पुना International School

Shree Swaminarayan Gurukul, Zundal

Class – XII | Subject: Chemistry(Practical) Term-1&2 | Experiment (2021_22)

Exp. No	Aim
	QUANTITATIVE ANALYSIS(Term-1&2)
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(Term-1&2)
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 [(NH4)3PO4]
10	To Identify the given inorganic salt [Sr(NO3)2]
	CHROMATOGRAPHY(Term-1)
11	Separate the Coloured Components Present in the Mixture of Red and Blue Inks by Ascending Paper Chromatography and Find their Rf Values
12	Separate the Coloured Components Present in the Given Grass/Flower by Ascending Paper Chromatography and Determine their Rf Values
	ORGANIC COMPOUNDS(Term-2)
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)

Diagram.

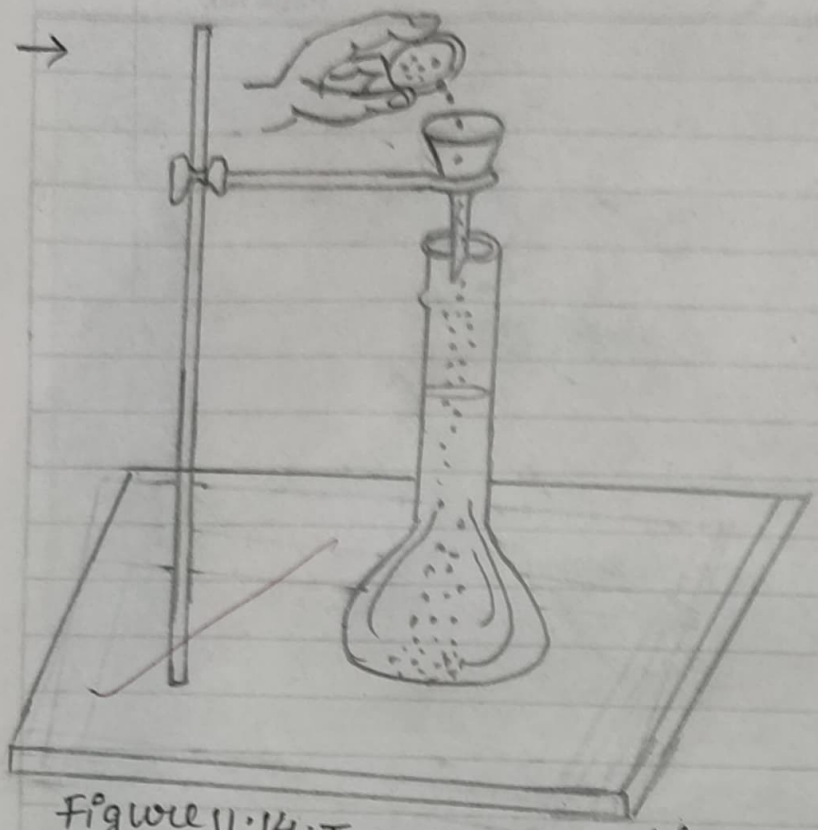

Figure 11.14. Transfering oxalic acid to the flask.

