पुष्पा International School

Shree Swaminarayan Gurukul, Zundal

Class – XII | Subject: Chemistry(Practical) | Experiment (2020_21)

Exp. No	Aim
	QUANTITATIVE ANALYSIS
1	Prepare 250 ml of 0.1MSolution of Oxalic Acid From Crystalline Oxalic Acid
2	Determination of Concentration/Molarity of KMnO4 Solution by Titrating it against a 0.1M Standard Solution of Oxalic acid
3	Determination of Concentration/Molarity of KMnO4 Solution by Titrating it against a Standard Solution of Ferrous ammonium sulphate
	QUALITATIVE ANALYSIS
4	To Identify the given inorganic salt [Ba(NO3)2]
5	To Identify the given inorganic salt [Pb(CH3COO)2]
6	To Identify the given inorganic salt [Pb(NO3)2]
7	To Identify the given inorganic salt PbCl2
8	To Identify the given inorganic salt MgSO4
9	To Identify the given inorganic salt ZnCl2
10	To Identify the given inorganic salt ZnSO4
11	To Identify the given inorganic salt [(NH4)3PO4]
12	To Identify the given inorganic salt NH4Br
13	To Identify the given inorganic salt [(NH4)2CO3]
14	To Identify the given inorganic salt [Sr(NO3)2]

	ORGANIC COMPOUNDS
15	To Identify functional group of Aldehyde (-CHO)
16	To Identify functional group of Ketone (-CO-)
17	To Identify functional group of Alcohol (-OH)
18	To Identify functional group of Carboxylic acid (-COOH)

EXPERIMENT 11.1

Prepare 250 ml of 0.1 M solution of oxalic acid from crystalline oxalic acid.

THEORY

Molecular mass of crystalline oxalic acid $\left(\begin{matrix}COOH\\|\\COOH\end{matrix} . 2H_2O\right) = 126$

Hence, for preparing 1000 ml of 1M oxalic acid, weight of oxalic acid crystals required = 126 g

∴ For preparing 250 ml of 0.1M solution,

oxalic acid crystals required = $\frac{126}{1000} \times 250 \times 0.1 = 3.150$ g.

APPARATUS

Watch glass, analytical balance, weight box, fractional weight box, 250 ml beaker, glass rod, 250 ml measuring flask and wash bottle.

CHEMICALS REQUIRED

Oxalic acid crystals and distilled water.

PROCEDURE

1. Take a watch glass, wash it with distilled water and then dry it.
2. Weigh the clean and dried watch glass accurately and record its weight in the note-book.
3. Weigh 3.150 g oxalic acid on the watch glass accurately and record this weight in the notebook.
4. Transfer gently and carefully the oxalic acid from the watch glass into a clean 250 ml measuring flask using a funnel. Wash the watch glass with distilled water with the help of a wash bottle to transfer the particles sticking to it into the funnel [Fig. 11.14]. The volume of distilled water for this purpose should not be more than 50 ml.
5. Finally wash the funnel well with distilled water with the help of a wash bottle to transfer the solution sticking to the funnel into the measuring flask [Fig. 11.15].
6. Swirl the measuring flask till solid oxalic acid dissolves.
7. Add enough distilled water to the measuring flask carefully, upto just below the etched mark on it, with the help of a wash bottle.

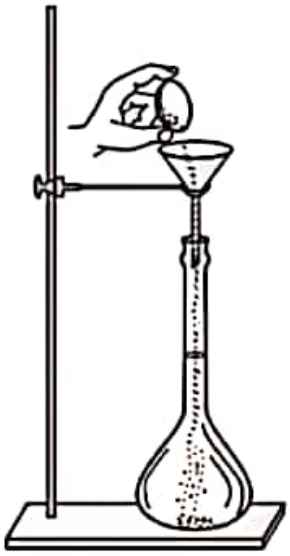

Fig. 11.14. Transferring oxalic acid to the flask.

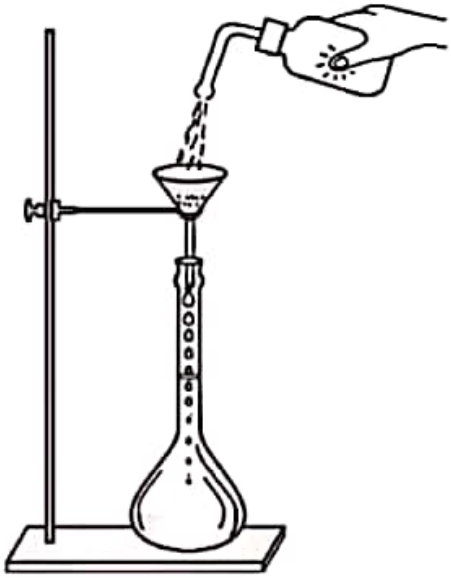

Fig. 11.15. Adding water.

8. Add the last few drops of distilled water with a pipette or a dropper until the lower level of the meniscus just touches the mark on the measuring flask [Fig. 11.16].
9. Stopper the measuring flask and shake gently to make the solution uniform throughout. **Label it as 0.1 M oxalic acid solution [Fig. 11.17].**

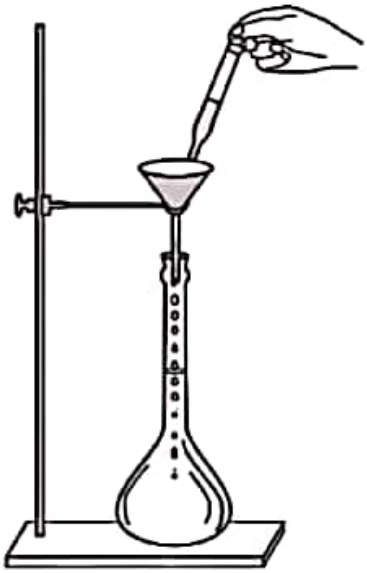

Fig. 11.16. Adding last small amount of water dropwise.

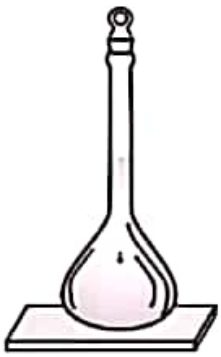

Fig. 11.17. Standard solution of oxalic acid.

