



# PUN International School

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Class – XI

Subject: Chemistry(Practical)

Experiment (2025\_26)

Exp. No	Aim
	<b>QUANTITATIVE ANALYSIS</b>
1	Prepare 250 ml of 0.1M Solution of Oxalic Acid From Crystalline Oxalic Acid
2	To determine the strength of a given solution of sodium hydroxide solution by titrating it against a standard solution of oxalic acid.
3	Determination of strength of a given solution of dilute Hydrochloric acid by titrating it against standard solution of Sodium Carbonate solution (M/10).
	<b>QUALITATIVE ANALYSIS</b>
4	To Identify the given inorganic salt $[Ba(NO_3)_2]$
5	To Identify the given inorganic salt $[ZnCO_3]$
6	To Identify the given inorganic salt $[Pb(NO_3)_2]$
7	To Identify the given inorganic salt $PbCl_2$
8	To Identify the given inorganic salt $MgSO_4$
9	To Identify the given inorganic salt $[BaSO_4]$
10	To Identify the given inorganic salt $[Sr(NO_3)_2]$
	<b>CONTENT BASED EXPERIMENT</b>
11	Purification of the impure Copper Sulphate by the process of crystallization.

## EXPERIMENT-1

**Aim:** Prepare 250 ml of M/10 Solution of Oxalic Acid From Crystalline Oxalic Acid

### Theory

Molecular mass of crystalline oxalic acid  $\left( \begin{array}{c} \text{COOH} \\ | \\ \text{COOH} \end{array} \cdot 2\text{H}_2\text{O} \right) = 126$

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,

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

### Apparatus

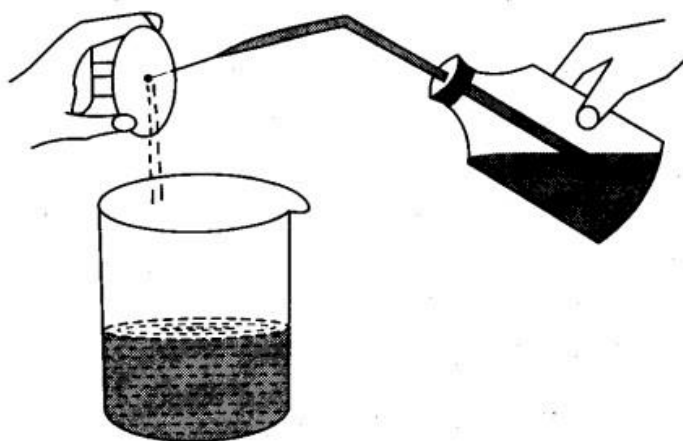
Watch glass, analytical balance, weight box, fractional weight box, 250 ml beaker, glass rod, 250 ml measuring flask and wash bottle.

### Chemical Required

Oxalic acid crystals and distilled water.

### Procedure

Take a watch glass, wash it with distilled water and then dry it.



**Fig.** Washing of watch glass to transfer sticking particles to beaker.

Weigh the clean and dried watch glass accurately and record its weight in the note book.

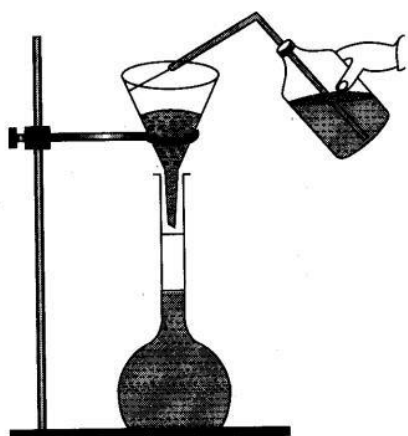
Weigh 3.150 g oxalic acid on the watch glass accurately and record this weight in the note-book.

Transfer gently and carefully the oxalic acid from the watch glass into a clean 250 ml beaker. Wash the watch glass with distilled water with the help of a wash bottle to transfer the particles sticking to it into the beaker [Fig].

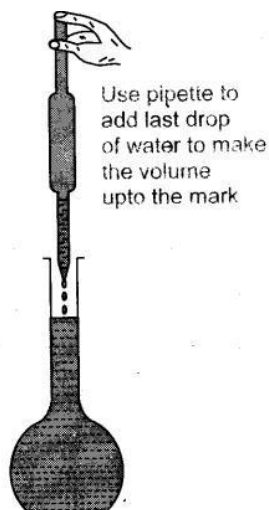
The volume of distilled water for this purpose should not be more than 50 ml.

Dissolve oxalic acid crystals in the beaker by gentle stirring with a clean glass rod.

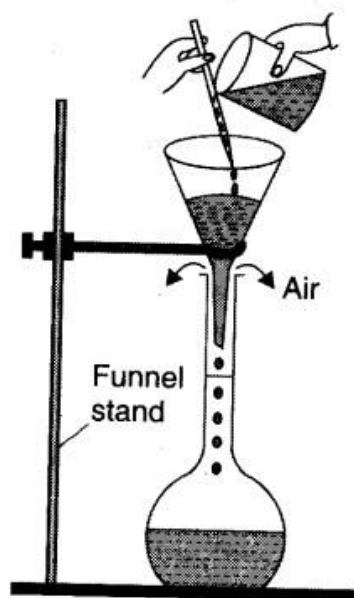
When the oxalic acid in the beaker is completely dissolved, transfer carefully the entire solution from the beaker into a 250 ml measuring flask (volumetric flask) with the help of a funnel [Fig].