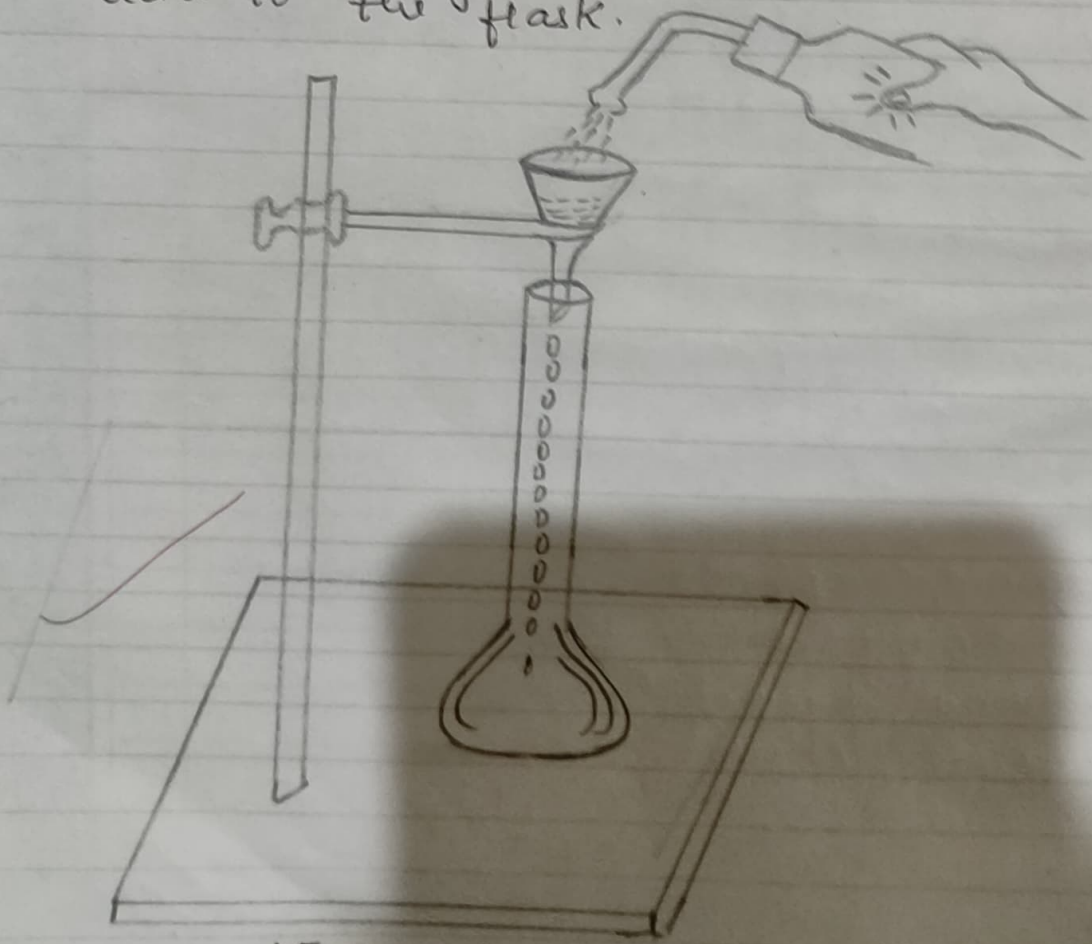

Figure 11.15 Adding water.

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

→ Theory:
Molecular mass of crystalline oxalic acid $\left[\begin{matrix}COOH \\ COOH\end{matrix} \cdot 2H_2O\right]$

= 126.

Hence, for preparing 1000ml of 1M oxalic acid, weight of oxalic acid crystals required = $\frac{126}{1000} \times 250 \times 0.1 = 3.150g$.

→ Apparatus
- watch glass
- Analytical balance
- weight box
- fractional weight box.
- 250ml beaker
- Glass rod.
- 250ml measuring flask
- wash Bottle

→ Chemicals Required
- Oxalic acid crystals and distilled water.

→ Procedure
1) Take a watch glass, wash it with distilled water and dry it.