Experiment 6.1

Aim

To determine the concentration/molarity of $KMnO_4$ solution by titrating it against a 0.1 M standard solution of oxalic acid.

Reactions of oxalic acid

A. Chemical equations

Reduction half reaction : $2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5\,[O]$

Oxidation half reaction : $H_2C_2O_4 + [O] \xrightarrow{60^\circ C} 2CO_2 + H_2O] \times 5$

$$2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10\,CO_2$$

B. Ionic equation

Reduction half reaction : $MnO_4^- + 5e^- + 8H^+ \longrightarrow Mn^{2+} + 4H_2O] \times 2$

Oxidation half reaction : $C_2O_4^- \longrightarrow 2CO_2 + 2e^-] \times 5$

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

Material Required

- Measuring flask (250 mL): One
- Burette (50 mL) : One
- Burette stand : One
- Pipette : One
- Conical flask : One
- Funnel : One
- Weighing bottle : One
- Glazed tile(white) : One
- Burner : One
- Wire gauze : One
- Chemical balance : One

- Oxalic acid : As per need
- Potassium permanganate solution : As per need
- 1.0 M Sulphuric acid : As per need

Procedure

A. Preparation of 0.1 M standard solution of oxalic acid

Prepare 0.1M oxalic acid solution as mentioned in experiment 2.1(Unit 2, Class XI, Laboratory Manual)

Oxalic acid

Potassium permanganate

Sulphuric acid

B. Titration of oxalic acid solution against potassium permanganate solution

(i) Rinse and fill a clean burette with potassium permanganate solution. Remove the air bubble, if any, from the nozzle of the burette by releasing some solution through it. The burette used in the permanganate titration must have a glass stop cock as rubber is attacked by permanganate ions.

(ii) Take 10 mL of 0.1 M oxalic acid solution in a conical flask and add half of the test tube full (= 5 mL) of 1.0 M H_2SO_4 to it to prevent the formation of any precipitate of manganese dioxide during the course of the titration.

(iii) Heat the oxalic acid solution upto 50°– 60°C before titrating it with potassium permanganate solution taken in the burette. To increase the visibility of the colour change, place the conical flask containing the solution to be titrated over a white glazed tile kept below the nozzle of the vertically fitted burette.

(iv) Note the initial reading of the volume of permanganate solution in the burette and add it in small volumes to the hot oxalic acid solution while swirling the contents of the flask gently. The violet colour of permanganate solution is

discharged on reaction with oxalic acid. The end point is indicated by the appearance of permanent light pink colour due to a slight excess of permanganate solution.

(v) Repeat the titration till three concordant readings are obtained. Since the solution of $KMnO_4$ is of dark colour, the upper meniscus should be considered for noting the burette readings.

(vi) Record the readings as shown in observation Table 6.1 and calculate the strength of potassium permanganate solution in mols/litre.

Table 6.1 : Titration of potassium permanganate solution against standard oxalic acid solution

Sl. No.	Volume of Oxalic acid in mL	Burette readings		Volume (V) of $KMnO_4$ used $V = (y-x)$ mL
		Initial (x)	Final (y)	

Calculations

(i) The strength of the unknown solution in terms of molarity may be determined by the following equation.

$$a_1 M_1 V_1 = a_2 M_2 V_2 \qquad (6.1)$$

For oxalic acid vs potassium permanganate titration:

a_1 = 2. (the number of electrons lost per formula unit of oxalic acid in a balanced equation of half cell reaction)

a_2 = 5. (the number of electrons gained per formula unit of potassium permanganate in the balanced equation of half cell reaction)

M_1 and M_2 are the molarities of oxalic acid and potassium permanganate solutions used in the titration.

V_1 and V_2 are the volumes of oxalic acid and potassium permanganate solutions.

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On putting the value of a_1 and a_2 in equation 6.1 we get

Oxalic acid $\quad\quad$ $KMnO_4$

$$2M_1V_1 = 5M_2V_2$$

$$M_2 = \frac{2}{5}\frac{M_1V_1}{V_2} \qquad (6.2)$$

We can calculate the molarity of potassium permanganate solution by using equation 6.2. Strength of the solution is given by the following equation:

Strength = Molarity × Molar mass

Result

(i) Molarity of $KMnO_4$ solution is _____.

(ii) Strength of $KMnO_4$ solution is _____.

Precautions

(a) Always rinse the burette and the pipette with the solutions to be taken in them.

(b) Never rinse the conical flask with the experimental solutions.

(c) Remove the air gaps if any, from the burette.

(d) Never forget to remove the funnel from the burette before noting the initial reading of the burette.

(e) No drop of the liquid should hang at the tip of the burette at the end point and while noting reading.

(f) Always read the upper meniscus for recording the burette reading in the case of all coloured solutions.

(g) Never use pipette and burette with a broken nozzle.

(h) Lower end of the pipette should always remain dipped in the liquid while sucking the liquid.

(i) Do not blow out the last drop of the solution from the jet end of the pi

(j) The strength of the solution must be calculated up to the fourth decin

(k) Do not forget to heat the mixture of oxalic acid and H_2SO_4 solutions between 5 while titrating it against potassium permanganate.

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EXPERIMENT 6.2

Aim

To determine the concentration/molarity of $KMnO_4$ solution by titrating it against standard solution of ferrous ammonium sulphate.

Theory

Like oxalic acid, ferrous ammonium sulphate also acts as a reducing agent in the titration against potassium permanganate. The reaction which takes place is given below :

(a) Chemical equation

Reduction half reaction : $2\,KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2\,MnSO_4 + 3H_2O + 5\,[O]$

Oxidation half reaction : $2\,FeSO_4(NH_4)_2SO_4 . 6H_2O + H_2SO_4 + [O] \longrightarrow Fe_2(SO_4)_3 + 2(NH_4)_2SO_4 + 13\,H_2O] \times 5$

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

(b) Ionic equation

Reduction half reaction : $MnO_4^- + 5e^- + 8H^+ \longrightarrow Mn^{2+} + 4H_2O$

Oxidation half reaction : $Fe^{2+} \longrightarrow Fe^{3+} + e^-] \times 5$

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

Material Required

- Measuring flask (250 mL) : One
- Burette (50 mL) : One
- Burette stand : One
- Pipette : One
- Conical flask : One
- Glazed tile (white) : One
- Funnel : One
- Weighing bottle : One

- Potassium permanganate solution : As per need
- Dilute sulphuric acid : As per need
- Ferrous ammonium sulphate : As per need

Procedure

Potassium permanganate

Sulphuric acid

A. Preparation of 0.05 M, standard solution of ferrous ammonium sulphate

(Molar mass of $FeSO_4(NH_4)_2SO_4 . 6H_2O = 392\ g\ mol^{-1}$).