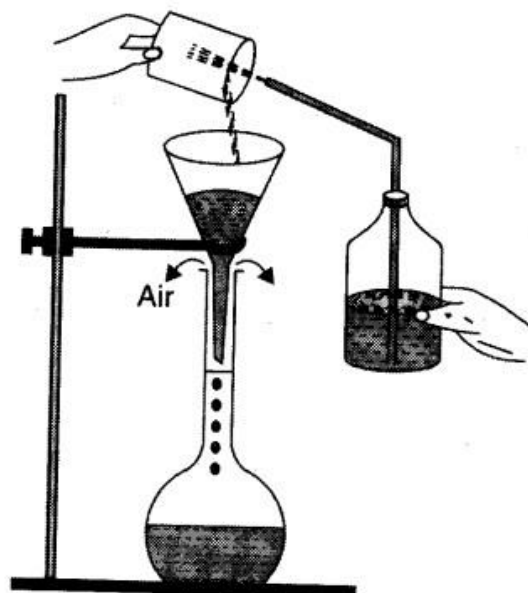
**Fig.** Washing last traces of solution from funnel to the measuring flask.



**Fig.** Using pipette to add last drop of water to make the volume upto the mark.



**Fig.** Transferring solution to measuring flask.



**Fig.** Transferring last traces of solution to measuring flask.

Wash the beaker with distilled water. Transfer the washings into the measuring flask [Fig].

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].

Add enough distilled water to the measuring flask carefully, up to just below the etched mark on it, with the help of a wash bottle.

Add the last few drops of distilled water with a pipette until the lower level of the meniscus just touches the mark on the measuring flask [Fig].

Stopper the measuring flask and shake gently to make the solution uniform through-out. Label it as oxalic acid solution.

**Result:-** 250 ml of M/10 Solution of Oxalic Acid From Crystalline Oxalic Acid is prepared.

## EXPERIMENT-2

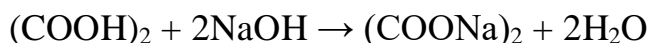
### Aim:

To determine the strength of a given solution of sodium hydroxide solution by titrating it against a standard solution of oxalic acid.

### Theory

This estimation involves titration of a weak acid that is oxalic acid against a strong base sodium hydroxide and phenolphthalein is the indicator of choice.

The reaction between oxalic acid and sodium hydroxide is



Since sodium hydroxide is not a primary standard a standard solution of oxalic acid is prepared and used for standardisation of sodium hydroxide.

In acid base titration at the end point the amount of acid becomes chemically equivalent to the amount of base present. In case of strong acid and strong base titration at the end point of solution the solution become neutral.

### Materials Required

Burette

Pipette

Conical flask

Burette stand

Funnel

Stirrer

White glazed tile

Measuring flask

Oxalic acid (solid)

Oxalic acid (as per needed)

Sodium hydroxide solution (as per needed)

Phenolphthalein indicator (as per needed)

## Apparatus Setup

### Procedure

#### (a) Preparation of 0.1M Standard Oxalic Acid Solution

Take a watch glass, wash it with distilled water and dry it.

Weigh the exact amount of clean and dried watch glass and record its weight in the notebook.

Weigh correctly on the watch glass 3.15 g of oxalic acid and record this weight in the notebook. Using a funnel, transfer oxalic acid softly and carefully from the watch glass into a clean and dry measuring flask.

Wash the watch glass with distilled water to move the particles that stick to it into the flask with the assistance of a wash bottle.

For this purpose, the volume of distilled water should not exceed 50 ml.

Wash funnel several times with distilled water to move the sticking particles into the measuring flask using a wash bottle. Add water in tiny quantities while washing the funnel. The distilled water quantity used for this purpose should not exceed 50 mL.

Using a wash bottle, wash the funnel carefully with distilled water to pass the solution attached to the funnel into the measuring flask.

Turn the flask of measurement until the oxalic acid dissolves.

Using a wash bottle, thoroughly add enough distilled water to the measuring flask just below the etched mark on it.

Add the last few mL of distilled water drop into the measuring flask until the reduced meniscus level just touches the mark.

Put the stopper on the mouth of the flask and shake softly to make the entire solution uniform. Calculate it as a solution of oxalic acid M/10.

#### (b) Titration of Sodium Hydroxide and Oxalic Acid Solution

Rinse the burette with the standard oxalic acid solution.

Take 10 cm<sup>3</sup> of oxalic acid solution in a titration flask. Fill the burette with sodium hydroxide solution.

Remove the air gap if any, from the burette by running the solution forcefully from the burette nozzle and note the initial reading

Pipette out 20ml of NaOH solution in a conical flask. Add 2-3 drops of phenolphthalein indicator to it.