2) weigh the clean and dried watch glass accurately

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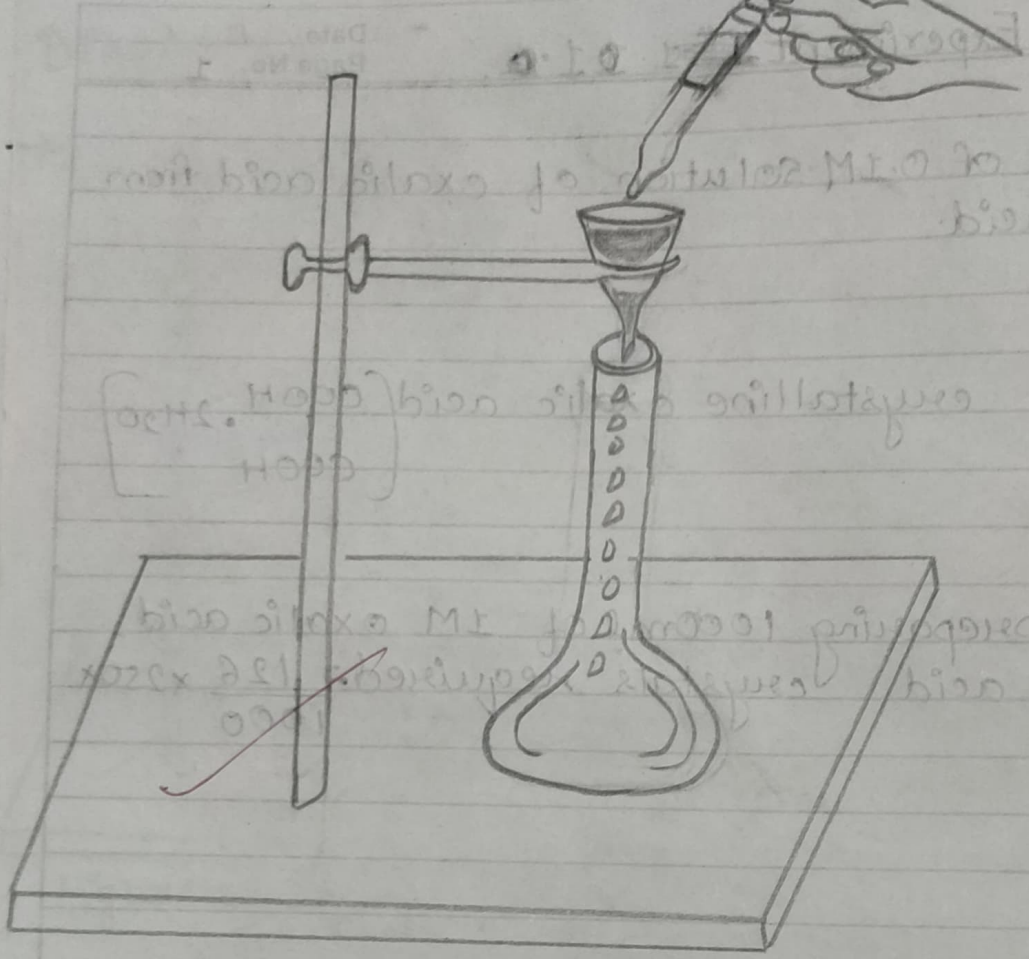

Figure 11.16 Adding last small amount of water dropwise.

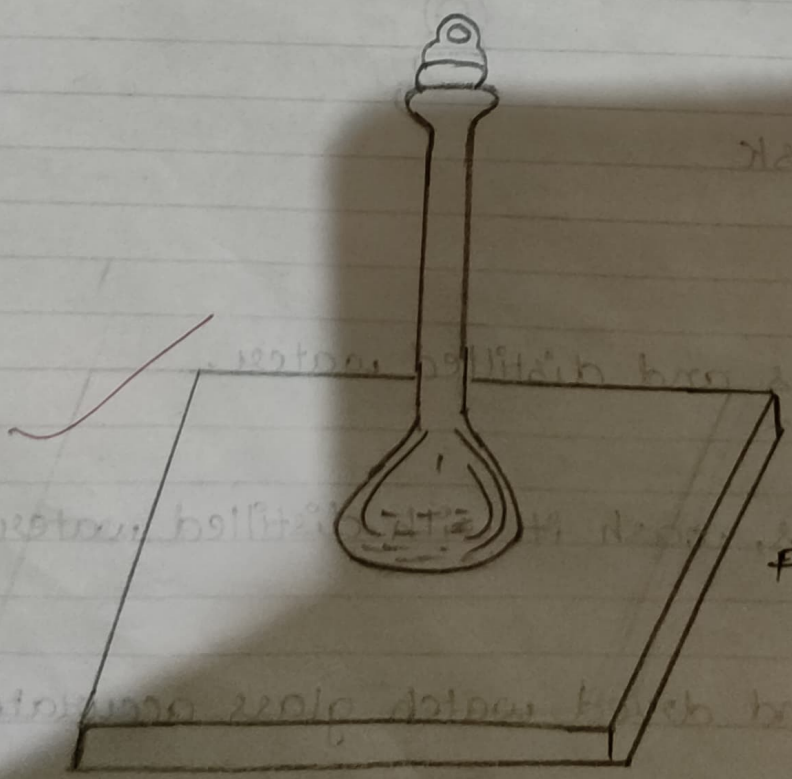

Fig. 11.17 Standard solution of oxalic acid.

and record its weight in the notebook.

3) Weight 3.150g 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 250ml 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 50ml.

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.

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 through out. Label it as 0.1M oxalic acid soln. [fig 11.17]

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Observation Table:-

S.I.NO	Volume of oxalic acid in ml	Burette readings Initial(x)	final(y)	Volume(V) of $KMnO_4$ used V = (y-x)ml
1	10	0	9	9
2	10	0	8.8	8.8
3	10	0	8.6	8.6

Calculations:-

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

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

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.

