_4	No reaction	conc. H_2SO_4 group absent
3.	Salt sol^n + dil HCl + $BaCl_2$ sol^n	white ppt form	SO_4^{2-} present
(a)	Above ppt + conc HCl or HNO_3	white ppt remain undissolved	SO_4^{2-} confirm
(b)	Salt sol^n + CH_3COOH + $(CH_3COO)_2Pb$ sol^n	white ppt obtain	SO_4^{2-} confirm
[B]	Basic radical		
1	Salt + NaOH and heat	No smell of NH_3	Zero group absent

Teacher's Signature

Experiment Name / No.: _____ Camlin Page No. / Date / /

2.	O.S + dil HCl	No white ppt form	I group absent
3.	Pass H_2S gas in above sol^n	No black or yellow ppt form	II group absent
4.	O.S + a drop of conc. HNO_3 + heat then cool + $NH_4Cl_{(s)}$ + NH_4OH excess. Dissolve the white ppt in dil. HCl & divide it into 3 parts.	Gelatinous white ppt form	III group present Al^{+3} may be
(a)	I part + few drops of blue litmus sol^n + NH_4OH sol^n along the side of test tube	A blue floating mass in the colourless sol^n obtain	Al^{+3} confirm
(b)	II part + NaOH sol^n	white gelatinous ppt soluble in excess of NaOH	

RESULT:

In the given salt acidic radical is SO_4^{2-} and basic radical is Al^{3+} is present.

Teacher's Signature