Titrate the base with oxalic acid solution until pink colour disappears.

Repeat the titration till three concordant readings are obtained.

### Observations

Molarity of oxalic acid solution = 0.1M

Molarity of sodium hydroxide solution = x

Volume of oxalic acid solution = 10ml

Indicator = Phenolphthalein

End point = Light pink color

S.No	Initial Reading of the Burette	Final Reading of the Burette	Volume of NaOH solution used	Concordant Reading
1				
2				
3				

## Calculations

Molarity of NaOH solution can be calculated by using the equation:

Oxalic acid Sodium hydroxide

$$a_1 M_1 V_1 = a_2 M_2 V_2$$

where,  $M_1$  and  $V_1$  are the molarity and volume of the oxalic acid solution.

$M_2$  and  $V_2$  are the molarity and volume of the sodium hydroxide solution.

$a_1$  and  $a_2$  are respectively the basicity of oxalic acid and acidity of sodium hydroxide. In this case  $a_1 = 2$  and  $a_2 = 1$ .

Also, Molar mass of oxalic acid,  $(\text{COOH})_2 \cdot 2\text{H}_2\text{O} = 126 \text{ g mol}^{-1}$

and Molar mass of sodium hydroxide  $(\text{NaOH}) = 40 \text{ g mol}^{-1}$

Calculate the concentration of sodium hydroxide solution in g/L by using the equation given below.

Concentration (strength) in g/L = Molarity  $\times$  Molar mass

## Result

Concentration of NaOH solution is \_\_\_\_\_ g/L.



## EXPERIMENT-3

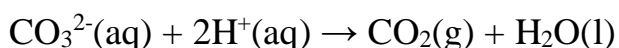
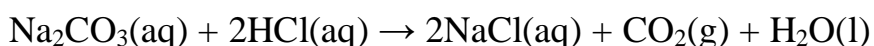
### Aim

Determination of strength of a given solution of dilute Hydrochloric acid by titrating it against standard solution of Sodium Carbonate solution (M/10).

### Theory

Hydrochloric acid solution may be titrated against sodium carbonate solution using methyl orange indicator. When weak base is titrated with a strong acid solution is slightly acidic at end point. If a weak acid is titrated with a strong base the solution is slightly basic because the salt formed will be hydrolysed to a certain extent.

The chemical reactions involved in this titration is given below.



In acid base titrations at the end point the amount of the acid becomes chemically equivalent to the amount of base present. In case of a strong acid and a strong base titration at the end point of solution the solution becomes neutral.

### Materials Required

Burette

Pipette

Conical flask

Burette stand

Funnel

Stirrer

White glazed tile

Measuring flask

Hydrochloric acid

Sodium carbonate

Methyl orange

Watch glass

Apparatus Setup

### Procedure

(a) Preparation of standard solution of sodium carbonate

Molecular weight of sodium carbonate = 106

Amount of sodium carbonate required to prepare solution of 250ml = 1.325g

Dissolve 1.325g of sodium carbonate in distilled water and prepare the standard solution in 250ml of measuring flask by adding the required amount of water.

(b) Titration of hydrochloric acid and sodium carbonate solution

Wash, rinse and fill the burette with M/10  $\text{Na}_2\text{CO}_3$  solution. Note the initial reading.

Take  $10\text{cm}^3$  of HCl solution with the help of a pipette and transfer it into a clean washed titration flask.

Add 2 drops of methyl orange into the titration flask.

Add M/10 sodium carbonate solution to the titration flask till the colour changes to the light pink.

Note the final reading and find out the volume of sodium carbonate solution used to neutralize HCl solution.

Repeat the experiment till you get concordant readings.

### Observations

Volume of HCl solution =  $10\text{cm}^3$

Volume of sodium carbonate solution used =  $V\text{ cm}^3$

S.No	Initial reading of the burette	Final reading of the burette	Volume of Sodium carbonate solution used.
1			

2			
3			

### Calculations

(Sodium carbonate)  $a_1M_1V_1 = (\text{HCl}) a_2M_2V_2$

Strength in g/L = molarity  $\times$  molar

### Results and Discussion

The strength of hydrochloric acid solution is \_\_\_\_\_ g/L.

### Precautions

While weighing do not spill the substance on balance pan.

Rotate the knob of balance gently.

Keep the weights in weights box at proper places after weighing

Wash the watch glass carefully so that even a single crystal is not left on the watch glass.

Bring the watch glass close to funnel while transferring weighed substance and transfer it gently. Wash it repeatedly with distilled water.

Wash the burette with water after titration is over.

Last few drops should be added using pipette to avoid extra addition of distilled water above the mark on the neck of the measuring cylinder.