Expt. No./Name: 2 Experiment: 2.0 Date / / Page No. 3

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

→ Reactions of oxalic acid

A) chemical equations

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

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

$2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$.

B) Ionic equation.

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

Oxidation half reaction: $C_2O_4^- \rightarrow 2CO_2 + 2e^- | \times 5$.

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

→ Material Required

- Measuring flask (250ml): one
- Burette (50ml): one
- Burette stand: one.
- Pipette: one
- conical flask: one
- Funnel: one
- weighting bottle: one.

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Calculation:-

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

Oxalic acid $KMnO_4$

$$2M_1V_1 = 5M_2V_2$$

$$M_2 = \frac{2M_1V_1}{5V_2}$$

$$M_2 = \frac{2(0.1)(20)}{5 \times 9} = 0.04M$$

Strength :- M_2 of $KMnO_4$ x molar mass of $KMnO_4$.

$$= 0.04 \times 158$$

$$= 6.3 g/L$$

- Glazed tile (white) : one
- Burner: one
- wire gauze: one
- chemical balance: one.
- Oxalic acid: As per need
- Potassium Permanganate solution: As per need.
- 1.0M Sulphuric acid: As per need.

→ Procedure :-

A. Preparation of 0.1M standard solution of oxallic acid.
Prepare 0.1M oxalic acid solution as mentioned in experiment 2.1 (Unit 2).

B. Titration of oxalic acid solution against potassium permanganate sol^{n}.

(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 10ml of 0.1M oxalic acid solution in a conical flask and add half of the test tube full (≈5ml) of 1.0M 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°c - 60°c before titrating it with potassium permanganate solution taken in the burette. To increase the visibility

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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 burrette 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 reading.

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

→ Result:

(i) Molarity of $KMnO_4$ solution is 0.04 M

(ii) Strength of $KMnO_4$ solution is 6.3 g/lit

→ 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

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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 pipette.

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 50°c to 60°c while titrating it against potassium permanganate.

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→ Observation Table :-

S.I-NO.	Volume of ferrous ammonium sulphate solution used for each titration in ml.	Burette Reading		Volume (V) of $KMnO_4$ used V = (y-x) ml.
		Initial (x)	final (y)	
1	10ml	0	11.5	11.5
2	10ml	0	11.5	11.5
3	10ml	0	11	11

→ Calculation.

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

$$a_1 M_1 V_1 = a_2 M_2 V_2$$

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 solution 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).

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

→ Chemical equation

(a)

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

- Oxidation half reaction: $2FeSO_4[NH_4]_2SO_4 \cdot 6H_2O + H_2SO_4 + [O] \rightarrow Fe[SO_4]_3 + 2[NH_4]_3SO_4 + 13H_2O] \times 5$

$2KMnO_4 + 8H_2SO_4 + 10FeSO_4[NH_4]SO_4 \cdot 6H_2O \rightarrow K_2SO_4 + 2MnSO_4 + 2MnSO_4 + 5Fe[SO_4]_3 + 10 \cdot [NH_4]_2SO_4 + 68H_2O$.

→ Ionic equation.

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

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

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

→ Material required:

- Measuring flask (250ml) : one
- Burette (50ml): one
- Burette sand : one
- Pipette : one
- Conical flask : one
- Glazed tile (white) : one
- Funnel : one
- Weighting bottle : one.

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Calculation:

$$a_1 m_1 V_1 = a_2 m_2 V_2$$

$$(1)((0.05)(10ml)) = (5)(m_2)(11.5^2)$$

$$(0.05)(10) = (57.5)(m_2)$$

$$(0.50) = (5.75)(m_2)$$

$$m_2 = 0.008$$

Strength = 0.008×158

$= 1.37$

- Potassium Permanganate solution: As per need.
- Dilute Sulphuric acid: As per need.
- Ferrous ammonium sulphate: As per need.

→ Procedure.

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

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

i) Weigh 4.9000 g of ferrous ammonium sulphate and transfer it into a 250ml 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 10ml of 0.05M ferrous ammonium sulphate solution in a conical flask and add half test tube (≈5ml) full of (1.0M) 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.

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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.

→ Result.

The strength of the given potassium permanganate solution is 1.37 g/l.

→ Precaution

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:- To identify the given inorganic salt [$Ba(NO_3)_2$].