(i) Weigh 4.9000 g of ferrous ammonium sulphate and transfer it into a 250 mL measuring flask through a funnel.

(ii) Transfer the solid sticking to the funnel with the help of distilled water into the flask and add dilute H_2SO_4 into the flask drop wise to get the clear solution.

(iii) Shake the flask till the substance dissolves and make the solution upto the mark.

B. Titration of ferrous ammonium sulphate against potassium permanganate solution

(i) Rinse and fill the clean burette with potassium permanganate solution. Remove air bubbles if any, from the burette tip by releasing some solution through it.

(ii) Take 10 mL of 0.05 M ferrous ammonium sulphate solution in a conical flask and add half test tube (≈ 5 mL) full of (1.0 M) H_2SO_4 to it.

(iii) Titrate the above solution with potassium permanganate solution till the colour of the solution changes to permanent pink. Swirl the content of the flask during the titration.

(iv) Repeat the titration, until three concordant readings are obtained.

(v) Record the readings as shown in observation Table 6.2 and calculate the strength of potassium permanganate solution in mols/litre.

Table 6.2 : Titration of potassium permanganate solution against standard ferrous ammonium sulphate solution

Sl. No.	Volume of ferrous ammonium sulphate solution used for each titration in mL	Burette Readings		Volume (V) of $KMnO_4$ used $V = (y-x)$ mL
		Initial (x)	Final (y)	

Calculations

The strength of unknown solution in terms of molarity may be determined by the following equation :

$a_1M_1V_1 = a_2M_2V_2$

M_1 and M_2 are the molarities of ferrous ammonium sulphate and potassium permanganate solutions and V_1 and V_2 are volumes of ferrous ammonium sulphate and potassium permanganate solutions, respectively.

$a_1 = 1$, (the number of electrons lost per formula unit of ferrous ammonium sulphate in the half cell reaction)

$a_2 = 5$, (the number of electrons gained per formula unit of potassium permanganate in a half cell reaction)

Strength can be calculated by the formula given below :

Strength = Molarity Molar mass

Result

The strength of the given potassium permanganate solution is _____ g/L.

Precautions

(a) Always use a fresh sample of ferrous ammonium sulphate to prepare its standard solution.

(b) Other precautions are same as that in Experiment 6.1.

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AIM:

EXPERIMENT-5

AIM- To identify the given inorganic Salt [$Ba(NO_3)_2$]

	EXPERIMENT	OBSERVATIONS	INFERENCE
*	PRIMARY TEST		
1.	Color.	white	Absence of Cu^{2+}, Fe^{3+}, Co^{+2}, Mn^{+2}
2.	Smell	No specific	NH_4^+, S^{2-}, CH_3COO^- absent.
3.	Gas evolved	A reddish brown gas evolved, which turned $FeSO_4$ sol^n black.	NO_3^- may be present.
4.	Sublimation	No sublimation	NH_4^+, I^- may be absent
5.	Decrepitation	No decrepitation	$[Pb(NO_3)_2]$, NaCl, KBr absent.
6.	Residue	white	Zn^{2+}, Pb^{2+} may be absent.
7.	FLAME TEST.		
	Prepare a paste Salt + Conc. HCl	Persistent grassy green flame on prolonged heating.	Ba^{+2} may be present.
8.	Salt + dil. H_2SO_4 (warm)	No gas evolves	CO_3^{2-}, S^{2-}, NO_2 may be absent.
9.	Salt + dil. H_2SO_4 adding drops of $KMnO_4$	Pink color of $KMnO_4$ is lost	Cl^-, Br^-, I^-, $C_2O_4^{2-}$, Fe^{2+} may be absent.
10.	Heat a pinch of salt and conc. NaOH	No ammonia gas evolved	NH_4^+ absent.

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AIM :			
11.	Preparation of (05) shake a salt + water mix	Soln obtained	label it as the original solution.
12	To a part of (0.5) add 1-2 ml of dil. HCl	No ppt formed	G.I. Absent (Pb^{2+} absent).
13.	To a part of soln pass H_2S gas.	No ppt formed	GII Absent. (Pb^{2+}, Cu^{2+}, Ag^{3+} absent)
14	To remaining soln. add Solid NH_4Cl, Boil, Cool down, add a few drops NH_4OH	No ppt formed	GIII absent. (Fe^{2+}, Al^{3+}, absent)
15.	Through a part of this soln, pass H_2S gas.	No ppt formed	GIV absent. (Zn^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+} absent).
16.	To the remaining ammonical solution, add ammonium Carbonate.	White ppt formed	GV present (Ca^{2+}, Ba^{2+}, Sr^{2+} may be present).
~~17.~~	Go		
*	CONFIRMATORY TEST		
17	For Nitrate -		
a)	Copper chips test, heated a pinch of the salt with conc. H_2SO_4.	Reddish Brown Gas	NO_3^- Confirmed.

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AIM :

b)	Ring Test	Dark Brown ring is observed	NO_3^- Confirmed.
18.	For Ba^{2+} -		
a)	Potassium Chromate test	Yellow ppt	Ba^{2+} Confirmed
b)	Perform flame test with salt	Grassy green flame	Ba^{2+} Confirmed

RESULT -

i) Acid Radical - NO_3^-

ii) Basic Radical - Ba^{2+}

PRECAUTIONS -

i) Handle reagents properly

ii) Never heat a wet test-tube

iii) Keep processing test-tube away from body.

iv) Don't inhale unknown / poisonous gases.