## EXPERIMENT-4

**Aim:** To analyse the given salt for acidic and basic radicals.

Experiment	Observations	Inference
<b>1. Physical examination :</b> (a) Noted the colour of the given salt. (b) Noted the smell of the salt.	White  No specific odour	$\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ absent. $\text{NH}_4^+$ , $\text{S}^{2-}$ and $\text{CH}_3\text{COO}^-$ may be absent.
<b>2. Dry heating test</b> Heated a pinch of the salt in a dry test tube and noted the following observations : (a) Gas evolved (b) Sublimation (c) Decrepitation (d) Fusion (e) Colour of the residue	A reddish brown gas evolved which turned freshly prepared $\text{FeSO}_4$ solution black.  No sublimate formed.    No crackling sound observed.   Salt does not fuse.  White	$\text{NO}_3^-$ may be present.  Ammonium halides, aluminium chloride, iodide may be absent. Lead nitrate, barium nitrate, sodium chloride, potassium chloride and potassium iodide may be absent. Alkali (sodium, potassium) salts may be absent. $\text{Zn}^{2+}$ , $\text{Pb}^{2+}$ may be absent.

<p><b>5. Flame test</b></p> <p>Prepared a paste of the salt in conc. HCl and performed flame test.</p> <p><b>6. Borax bead test</b></p> <p>Did not perform this test since the given salt was white.</p> <p><b>7. Dil. sulphuric acid test</b></p> <p>Treated a pinch of the salt with dil. <math>\text{H}_2\text{SO}_4</math> and warmed.</p> <p><b>8. <math>\text{KMnO}_4</math> test</b></p> <p>To a pinch of the salt added dil. <math>\text{H}_2\text{SO}_4</math> warm and then a drop of <math>\text{KMnO}_4</math> solution.</p> <p><b>9. Conc. sulphuric acid test</b></p> <p>Heated a pinch of the salt with conc. sulphuric acid and added to it a paper pellet.</p> <p><b>10. Confirmatory test for nitrate</b></p> <p>(a) <i>Copper chips test.</i> Heated a pinch of the salt with conc. sulphuric acid and a few copper chips.</p> <p>(b) <i>Ring test.</i> To 2–3 ml of the salt solution, added freshly prepared <math>\text{FeSO}_4</math> solution. Now added conc. sulphuric acid along the sides of the test tube.</p> <p><b>11. Heated a pinch of salt with conc. NaOH solution</b></p> <p><b>12. Preparation of Original Solution (O.S.)</b></p> <p>Shook a pinch of the salt with water.</p> <p><b>13.</b> To a part of the O.S. added 1–2 mls of dilute hydrochloric acid.</p> <p><b>14.</b> Through a part of the above solution, passed <math>\text{H}_2\text{S}</math> gas.</p> <p><b>15.</b> To the remaining solution, added a pinch of solid ammonium chloride. Boiled the solution, cooled it and added excess of ammonium hydroxide solution.</p>	<p>Persistent grassy green flame on prolonged heating.</p> <p>—</p> <p>No gas evolved.</p> <p>Pink colour of <math>\text{KMnO}_4</math> was not discharged.</p> <p>A reddish brown gas evolved which turned <math>\text{FeSO}_4</math> solution black.</p> <p>Reddish brown gas evolved.</p> <p>A dark brown ring formed at the junction of the two liquids.</p> <p>No ammonia gas evolved.</p> <p>Solution obtained</p> <p>No ppt. formed.</p> <p>No ppt. formed.</p> <p>No ppt. formed.</p>	<p><math>\text{Ba}^{2+}</math> present.</p> <p><math>\text{Cu}^{2+}</math>, <math>\text{Ni}^{2+}</math>, <math>\text{Fe}^{3+}</math>, <math>\text{Mn}^{2+}</math>, <math>\text{Co}^{2+}</math> may be absent.</p> <p><math>\text{CO}_3^{2-}</math>, <math>\text{S}^{2-}</math>, <math>\text{NO}_2^-</math>, <math>\text{SO}_3^{2-}</math> may be absent.</p> <p><math>\text{Cl}^-</math>, <math>\text{Br}^-</math>, <math>\text{I}^-</math>, <math>\text{C}_2\text{O}_4^{2-}</math>, <math>\text{Fe}^{2+}</math> may be absent.</p> <p><math>\text{NO}_3^-</math> may be present.</p> <p><math>\text{NO}_3^-</math> confirmed.</p> <p><math>\text{NO}_3^-</math> confirmed.</p> <p><math>\text{NH}_4^+</math> absent.</p> <p>Labelled it as Original Solution (O.S.) Group I absent. (<math>\text{Pb}^{2+}</math> absent)</p> <p>Group II absent (<math>\text{Pb}^{2+}</math>, <math>\text{Cu}^{2+}</math>, <math>\text{As}^{3+}</math>, absent)</p> <p>Group III absent. (<math>\text{Fe}^{3+}</math>, <math>\text{Al}^{3+}</math> absent)</p>	

Experiment	Observations	Inference
16. Through a part of this solution, passed H <sub>2</sub> S gas.	No ppt. formed.	Group IV absent. (Zn <sup>2+</sup> , Mn <sup>2+</sup> , Ni <sup>2+</sup> , Co <sup>2+</sup> , absent)
17. To the remaining ammonical solution added ammonium carbonate solution.	White ppt. formed.	Group V present. (Ca <sup>2+</sup> , Ba <sup>2+</sup> , Sr <sup>2+</sup> may be present)
18. Confirmatory test for Barium  Filtered the above white ppt. Dissolved the ppt. in hot dilute acetic acid.	Yellow ppt.	Ba <sup>2+</sup> confirmed.
(a) Pot. chromate test. To one part of the above solution, added a few drops of pot. chromate solution.  (b) Flame test. Performed flame test with the salt.	Persistent grassy green flame on prolonged heating.	Ba <sup>2+</sup> confirmed.