	Experiment	Observation	Inference.
*	Primary test.		
1.	Colour	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.	Description	No description	$[Pb(NO_3)_2]$, NaCl, KBr absente.
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 colour 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.
11.	Preparation of (0.5) Shake a Salt + water mix.	Sol^n obtained.	label it as the original Solution.

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12.	To a part of (CO.5) add 1.2ml of dil. HCl	NO PPt formed.	Gr.I. Absent. (Pb^{2+} absent).
13.	To a part of Soln pass H_2S gas.	NO PPt formed.	Gr.II 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	Gr.III absent. (Fe^{2+}, Al^{3+}, absent)
15.	Through a part of this soln, pass H_2S gas.	NO PPt formed.	Gr.IV absent. (Zn^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+}, absent).
16.	To the remaining ammonical solution add ammonium carbonate.	white ppt formed.	Gr.V present. (Ca^{2+}, Ba^{2+}, Sn^{2+} may be present).
*	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.
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.

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→ Result.

i) Acid Radical NO_3^-

ii) Basic Radical. Ba^{2+}

→ Precaution

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.

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→ 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.	Diliquescene	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 characteristics vinegar like smell.	CH_3COO^- may be present
6.	Sublimate formed	No Sublimation	NH_4^+ & I^- are absent.
7.	Description	No decrepitation	Salts like $Pb(NO_3)_2$, NaCl, KI are absent.
8.	Residue	white salt become 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.
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.

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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 CO.S) Shake mix. of salt & water.	Solution is obtained	label it as the original solution.
14.	To a part of 0.5 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

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→ Aim: To identify the given inorganic salt $Pb(NO_3)_2$.

	Experiment	Observation	Inference
★	PRIMARY TEST		
1.	Colour	White	Shows absence of NH_4^+, CH_3COO^-, S^{2-}
2.	Smell	NO specific odour	Shows absence of Cu^{2+}, Ni^{+}, Fe^{2+}, Ca^{2+}
3.	Density	Heavy / Thick	Salt of Pb^{2+} or Ba^{2+} carbonate
4.	Deliquescence	NO deliquescene	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.	Sublinate formed	NO sublimation	Shows absence of NH_4^+ & I^-
7.	Descrepitation	The salt descripitates	$Pb(NO_3)_2$, NaCl, KBr may be present.
8.	Swelling	NO swelling	Shows absence of indicated PO_4^{3-}.
9.	Residue	Heat → Brown cold → Yellow	Pb^{2+} might be present.
★	FLAME TEST.		
10.	Prepare a paste of salt with concentrated HCl and perform flame test.	Dull bluish-white flame	Pb^{2+} may be present.

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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 colour 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 tests 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 evolved.	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 colour, 2 liquids at the function.	label it as original soln.
15.	Preparation of (0.5) Shake a pinch of salt with water.	Solution obtained.	label it as original soln.
16.	To a pinch of 0.5, add 1-2 ml of dil HCl.	white ppt is formed.	Group I, Pb^{2+} may be present.

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11. 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.		Pb^{2+} is confirmed. $PbCl_2 + K_2CrO_4 \rightarrow PbCrO_4 + 2KCl$.

→ RESULT:

- Acid Radical : NO_3^-
- Basic Radical : Pb^{2+}

→ Precaution:-

1) Don't heat 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.

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Aim:- To identify the given inorganic salt $PbCCl_2$.

Experiment.	Observation.	Inference.
1. Colour [primary test]	white.	Shows absence of Cu^{2+}, Ni^{2+}, Fe^{2+}, Fe^{3+}, Mn^{2+}, Ca^{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. Descreption	No descreption.	$PbCNO_3)_2$, Nacl are absent.
7. Residue	Hot → Brown cold → Yellow	Pb^{2+} might be present.
* 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.

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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 ammonia gas evolved.	NH_4^+ absent.
12.	Preparation (0.5) of shaking a mix of salt and water.	Solution obtained.	label it as the original sol^n.
13.	To a part of 0.5 add 1.2 ml of dil HCl.	white coloured 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+}.

→ 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.

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Expt. No./Name: Experiment-8 Date / / Page No. 20

→ Aim:- To identify the given inorganic salt $MgSO_4$.