AIM :

EXPERIMENT - 6

AIM - To identify the given inorganic Salt [$Pb(CH_3COO)_2$]

	EXPERIMENT	OBSERVATION	INFERENCE
★	PRIMARY TEST-		
1.	Colour	white	shows absence of Cu^{2+}, Ni^{2+}, Fe^{3+}, Mn^{2+}, Co^{2+}.
2.	Smell	Vinegar like smell	shows presence of CH_3COO^-
3.	Density	heavy.	Salt of Pb^{2+} or Ba^{2+} Carbonate may be present.
4.	Diliquescence	No deliquescence	shows absence of $Zn(NO_3)_2$ & Cl of Zn^{+2}, Mg^{+2} etc.
★	DRY HEATING TEST		
5.	Gas evolved	Colourless gas with characteristic vinegar like smell	CH_3COO^- may be present.
6.	Sublimate formed	No Sublimation	NH_4 & I^- are absent.
7.	Descrepitation	No descrepitation	Salts like $Pb(NO_3)_2$, NaCl, KI are absent.
8.	Residue.	white salt becomes black on heating	CH_3COO^- may be present.
★	FLAME TEST-		
9.	Make a paste of Salt and conc. HCl & perform the test	Dull bluish white flame	Pb^{2+} may be present.

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Teacher's Signature : _____

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AIM :

10.	Dil H_2SO_4 test: Treat a pinch of salt with dil. H_2SO_4 (+Heat)	No gas evolved.	CO_3^{2-}, S^{2-}, NO_2^-, SO_3^{2-} may be absent.
11.	$KMnO_4$ Test: To a pinch of salt add dil H_2SO_4 & heat Then add $KMnO_4$	Pink color of $KMnO_4$ wasn't discharged	Cl^-, Br^-, I^-, $C_2O_4^{2-}$, Fe^{2+} may be absent.
12.	Heat a pinch of Salt with Conc. NaOH	No ammonia gas is evolved	NH_4^+ Absent.
13.	Preparation of (O.S.): Shake mix of Salt & water	Solution is obtained	label it as the original solution.
14.	To a part of O.S. add 2ml of dil HCl	white ppt is obtained	• Group I is present • Pb^{2+} might be present.

RESULT - i) Acid Radical : CH_3COO^-
ii) Basic Radical : Pb^{2+}

PRECAUTIONS - i) Don't heat wet test tube
ii) Don't inhale gases, they might be poisonous
iii) Keep test-tube far from face, while dry heating.
iv) Handle reagents carefully.

AIM:

EXPERIMENT - 7.

AIM - To Identify the given inorganic Salt $Pb(NO_3)_2$

	EXPERIMENT	OBSERVATION	INFERENCE
*	PRIMARY TEST -		
1.	Color.	white.	Shows absence of NH_4^+, CH_3COO^-, S^{2-}
2.	Smell	No specific odour	Shows absence of Cu^{2+}, Ni^+, Fe^{2+}, Co^{2+}.
3.	Density.	Heavy / Thick.	Salt of Pb^{2+} or Ba^{2+} carbonate.
4	Delique scence	No deliquescence.	Shows absence of $Zn(NO_3)_2$, Chlorides of Zn^{2+}, Mg^{2+} etc.
*	DRY HEATING TEST -		
5.	Gas evolved.	A reddish Brown gas evolved which turned $FeSO_4$ Solution, black.	NO_3^- may be present.
6.	Sublimate Formed	No Sublimation.	Shows absence of NH_4^+ & I^-
7.	Decrepitation.	The Salt decripitates	$Pb(NO_3)_2$, NaCl, KBr may be present.
8.	Swelling.	No Swelling.	Shows absence of indicated. PO_4^{3-}.
9.	Residue	Hot → Brown. Cold → Yellow.	Pb^{2+} might be present.

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AIM: FLAME TEST

10.	Prepare a paste of Salt & with concentrated HCl and perform flame Test.	Dull bluish - white flame	Pb^{3+} Pb^{2+} may be present.
11.	Dil H_2SO_4 test: Treat a pinch of salt with dil H_2SO_4 & heat.	No gas evolved	Pb^{2+} may be present.
12.	$KMnO_4$ Test: To a pinch of Salt add dil H_2SO_4 (hot) and then add a drop of $KMnO_4$	Pink color of $KMnO_4$ was not discharged.	Cl^-, Br^-, I^-, $C_2O_4^{2-}$, Fe^{2+} may be absent.
13.	Conc. H_2SO_4 Test: Salt + Conc. H_2SO_4 + (Heat if required)	A reddish brown gas evolved, which turned $FeSO_4$ soln into black.	NO_3^- may be present.
14.	Confirmatory Test: FOR NITRATE -		
a)	'Cu' chip test; Heat a small quantity of Salt with conc. H_2SO_4 and a few 'Cu' chips	Reddish brown gas evolves	NO_3^- is confirmed $2KNO_3 + H_2SO_4 \rightarrow K_2SO_4 + 2HNO_3$
b)	Ring Test - 2-3 ml of Salt soln + $FeSO_4$ soln Add Conc. H_2SO_4 along sides of test tube.	Solution obtained of dark brown color, 2 liquids at the function.	label it as original soln.
15.	Preparation of (o.s) Shake a pinch of Salt with water.	Solution obtained	label it as original soln.

Teacher's Signature: _____

AIM:

16.	To a pinch of o.s, add 1-2 ml of dil. HCl	White ppt is formed	Group I : Pb^{2+} may be present
17.	Confirmatory test for Pb^{2+} dissolve white ppt with distilled water & divide it in two parts.		
a)	KI Test: To one part add KI solution.	Yellow ppt obtained	Pb^{2+} is confirmed $PbCl_2 + 2KI \rightarrow PbI_2 + 2KCl$
b)	K_2CrO_4 Test: to one part add K_2CrO_4 soln.	Yellow ppt obtained	Pb^{2+} is confirmed $PbCl_2 + K_2CrO_4 \rightarrow PbCrO_4 + 2KCl$.

RESULT-

Acid Radical : NO_3^-

Basic Radical : Pb^{2+}.

PRECAUTIONS -

1) Don't heat a wet test tube.
2) Don't inhale gases directly, they might be harmful
3) Keep test tube away from face while dry heating.
4) Handle reagents carefully.