**Result.** Acid radical: NO<sub>3</sub><sup>-</sup>

Basic radical: Ba<sup>2+</sup>.

# Experiment- 5



To analyse the given salt for acidic and basic radicals.

Experiment	Observations	Inference
<b>1. Physical examination</b> (a) Noted the colour of the given salt. (b) Noted the smell of the salt.	White  No specific odour	$\text{Cu}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ absent.  $\text{NH}_4^+$ , $\text{S}^{2-}$ and $\text{CH}_3\text{COO}^-$ may be absent.
<b>2. Dry heating test</b> Heated a pinch of the salt in a dry test tube and noted the following : (a) Gas evolved (b) Sublimation (c) Decrepitation (d) Colour of the residue	A colourless, odourless gas evolved which turned lime water milky.  No sublimate formed.  No crackling sound observed.  Yellow when hot and white when cold.	$\text{CO}_3^{2-}$ may be present.  Ammonium halides, iodide may be absent.  Lead nitrate, barium nitrate, sodium chloride, potassium chloride and potassium iodide may be absent.  $\text{Zn}^{2+}$ may be present.
<b>3. Flame test</b> Prepared a paste of the salt in conc. HCl and performed flame test.	Green flashes seen with naked eye.	$\text{Zn}^{2+}$ may be present.
<b>4. Borax bead test</b> Did not perform this test since the given salt was white.	—	$\text{Cu}^{2+}$ , $\text{Ni}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ may be absent.
<b>5. Dil. Sulphuric acid test</b> Treated a pinch of the salt with dil. $\text{H}_2\text{SO}_4$ and warmed.  Shook a pinch of salt with water taken in test tube.	Colourless, odourless gas evolved with brisk effervescence, turned lime water milky. Salt did not dissolve.	$\text{CO}_3^{2-}$ present  Insoluble $\text{CO}_3^{2-}$ indicated.
<b>6. <math>\text{KMnO}_4</math> test</b> To a pinch of the salt added dilute $\text{H}_2\text{SO}_4$ warm and then a drop of $\text{KMnO}_4$ solution.	Pink colour of $\text{KMnO}_4$ was not discharged.	$\text{Cl}^-$ , $\text{Br}^-$ , $\text{I}^-$ , $\text{Fe}^{2+}$ , $\text{C}_2\text{O}_4^{2-}$ are absent.
<b>7. Conc. Sulphuric acid test</b> Did not perform this test because the salt reacted with dil. $\text{H}_2\text{SO}_4$ .	—	$\text{Cl}^-$ , $\text{Br}^-$ , $\text{I}^-$ , $\text{NO}_3^-$ , $\text{CH}_3\text{COO}^-$ , $\text{C}_2\text{O}_4^{2-}$ are absent.
<b>8. Confirmatory tests for carbonate</b> (a) Shook a pinch of the salt with water. (b) To the salt added dil. HCl.	Salt did not dissolve.  Brisk effervescence with evolution of colourless, odourless gas which turned lime water milky.	Insoluble carbonate indicated.  Insoluble carbonate confirmed.

11. Heated a pinch of salt with conc. NaOH solution	No ammonia gas evolved.	$\text{NH}_4^+$ absent.
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Experiment	Observations	Inference
<p><b>12. Preparation of Original solution (O.S.)</b></p> <p>(a) Shook a pinch of the salt with water.</p> <p>(b) Shook a pinch of the salt in dil. HCl.</p> <p>13. As the O.S. is prepared in dil. HCl.</p> <p>14. Through a part of O.S. passed <math>\text{H}_2\text{S}</math> gas.</p> <p>15. To the remaining solution, added a pinch of solid ammonium chloride. Boiled the solution, cooled it and added excess of ammonium hydroxide solution.</p> <p>16. Through a part of this solution, passed <math>\text{H}_2\text{S}</math> gas.</p> <p><b>17. Confirmatory tests for <math>\text{Zn}^{2+}</math> ion</b></p> <p>Dissolved the above dull white ppt. in dil HCl. Boiled off <math>\text{H}_2\text{S}</math>.</p> <p>Divided the solution into two parts.</p> <p>(a) To one part added NaOH solution dropwise.</p> <p>(b) To another part, added potassium ferrocyanide solution.</p>	<p>Insoluble</p> <p>Clear solution obtained.</p> <p>No ppt. formed.</p> <p>No ppt. formed</p> <p>Dull white ppt. formed.</p> <p>White ppt. soluble in excess of NaOH.</p> <p>Bluish white ppt.</p>	<p>Labelled it as O.S.</p> <p>Group I absent. (<math>\text{Pb}^{2+}</math> absent)</p> <p>Group II absent (<math>\text{Pb}^{2+}</math>, <math>\text{Hg}^{2+}</math>, <math>\text{Cu}^{2+}</math>, <math>\text{As}^{3+}</math> absent).</p> <p>Group III absent. (<math>\text{Fe}^{3+}</math>, <math>\text{Al}^{3+}</math> absent).</p> <p>Group IV present. (<math>\text{Zn}^{2+}</math> present)</p> <p><math>\text{Zn}^{2+}</math> confirmed.</p> <p><math>\text{Zn}^{2+}</math> confirmed.</p>

**Result.** Acid Radical :  $\text{CO}_3^{2-}$

Basic Radical :  $\text{Zn}^{2+}$ .