→ Experiment.	Observation	Inference.
✱ Primary Test:-		
1. colour.	white.	shows absence of Cu^{2+}, Ni^{2+}, Mn^{2+}, CO^{2+}, NH_4^+, CH_3COO^-
2. Smell	odourless.	S^{2-}, SO_3^{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. Descripitation.	No descripitation	$Pb(NO_3)_2$; NaCl, KBr, are absent.
6. Residue	white residue that glows on heating	Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, Al^{3+} maybe present.
✱ Flame test:-		
7. Make a paste of salt + conc. HCl.	No specific flame colour.	Ca^{2+}, Sr^{2+}, Ba^{2+}, Cu^{2+}, Zn^{2+}, Pb^{2+} may be present.
8. Dil H_2SO_4 Test. Treat a pinch of salt + dil H_2SO_4 and heat.	No gas evolved.	CO_3^{2-}, S^-, NO_2^-, SO^{2-} might be absent.
9. $KMnO_4$ Test. A Pinch of salt added to dil. H_2SO_4 + heat. then add $KMnO_4$.	Pink colour of $KMnO_4$ wasn't discharged.	Cl^-, Br^-, I^-, $C_2O_4^{2-}$, Fe^{2+}, maybe Absent.
10. conc. H_2SO_4 + Salt + Heat (If required)	No gas evolved.	Cl^-, Br^-, I^-, NO_3^-, CH_3COO are absent.

Teacher's Signature

11.	Heat a pinch of Salt with conc. NaOH.	No ammonia gas evolved.	Cl^-, Br^-, I^-, NO_3^-, CH_3COO^- are absent. & NH_4^+ absent.
12.	Shake a mix. of Salt with water.	Solution obtained.	Label as original solution.
13.	To a part of 0.5 add 1-2 mL of dil HCl.	No ppt formed.	Group I absent (Pb^{2+}) ~~Ag^+, Hg_2^{2+} etc~~).
14.	Through the above formed solution Pass H_2S gas.	No ppt formed.	Group II absent (Pb^{2+}, Cu^{2+}, ~~Ag^+~~ etc).
15.	To remaining soln add a pinch of solid NH_4Cl, Boil the soln and add excess NH_4OH.	No ppt formed.	Group III absent (Fe^{2+}, ~~Al^{3+}~~ absent).
16.	To remaining soln add ammonium carbonate.	No ppt formed.	Group IV absent (Ca^{2+}, Ba^{2+} absent).
17.	Through a part of the above soln, Pass H_2S gas.	No ppt formed.	Group IV absent. (Zn^{2+}, Mn^{2+}, Ni^{2+}, Ca^{2+} absent).

→ Result:-

- Acid Radical - SO_4^{2-}
- Basic Radical - Mg^{2+}

→ Precaution:-

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

Teacher's Signature

Expt. No./Name: **Experiment: 11** Date / / Page No. 26

★ **Aim:** To identify the given inorganic salt $(NH_4)_3PO_4$.

★ Experiment	Observation	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. Dilute 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.

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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 Ammonical smell evolved.	Group 3 is present (NH_4^+ Present)

→ Result.

Acid Radical - PO_4^{3-}

Basic Radical - NH_4^+

→ Precaution

1) Never heat a wet test tube

2) Don't inhale gases which are unknown/poisonous

3) Handle reagent very carefully.

Teacher's Signature

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→ 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+}, Sn^{2+}, Co^{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^{2-}, NO_3^-, SO_3^{2-} is absent.
9.	Salt + dil. H_2SO_4 & Heat + few drops of $KMnO_4$	Pink colour of $KMnO_4$ was ~~dissolved~~ 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.
12.	To a part of 0.5 add 1-2ml of dil. HCl.	No PPt obtained.	Group I absent, Pb^{++} absent
13.	Through apart.	No PPt formed.	Group II absent.

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	of this soln pass H_2S gas.		
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:

- Don't heat wet test tube
- Handle reagents carefully
- Don't inhale unknown gas.

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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 2 mL 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.

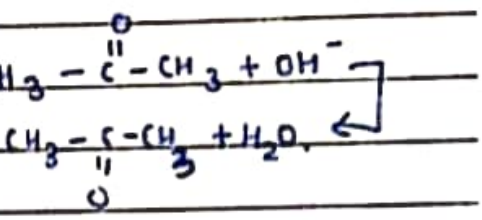
iv) Use a lab coat & gloves while dealing with corrosive chemicals.

AIM:

EXPERIMENT-22 21

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

	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 Color 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).