AIM:

EXPERIMENT-8

AIM- To identify the given inorganic salt $PbCl_2$

	EXPERIMENT	OBSERVATION	INFERENCE
*	PRIMARY TEST-		
1.	Colour	white	Shows absence of Cu^{2+}, Ni^{2+}, Fe^{2+}, Fe^{3+}, Mn^{2+}, Co^{2+}
2.	Smell	No specific smell	Shows absence of NH_4^+, CH_3COO^-.
3.	Density	Heavy	Salt of Pb^{2+} or Ba^{2+} Carbonate may be present.
4.	Deliquescene.	no deliquescene	Shows absence of $Zn(NO_3)_2$ & chlorides of Zn^{2+}.
*	DRY HEATING TEST		
5.	Gas evolved	Colourless gas with pungent smell, white fumes with ammonia → white ppt with $AgNO_3$.	Cl^- may be present.
6.	Description.	No description.	$Pb(NO_3)_2$, NaCl are absent
7.	Residue.	Hot → Brown. Cold → Yellow	Pb^{2+} might be present.

AIM :

*	FLAME TEST-		
8	Make a paste of Salt + Conc. HCl.	Dull bluish white flame.	Pb^{2+} may be present.
9.	Dil. H_2SO_4 Test. Treat a pinch of Salt with dil H_2SO_4 and heat.	No gas evolved	CO_3^{2-}, S^{2-}, NO_2^-, SO_3^{2-} may be present.
10.	Conc. H_2SO_4 + Salt + Heat (if required)	Colourless gas, pungent smell, white fumes with ammonia, and white $AgNO_3$ ppt.	Cl^- may be present.
11.	Heat a pinch of Salt with Conc. NaOH	No ammonic gas evolved	NH_4^+ absent.
12.	Preparation(os) of : Shaking a mix of Salt and water	Solution obtained	label it as the original Soln.
13.	To a part of 0.5 add 1.2 mL of dil. HCl.	white colored ppt is obtained	Group I is present Pb^{2+} may be present.
14.	Heat a pinch of Salt with Conc. NaOH.	No NH_3 gas is released	Absence of NH_4^+ ions.

RESULT -

Acid Radical - Cl^-

Basic Radical - Pb^{2+}

Date _____

AIM

PRECAUTIONS -

i) Never heat wet test-tube

ii) No direct inhalation of gases.

iii) Keep tube away from face while dry heating.

iv) Handle reagents carefully.

Expt. No. _____ Date _____

AIM :

EXPERIMENT-9

AIM- To identify the given inorganic Salt $MgSO_4$

	EXPERIMENT	OBSERVATIONS	INFERENCE
*	PRIMARY TEST-		
1.	Colour	White	Shows absence of Cu^{2+}, Ni^{2+}, Mn^{2+}, Co^{2+}, NH_4^+, CH_3COO^-, S^{2-}
2.	Smell	Odourless	S^{2-}, NH_4^+, CH_3COO^- are absent.
3.	Gas evolved	No gas evolved	S^{2-}, SO_3^{2-}, Cl^-, CH_3COO^-, NH_4^+, NO_3^- are absent.
4.	Sublimate formed	No sublimation	NH_4^+, I^- are absent.
5.	Decripitation	No decripitation.	$Pb(NO_3)_2$, NaCl, KBr, are absent.
6.	Residue	White residue that glows on heating	Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, Al^{3+}, maybe present.
7.	Flame Test Make a paste of Salt + Conc. HCl	No specific flame color	Ca^{2+}, Sr^{2+}, Ba^{2+}, Cu^{2+}, Zn^{2+}, Pb^+ may be absent.
8.	Dil H_2SO_4 Test Treat a pinch of Salt + dil H_2SO_4 and heat	No gas evolved	CO_3^{2-}, S^{2-}, NO_2^-, SO^{2-} might be absent.
9.	$KMnO_4$ Test: A pinch of salt added to dil. H_2SO_4 & heat.	Pink color of $KMnO_4$ wasn't discharged.	Cl^-, Br^-, I^-, $C_2O_4^{2-}$, Fe^{2+} maybe Absent.

AIM	Then add $KMnO_4$.		
10.	Conc. H_2SO_4 + Salt + Heat (If required)	No gas evolved	Cl^-, Br^-, I^-, NO_3^-, CH_3COO^- are absent.
11.	Heat a pinch of Salt with conc. NaOH	No ammonia gas evolved	NH_4^+ absent.
12.	Shake a mix of Salt with water.	Solution obtained	Label as original Solution.
13.	To a part of o.s add 1-2 ml of dil. HCl	No ppt formed	Group I absent Pb^{2+} absent.
14.	Through the above formed solution, Pass H_2S gas	No ppt formed	Group II absent (Pb^{2+}, Cu^{2+}, As^{2+}, etc.)
15.	To remaining Sol^n add a pinch of Solid NH_4Cl, Boil the Sol^n and add excess NH_4OH	No ppt formed.	Group III absent (Fe^{2+}, Al^{3+}, absent)
16.	To the remaining Sol^n add ammonium Carbonate.	No ppt formed	Group IV absent (Ca^{+}, Ba^{2+} absent).
17.	Through a part of the above Sol^n. pass H_2S gas	No ppt formed	Group IV absent (Zn^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+} absent)

RESULT -

Acid Radical - SO_4^{2-}

Basic Radical - Mg^{2+}

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AIM : PRECAUTIONS.

i) Don't heat wet test-tube
ii) Don't inhale any gases.
iii) Keep tube away from face while heating dry.
iv) Handle reagents carefully.

AIM:

EXPERIMENT-12.11

AIM- To Identify the given inorganic Salt $ZnCl_2$.