## EXPERIMENT-6

**Aim:** To analyse the given salt for acidic and basic radicals.

Experiment	Observations	Inference
<b>1. Physical examination :</b> (c) Noted the colour of the given salt. (d) Noted the smell of the salt.  <b>2. Dry heating test</b> Heated a pinch of the salt in a dry test tube and noted the following observations : (f) Gas evolved  (g) Sublimation  (h) Decrepitation  (i) Fusion  (j) Colour of the residue	White  No specific odour   A reddish brown gas evolved which turned freshly prepared $\text{FeSO}_4$ solution black. No sublimate formed.  No crackling sound observed.  Salt does not fuse.  White	$\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ absent. $\text{NH}_4^+$ , $\text{S}^{2-}$ and $\text{CH}_3\text{COO}^-$ may be absent.  $\text{NO}_3^-$ may be present.  Ammonium halides, aluminium chloride, iodide may be absent. Lead nitrate, barium nitrate, sodium chloride, potassium chloride and potassium iodide may be absent. Alkali (sodium, potassium) salts may be absent. $\text{Zn}^{2+}$ , $\text{Pb}^{2+}$ may be absent.

Experiment	Observations	Inference
<p><b>11. Flame test</b> Prepared a paste of the salt in conc. HCl and performed flame test.</p> <p><b>12. Borax bead test</b> Did not perform this test since the given salt was white.</p> <p><b>13. Dil. sulphuric acid test</b> Treated a pinch of the salt with dil. <math>\text{H}_2\text{SO}_4</math> and warmed.</p> <p><b>14. <math>\text{KMnO}_4</math> test</b> To a pinch of the salt added dil. <math>\text{H}_2\text{SO}_4</math> warm and then a drop of <math>\text{KMnO}_4</math> solution.</p> <p><b>15. Conc. sulphuric acid test</b> Heated a pinch of the salt with conc. sulphuric acid and added to it a paper pellet.</p> <p><b>16. Confirmatory test for nitrate</b> (c) <i>Copper chips test</i>. Heated a pinch of the salt with conc. sulphuric acid and a few copper chips. (d) <i>Ring test</i>. To 2–3 ml of the salt solution, added freshly prepared <math>\text{FeSO}_4</math> solution. Now added conc. sulphuric acid along the sides of the test tube.</p> <p><b>16. Heated a pinch of salt with conc. NaOH solution</b></p> <p><b>17. Preparation of Original Solution (O.S.)</b> Shook a pinch of the salt with water.</p> <p><b>18. Confirmatory test for Barium</b> Add KI in original Solution</p>	<p>Persistent grassy green flame on prolonged heating.</p> <p>—</p> <p>No gas evolved.</p> <p>Pink colour of <math>\text{KMnO}_4</math> was not discharged.</p> <p>A reddish brown gas evolved which turned <math>\text{FeSO}_4</math> solution black.</p> <p>Reddish brown gas evolved.</p> <p>A dark brown ring formed at the junction of the two liquids.</p> <p>No ammonia gas evolved.</p> <p>Solution obtained</p> <p>ppt. formed.</p> <p>Yellow ppt formed</p>	<p><math>\text{Ba}^{2+}</math> present.</p> <p><math>\text{Cu}^{2+}</math>, <math>\text{Ni}^{2+}</math>, <math>\text{Fe}^{3+}</math>, <math>\text{Mn}^{2+}</math>, <math>\text{Co}^{2+}</math> may be absent.</p> <p><math>\text{CO}_3^{2-}</math>, <math>\text{S}^{2-}</math>, <math>\text{NO}_2^-</math>, <math>\text{SO}_3^{2-}</math> may be absent.</p> <p><math>\text{Cl}^-</math>, <math>\text{Br}^-</math>, <math>\text{I}^-</math>, <math>\text{C}_2\text{O}_4^{2-}</math>, <math>\text{Fe}^{2+}</math> may be absent.</p> <p><math>\text{NO}_3^-</math> may be present.</p> <p><math>\text{NO}_3^-</math> confirmed.</p> <p><math>\text{NO}_3^-</math> confirmed.</p> <p><math>\text{NH}_4^+</math> absent.</p> <p>Labelled it as Original Solution (O.S.) Group I absent. (<math>\text{Pb}^{2+}</math> present)</p> <p><math>\text{Pb}^{2+}</math> conformed</p>

**Result.** Acid radical:  $\text{NO}_3^-$

Basic radical:  $\text{Pb}^{2+}$ .