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 $\left(-\overset{O}{\overset{\|}{C}}-\right)$

PRECAUTIONS -

→ $FeCl_3$ soln 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.

Teacher's Signature

AIM		
5. Test for alcoholic group: Small piece of Na + 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 Unsaturated 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 gp Small piece of Na^+ 1 ml of given liq	no effervescence	Alcoholic groups is absent.
Test for Carbonyl gp -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

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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 Containing Water	A fruity Smell obtained	-COOH is confirmed $RCOOH + C_2H_5OH \xrightarrow{H_2SO_4} RCOOC_2H_5 + H_2O$ 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.

EXPERIMENT 6.1

To separate the coloured components present in the mixture of red and blue inks by ascending paper chromatography and find their R_f values.

APPARATUS

Gas jar, glass rod, filter paper strip (Whatman No. 1 filter paper), jar cover and a fine capillary tube.

REQUIREMENT

A mixture of red and blue inks, alcohol and distilled water.

PROCEDURE

1. Take a Whatman filter paper strip (20 × 2 cm) and draw a line with pencil above 3 cm from one end. Draw another line lengthwise from the centre of the paper as shown in Fig. 6.4.

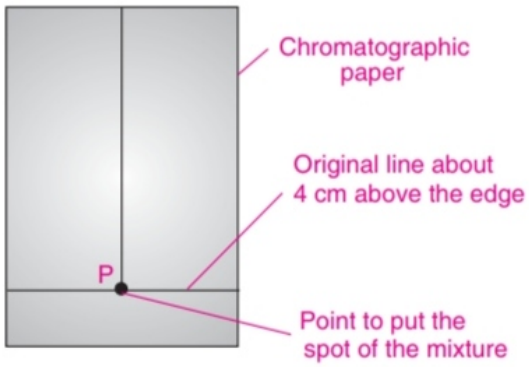

Fig. 6.4. Spotting of the mixture.

2. With the help of fine capillary tube, put a drop of the mixture of red and blue inks at the point P. Let it dry in air. Put another drop on the same spot and dry again. Repeat 2–3 times, so that the spot is rich in the mixture.
3. Suspend the filter paper vertically in a gas jar containing the solvent (eluent) with the help of a glass rod in such a way that the pencil line (and the spot) remains about 2 cm above the solvent level (50% alcohol + distilled water).
4. Cover the jar and keep it undisturbed. Notice the rising solvent along with the mixture of red and blue inks. After the solvent has risen about 15 cm you will notice two different spots of blue and red colours on the filter paper.
5. Take the filter paper out of the jar and mark the distance that the solvent has risen on the paper with a pencil. This is called the solvent front.
6. Dry the paper. Put pencil marks in the centre of the blue and red spots.
7. Measure the distance of the two spots from the original line and the distance of the solvent from the original line.

8. Calculate the R_f values of the blue and red inks by using the formula :

$$R_f = \frac{\text{Distance travelled by the blue or red ink from the point of application}}{\text{Distance travelled by the solvent from the original line}}$$

OBSERVATIONS AND CALCULATIONS

Substance	*Distance travelled by different components*	*Distance travelled by solvent*	*R_f Value*
Red ink + Blue ink	A cm (Red Ink)	X cm	A/X
	B cm (Blue Ink)	X cm	B/X

PRECAUTIONS

1. Use good quality pencil for drawing the reference line so that the mark does not dissolve in the solvent in which the chromatography is carried out.
2. Always make use of a fine capillary tube.
3. Keep the jar undisturbed and covered during the experiment.
4. A spot should be small and rich in mixture.
5. Allow the spot to dry before putting the strip in the jar.
6. Keep the strip erect. Do not let it to be curled.
7. Do not allow the spot to dip in the solvent.

EXPERIMENT 6.2

To separate the coloured components present in the given grass/flower by ascending paper chromatography and determine their R_f values.

In this experiment, crush fresh flowers or grass in a mortar and extract the juice with acetone. Use this solution for making the spot.

Proceed as in Expt. 6.1.

OBSERVATIONS AND CALCULATIONS

Colour of the spot	*Distance travelled by the spot from the original line*	*Distance travelled by the solvent from the original line*	*R_f Value*
Green (*Chlorophyll*)	A cm	X cm	A/X
Yellow *Xanthophyll*)	B cm	X cm	B/X
Red (*Carotene*)	C cm	X cm	C/X