	EXPERIMENT	OBSERVATIONS	INFERENCE
*	PRIMARY TEST-		
1.	Colour	White	Shows the absence of Cu^{2+}, Ni^{2+}, Co^{2+}.
2.	Smell	No specific odour.	NH_4^+, CH_3COO^- may be absent.
*	DRY HEATING TEST		
3.	Gas evolved	Colourless gas with pungent smell, white fumes with NH_3 presence	Cl^- may be present
4.	Sublimate formed	No Sublimation	NH_4^+, I^- are absent.
5.	Decripitation	No decripitation.	$Pb(NO_3)_2$, NaCl, KBr absent.
6.	Residue	Yellow for hot White for cold	Zn^{2+} may be present.
7.	Flame Test: Make Salt + Conc. HCl paste	shows a green flame	Zn^{2+} or Mn^{2+} may be ~~formed~~ present.
8.	Dil H_2SO_4 test. Salt + Dil. H_2SO_4	No gas evolved	CO_3^-, S^{2-}, NO_2^-, SO_3^{2-} may be absent.
9.	$KMnO_4$ Test: Salt + dil H_2SO_4 and heat	when cold, Pink colour of $KMnO_4$ is discharged	Cl^-, Br^-, I^- may be present.

AIM :

10.	Conc. H_2SO_4 + Salt + Heat	Colourless gas, pungent smell, white fumes with NH_4 & white ppt of $AgNO_3$	Cl^- may be present.
11.	Heat a pinch of Salt and conc. NaOH	No NH_3 gas evolved	NH_4^+ absent.
12.	Shake the mix of Salt + Water	Solution is obtained	Label it as the original Sol^n.
13.	To a part of 0.5 add 1-2 mL of dil HCl.	No ppt obtained	Group I absent (Pb^{2+} absent)
14.	Through the part of above, pass H_2S	No ppt obtained	Group II absent (Pb^{+2}, Cu^{+2}, Ag^{2+}, absent)
15.	To remaining sol^n. add pinch of NH_4Cl boil, cool, and add NH_4OH	No ppt formed	Group III absent (Fe^{3+}, Al^{3+} absent)
16.	To remaining Sol^n add pinch of NH_4Cl pass H_2S gas.	White ppt obtained	Group IV present (Zn^{+2}, Mn^{+2} may be present).

RESULT -

Acidic Radical - Cl^-

Basic Radical - Zn^{2+}

PRECAUTIONS -

- Don't heat wet test tube.

vision

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AIM :

ii) Don't inhale unidentified gases.

iii) Keep test-tube away from face while dry-heating.

iv) Handle reagents carefully.

AIM :

EXPERIMENT- ~~13~~ 12

AIM - To identify the given inorganic Salt $ZnSO_4$.

	EXPERIMENT	OBSERVATIONS	INFERENCE.
*	PRIMARY TEST-		
1.	Colour	White	Shows absence of Cu^{2+}, Fe^{3+}, Co^{2+}, Mn^{2+}
2.	Smell	No specific smell	NH_4^+, CH_3COO^-, S^{2-} may be absent.
*	DRY HEATING TEST-		
3.	Gas evolved	No gas evolved	SO_2^{2-}, Cl^-, Br^-, NO_3^- are absent.
4.	Sublimate formed	No Sublimation	NH_4^+, I^- are absent.
5.	Decriptation	Absent	$Pb(NO_3)_2$, NaCl, HBr are absent.
6.	Residue	Hot → Yellow Cold → White	~~absent~~. Zn^{+2} may be present.
7.	Flame Test - Paste of Salt + Conc. HCl & heated	Green flame	Zn^{2+} or Mn^{2+} may be present
8.	Dil H_2SO_4 + Salt + Heat (if required)	No gas evolved	CO_3^{2-}, S^{2-}, NO_2^-, SO_3^{2-} may be absent.
9.	Add $KMnO_4$ to Salt + dil H_2SO_4	Pink Colour of $KMnO_4$ is discharged.	Cl^-, Br^-, I^-, $C_2O_4^{2-}$ may be absent.
10.	Test for independent radical Boil a small amount	A white ppt insoluble in conc. HCl obtained	SO_4^{2-} is present.

vision

Teacher's Signature :

AIM :

	of salt with dil. HCl, filter wit and add few drops of $BaCl_2$ Sol^n		
11.	Heat a pinch of salt with Conc. NaOH	No ammonia gas evolved.	NH_4^+ absent.
12.	To a part original Solution add 1-2 mL of dil. HCl.	No ppt obtained	Group I absent (Pb^{2+} absent).
13.	Through a part of previous sol^n, pass H_2S gas	No ppt formed	Group II absent (Pb^{2+} absent)
14.	To remaining Sol^n add pinch of NH_4Cl, boil the Sol^n. Cool it down and add excess NH_4OH	No ppt formed	Group III absent (Fe^{3+}, Al^{2+} absence).

RESULT -

Acid Radical - SO_4^{2-}

Basic Radical - Zn^{2+}

PRECAUTIONS -

i) Never heat wet test-tube

ii) Don't inhale unknown or poisonous gases.

iii) Keep test-tube in a safe distance while dry-heating.

iv) Handle reagents carefully.

AIM :

EXPERIMENT - ~~16~~ 15

AIM - To identify the given inorganic salt $(NH_4)_3PO_4$.

	EXPERIMENT	OBSERVATIONS	INFERENCE.
*	PRIMARY TEST.		
1.	Colour.	White	Shows absence of Ni^{2+}, Fe^{3+}, Co^{2+}, Mn^{2+}, NH_4^+ is present.
2.	Smell	Ammonical smell	NH_4^+ is present.
*	DRY HEATING TEST		
3.	Gas evolved	Colourless gas, pungent and sweet smell, white fumes.	NH_4^+ may be present.
4.	Sublimation	White sublimate	NH_4^+ may be present.
5.	Swelling	Salt swells	PO_4^{3-} may be present.
6.	Flame Test. Make a paste of Salt + Conc. HCl & perform flame Test.	No specific smell	Ca^{2+}, Sr^+, Ba^+, Cu^{2+}, Zn^{2+}, Pb^{2+} are absent.
7.	Dil H_2SO_4 treated with a pinch of Salt and heat	No gas is evolved	CO_3^-, SO_3^-, S^{-2}, NO_2^- are absent.
8.	To a pinch of salt add dil. H_2SO_4 (warm) & then add $KMnO_4$	decolourise $KMnO_4$ from Pink	Cl^-, Br^-, I^-, $C_2O_4^{2-}$ and Fe^{2+} are absent.