## Experiment- 7



To analyse the given salt for acidic and basic radicals.

Experiment	Observations	Inference
<b>3. Physical examination</b> (a) Noted the colour of the given salt. (b) Noted the smell of the salt.	White  No specific odour	$\text{Cu}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ absent.  $\text{NH}_4^+$ , $\text{S}^{2-}$ and $\text{CH}_3\text{COO}^-$ may be absent.
<b>4. Dry heating test</b> Heated a pinch of the salt in a dry test tube and noted the following : (a) Gas evolved  (b) Sublimation  (c) Decrepitation  (d) Colour of the residue	A colourless, odourless gas evolved  No sublimate formed.  No crackling sound observed.  Yellow when hot and white when cold.	$\text{Cl}^-$ may be present.  Ammonium halides, iodide may be absent.  Lead nitrate, barium nitrate, sodium chloride, potassium chloride and potassium iodide may be absent.  $\text{Zn}^{2+}$ may be present.
<b>9. Flame test</b> Prepared a paste of the salt in conc. HCl and performed flame test.	White Flame observed with naked eye.	$\text{Pb}^{2+}$ may be present.
<b>10. Borax bead test</b> Did not perform this test since the given salt was white.	—	$\text{Cu}^{2+}$ , $\text{Ni}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ may be absent.
<b>11. Dil. Sulphuric acid test</b> Treated a pinch of the salt with dil. $\text{H}_2\text{SO}_4$ and warmed.	Colourless, odourless gas evolved	$\text{Cl}^-$ present
<b>12. Conc. Sulphuric acid test</b> Did not perform this test because the salt reacted with dil. $\text{H}_2\text{SO}_4$ .	—	$\text{Cl}^-$ , $\text{Br}^-$ , $\text{I}^-$ , $\text{NO}_3^-$ , $\text{CH}_3\text{COO}^-$ , $\text{C}_2\text{O}_4^{2-}$ are absent.
<b>13. Confirmatory tests for carbonate</b> <b>1. Silver nitrate test</b> Acidify a portion of aqueous solution (or sodium carbonate extract) with dil. $\text{HNO}_3$ . Boil for some time, cool and add silver nitrate solution.	A white ppt. is formed which is soluble in ammonium hydroxide.	$\text{Cl}^-$ is Conformed

<b>2. Manganese dioxide test</b> Heat a pinch of the salt with a small quantity of manganese dioxide and conc. $\text{H}_2\text{SO}_4$ .	Evolution of <b>greenish yellow gas</b> having a pungent irritating smell. It turns moist starch-iodide paper blue.	$\text{Cl}^-$ is Conformed
<b>11. Heated a pinch of salt with conc. NaOH solution</b>	No ammonia gas evolved.	$\text{NH}_4^+$ absent

Experiment	Observations	Inference
<b>12. Preparation of Original solution (O.S.)</b> (a) Shook a pinch of the salt with water. (b) Shook a pinch of the salt in dil. HCl. <b>13.</b> As the O.S. is prepared in dil. HCl.	Insoluble  Clear solution obtained.  ppt. formed.	Labelled it as O.S.   Group I present. ( $\text{Pb}^{2+}$ present)
<b>17. Confirmatory tests for <math>\text{Pb}^{2+}</math> ion</b> Add KI in original Solution	Yellow ppt formed	$\text{Pb}^{2+}$ conformed

**Result.** Acid Radical :  $\text{Cl}^-$

Basic Radical :  $\text{Pb}^{2+}$ .

## Experiment- 8

**Aim** To analyse the given salt for one anion and one cation present in it.



- Boiling tubes, test tubes, test tube holder, test tube stand, delivery tube, corks, filter papers, reagents

### Material required

Sl. No.	Experiment	Observation	Inference
1.	Noted the colour of the salt.	White	$\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Ni}^{2+}$ , $\text{Co}^{2+}$ , $\text{Mn}^{2+}$ are absent.
2.	Noted the smell of the salt.	No specific smell.	$\text{S}^{2-}$ , $\text{SO}_3^{2-}$ , $\text{CH}_3\text{COO}^-$ may be absent.
3.	Heated 0.5 g of the salt in a dry test tube and noted the colour of the gas evolved and change in the colour of the residue on heating and cooling.	(i) No gas was evolved.  (ii) No particular change in colour of the residue is observed when heated and when cooled.	(i) $\text{CO}_3^{2-}$ may be present, $\text{NO}_3^-$ , $\text{NO}_2^-$ , $\text{Br}^-$ may be absent. (ii) $\text{Zn}^{2+}$ may be absent.
4.	Prepared a paste of the salt with conc. HCl and performed the flame test.	No distinct colour of the flame seen.	$\text{Ca}^{2+}$ , $\text{Sr}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Cu}^{2+}$ may be absent.
5.	Borax bead test was not performed as the salt was white in colour.	—	—
6.	Treated 0.1 g of salt with 1 mL dil. $\text{H}_2\text{SO}_4$ and warmed.	No effervescence and evolution of vapours.	$\text{CO}_3^{2-}$ , $\text{SO}_3^{2-}$ , $\text{S}^{2-}$ , $\text{NO}_2^-$ , $\text{CH}_3\text{COO}^-$ absent.
7.	Heated 0.1 g of salt with 1 mL conc. $\text{H}_2\text{SO}_4$ .	No gas evolved.	$\text{Cl}^-$ , $\text{Br}^-$ , $\text{I}^-$ , $\text{NO}_3^-$ , $\text{C}_2\text{O}_4^{2-}$ are absent.
8.	Acidified 1 mL of aqueous salt solution with conc. $\text{HNO}_3$ . Warmed the contents	No yellow precipitate	$\text{PO}_4^{3-}$ absent.