AIM :

9.	Conc. H_2SO_4 + Salt + Heat (if required)	No gas evolved	Cl^-, Br^-, I^-, NO_3^-, CH_3COO^- absent.
10.	Heat a pinch of salt with conc. NaOH	Colourless gas, with Ammonial smell evolved.	Gp zero is present (NH_4^+ Present)

RESULT -

Acid Radical - PO_4^{3-}

Basic Radical - NH_4^+

PRECAUTIONS :

1) Never heat a wet test tube.
2) Don't inhale gases which are unknown / poisonous.
3) Handle reagents very carefully.

AIM:

EXPERIMENT - 16

AIM - To identify the given inorganic salt NH_4Br.

	EXPERIMENT	OBSERVATIONS	INFERENCE
✱	PRIMARY TEST -		
1.	Colour	white	Cu^{2+}, Ni^{2+}, Fe^{3+}, are absent.
2.	Smell	Ammonical	NH_4^+ is present.
3.	Gas evolved	Colourless gas, with characteristic smell gives white fumes ~~with~~.	NH_4^+ may be present.
4.	Sublimate formed	white Sublimate	NH_4^+ may be present.
5.	Flame Test: Make a paste of Salt + Conc. HCl. perform flame Test.	No specific flame	Shows absence of Ca^{2+}, Ba^{2+}, Zn^{2+}, Pb^{2+}.
6.	Treat a pinch of Salt with dil H_2SO_4 & heat	No gas evolved	CO_3^{2-}, SO_3^{2-}, S^{2-}, NO_2^-, absent.
7.	Salt + dil $KMnO_4$ heat it and add a drop of H_2SO_4	Pink Colour of $KMnO_4$ decolourises	Cl^-, Br^-, I^- may be present.
8.	Salt + Con. H_2SO_4 + heat (if required)	Reddish brown gas with a pungent odour Turns $FeSO_4$ into black	Br^- may be present.
9.	Heat a pinch of Salt with Con. NaOH	Colourless gas with ammonical smell	Group Zero present (NH_4^+ present).

RESULT - 1) Acid Radical - Br^-

2) Basic Radical - NH_4^+

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PRECAUTIONS -

1) No heating of wet test tube.
2) Use test-tube away from body
3) Handle reagents carefully.

AIM:

EXPERIMENT-17

AIM - To identify the given Inorganic Salt $(NH_4)_2CO_3$.

	EXPERIMENT	OBSERVATIONS	INFERENCE.
1.	Colour	White	Shows absence of Cu^{2+}, Fe^{2+}, Fe^{3+}, Co^{2+}
2.	Smell	Ammonical	NH_4^+ is present.
3.	Gas evolved	Colourless with characteristic smell gives white fumes when a Nessler's Sol^n brown	NH_4^+ maybe present.
4.	Sublimation	white Sublimate	NH_4^+ maybe is present.
5.	Decripitation	no decripitation	$Pb(NO_3)_2$, NaCl is absent.
6.	Flame Test Make paste of Salt + Conc. HCl & flame tested.	No specific flame	Ca^{2+}, Sr^{+2}, Ba^{2+}, Zn^{2+}, Pb^{2+} are absent.
7.	Dil H_2SO_4 + Salt + Δ	Colourless, odourless, gas with brisk effervescence	CO_3^{2-} may be present.
8.	Salt + water	Salt does not dissolve	Involves CO_3^{2-} indicated.
9.	Salt + Conc. H_2SO_4 + heat (if required)	No gas evolve	Cl^-, Br^-, I^-, NO_3^-, CH_3COO^-, $C_2O_4^{2-}$ are absent.
10.	Salt + Conc. H_2SO_4 + heat (if required)	No decolorisation	Indication of Carbonate

RESULTS -

Acid Radical → CO_3^{2-}

Basic Radical → NH_4^+.

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AIM :

PRECAUTIONS -

i) No heating of wet test-tubes.

ii) Use test-tube away from body.

iii) Handle reagents carefully.

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AIM :

EXPERIMENT-20-19

AIM- To Identify the given inorganic Salt $Sr(NO_3)_2$

	EXPERIMENT	OBSERVATION	INFERENCE.
1.	Colour	white	shows absence of Ni^{2+}, Fe^{2+}, Fe^{3+}, Co^{2+}.
2.	Smell	No specific smell	NH_4^+, CH_3COO^-, S^{2-} are absent.
3.	Gas evolved	NO_2 gas - Red-brown gas turns $FeSO_4$ into black.	NO_3^- may be present
4.	Sublimate formed	No sublimation	$Pb(NO_3)_2$, NaCl, HBr is absent.
5.	Decrepitation	No decrepitation	NH_4^+, I^- are absent.
6.	Residue	White residue which glows on heating	Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+} may be present.
7.	Flame Test: Salt + Conc. HCl & perform test	Crimson Red flame	Sr^{2+} may be present.
8.	Salt + dil H_2SO_4 and heat Sol^n	No gas evolved	CO_3^{2-}, S^{3-}, NO_2^-, SO_3^{2-} is absent.
9.	Salt + dil H_2SO_4 + Heat + few drops of $KMnO_4$	Pink colour of $KMnO_4$ was not discharged	Cl^-, Br^-, I^-, $C_2O_4^{2-}$, Fe^{2+} may be absent.
10.	Heat a pinch of salt with conc. NaOH	No ammonia gas evolved	NH_4^+ absent.
11.	Shake mix of Salt + water	Sol^n is obtained	label as original Sol^n.

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AIM :

12.	To a part of 0.5 add 1-2 mL of dil HCl	No ppt obtained	Group I absent Pb^{++} absent.
13.	Through a part of this soln pass H_2S gas	No ppt formed	Group II absent
14.	Through a part of this soln. pass H_2S gas.	No ppt formed	Group V present (Ca^{2+}, Ba^{2+}, Sr^{2+} may be present).

RESULT -

Acidic Radical - NO_3^-

Basic Radical - Sr^{2+}

PRECAUTION -

i) Don't heat wet test-tube.

ii) Handle reagents carefully.

iii) Don't inhale unknown gas.

Date

AIM :

EXPERIMENT - 20

AIM: ~~To Identif~~ To Identify functional group of aldehyde. $\left(-\overset{\overset{O}{\|}}{C}-H\right)$

	EXPERIMENT	OBSERVATION	INFERENCE
1.	Test for unsaturation	Brown color of bromine not discharged	No unsaturation is present.
2.	Test for carboxylic group	No effervescence	Carboxylic group is absent
3.	Test for phenolic group	No green or violet colour obtained	Phenolic group is absent.
4.	Test for alcoholic group	No effervescence	Alcoholic group is absent.
5.	Test for carbonyl group	Orange - yellow ppt formed	Carbonyl group is present may be an aldehyde or a ketone.
6.	Test for carbonyl group	Silver mirror formed on inner side of test-tube	Aldehyde is present.
7.	Test for Amine To a small amount of organic liq in test-tube add 1-mL Conc. HCl & $CHCl_3$. Also add 2mL of alc. KOH + Heat.	No offensive smelling gas is evolved	Amino group absent.

RESULT -

The set of tests prove the presence of $\left(-\overset{\overset{O}{\|}}{C}-H\right)$ aldehyde functional group.

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AIM :

PRECAUTIONS -

i) use freshly prepared solutions.

ii) Keep a safe distance from test-tube while heating

iii) Avoid inhalation of any fumes evolved which are unknown.

iv) Use a lab coat & gloves while dealing with corrosive chemicals.

AIM :

EXPERIMENT-22 21

AIM- To Identify functional group of Ketone. ($-\overset{\overset{O}{\|}}{C}-$)

	EXPERIMENT	OBSERVATION	INFERENCE
1.	Test for unsaturation dissolve 0.2 ml of CCl_4 then add Br_2 water	Brown colour of Bromine not discharged.	No unsaturation is present.
2.	Test for Carboxyl group 0.2 mL of Compound + Pinch of $NaHCO_3$	No effervescence	Carboxylic acid, group is absent.
3.	Test for phenolic group - 0.2 mL Compound + 2.3 ml of neutral $FeCl_3$ solution.	No green or violet Colour obtained	Phenolic group is absent
4.	Test of alcoholic group - Small peice of sodium + 1 ml of given Compound	No effervescence	Alcoholic group is absent.
5.	Test for Carbonyl group, shake 0.2 ml of 2.3 - di - nitro phenyl hydrazine	Orange - Yellow ppt formed.	Carbonyl group is present (Aldehyde / Ketone).

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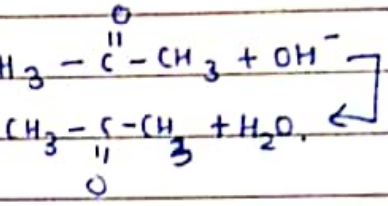
AIM			
6.	Test for Ketonic group - 0.5 ml Compound + 0.1 ml m-dinitro benzene + 1 ml dil. NaOH.	Violet colour obtained that slowly fades.	Ketonic group is present.
7.	Confirmatory for Ketone - Dissolve a crystal of Sodium nitro-prussside in distilled water + 0.5 g/ml of Compound + NaOH drop-wise.	Red colour is obtained.	Ketone is confirmed. 

RESULT -

The given organic compound contains Ketone group $\left(-\overset{\overset{O}{\|}}{C}-\right)$

PRECAUTIONS -

→ $FeCl_3$ soⁿ should be freshly prepared.

→ Br_2 water should be handeled carefully.

→ Unreacted Na metal should not be thrown in sink directly.

AIM:

EXPERIMENT-~~23~~ 22

AIM- To Identify the functional group of Alcohol (-OH).

	EXPERIMENT	OBSERVATIONS	INFERENCE
1.	Test for unsaturated dissolve 0.2 ml of Compound. In 2 ml of CCl_4 then add Br_2 water.	Brown colour of Bromine not discharged	No unsaturation present.
2.	Test for the Carboxylic group - 0.2 ml Compound + pinch of $NaHCO_3$	No effervesence	Carboxylic group is absent.
3.	Test for phenolic group - 0.2 ml organic Compounds + 2-3 ml $FeCl_3$ Soln.	No green or violet Colour obtained.	Phenolic group is absent.
4.	Test for carbonyl group: shake 0.2 ml of the Compound + 2-3 ml of 2,3 di-nitro phenyl hydrazine.	No ppt obtained	Carbonyl group is absent.

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AIM		
5. Test for alcoholic group: Small piece of N_a + 1mL of compound	Effervesence obtained	Alcohol group is present.

RESULT-

The given organic compound contains alcoholic (-OH) group.

PRECAUTIONS-

i) $FeCl_3$ soln should be freshly prepared

ii) Br_2 water should be handled carefully.

iii) Unreacted 'Na' should not be disposed directly into the sink.

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Identify the functional present in the given organic compound (Carboxylic acid)

Experiment	Observation	Inference
Test for Unsaturation Dissolve 0.2 ml Comp in 2 ml CCl_4 then add Br_2 Water	Brown Colour of bromine not discharged	No Unsaturation is present.
Test for phenolic grp Add 0.2 ml Comp in 2-3 ml neutral $FeCl_3$ Soln	No green Violet Colour obtained	phenolic grp is present
Test for alcoholic grp Small piece of Na 1 ml of given liq	no effervescence	Alcoholic groups is absent.
Test for Carbonyl grp -Shook 0.2 ml of Comp with 2-3 ml of 2,4-dinitrophenyl hydrazine	no orange yellow ppt formed	Carbonyl grp as Aldehyde and Ketone are absent
Test for Carboxylic grp - 0.2 ml of Comp + pinch of $NaHCO_3$	effervescence obtained	Carboxylic grp is present

Date

Confirmatory test for -COOH grp - 0.1 g Comp + 1 ml of ethyl alcohol and 1-2 drop of Conc. H_2SO_4 + heat the rxn mixture on a beaker Ce containing Water	A fruity Smell obtained	-COOH is confermed $RCOOH + C_2H_5OH \xrightarrow{H_2SO_4} RCOOC_2H_5 + H_2O$ fruity Smell

Result → The organic Compound contain Carboxylic (-COOH) group.

precautions →
$FeCl_3$ Sol^n Should be freshly prepared.
Br_2 Water Should be handeled Carefully.
Unreacted Na metal Should not be thrown in Sink directly.