9.	Acidified water extract of the salt with dil. HCl and then added 2mL of BaCl <sub>2</sub> solution.	A white ppt. is obtained which is insoluble in conc. HNO <sub>3</sub> and conc. HCl.	SO <sub>4</sub> <sup>2-</sup> present.
10.	Heated 0.1 g of salt with 2 mL NaOH solution.	Ammonia gas is not evolved.	NH <sub>4</sub> <sup>+</sup> absent.
11.	Attempted to prepare original solution of the salt by dissolving 1g of it in 20 mL water.	Clear solution formed	Water soluble salt is present.
12.	To a small part of the above salt solution added 2 mL of dil. HCl.	No white precipitate formed.	Group-I absent.
13.	Passed H <sub>2</sub> S gas through one portion of the solution of step 12.	No precipitate formed.	Group-II absent.
14.	Since salt is white, heating with conc. HNO <sub>3</sub> is not required. Added about 0.2 g of solid ammonium chloride and then added excess of ammonium hydroxide to the solution of step 12.	No precipitate formed.	Group-III absent.
15.	Passed H <sub>2</sub> S gas through the above solution.	No precipitate formed.	Group-IV absent.
16.	Added excess of ammonium hydroxide solution to the original solution and then added 0.5 g of ammonium carbonate.	No precipitate formed.	Group-V absent.
17.	To the original solution of salt added ammonium hydroxide solution, followed by disodium hydrogen phosphate solution. Heated and scratched the sides of the test tube.	White precipitate.	Mg <sup>2+</sup> confirmed.

## Result

The given salt contains:

**Result.** Acid Radical : SO<sub>4</sub><sup>2-</sup>

Basic Radical : Mg<sup>2+</sup>.

## Experiment- 9

**Aim** To analyse the given salt for one anion and one cation present in it.



- Boiling tubes, test tubes, test tube holder, test tube stand, delivery tube, corks, filter papers, reagents

### Material required

Sl. No.	Experiment	Observation	Inference
1.	Noted the colour of the given salt.	White	$\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Ni}^{2+}$ , $\text{Co}^{2+}$ , $\text{Mn}^{2+}$ are absent.
2.	Noted the smell of the salt.	No specific smell.	$\text{S}^{2-}$ , $\text{SO}_3^{2-}$ , $\text{CH}_3\text{COO}^-$ may be absent.
3.	Heated 0.5 g of the salt in a dry test tube and noted the colour of the gas evolved and change in the colour of the residue on heating and cooling.	(i) No gas was evolved.  (ii) No particular change in colour of the residue is observed when heated and when cooled.	(iii) $\text{CO}_3^{2-}$ may be present, $\text{NO}_3^-$ , $\text{NO}_2^-$ , $\text{Br}^-$ may be absent. (iv) $\text{Zn}^{2+}$ may be absent.
4.	Prepared a paste of the salt with conc. HCl and performed the flame test.	Green colour of the flame seen.	$\text{Ba}^{2+}$ may be present.
5.	Borax bead test was not performed as the salt was white in colour.	—	—
6.	Treated 0.1 g of salt with 1 mL dil. $\text{H}_2\text{SO}_4$ and warmed.	No effervescence and evolution of vapours.	$\text{CO}_3^{2-}$ , $\text{SO}_3^{2-}$ , $\text{S}^{2-}$ , $\text{NO}_2^-$ , $\text{CH}_3\text{COO}^-$ absent.
7.	Heated 0.1 g of salt with 1 mL conc. $\text{H}_2\text{SO}_4$ .	No gas evolved.	$\text{Cl}^-$ , $\text{Br}^-$ , $\text{I}^-$ , $\text{NO}_3^-$ , $\text{C}_2\text{O}_4^{2-}$ are absent.
8.	Acidified 1 mL of aqueous salt solution with conc. $\text{HNO}_3$ . Warmed the contents	No yellow precipitate	$\text{PO}_4^{3-}$ absent.

9.	Acidified water extract of the salt with dil. HCl and then added 2mL of BaCl <sub>2</sub> solution.	A white ppt. is obtained which is insoluble in conc. HNO <sub>3</sub> and conc. HCl.	SO <sub>4</sub> <sup>2-</sup> present.
10.	Heated 0.1 g of salt with 2 mL NaOH solution.	Ammonia gas is not evolved.	NH <sub>4</sub> <sup>+</sup> absent.
11.	Attempted to prepare original solution of the salt by dissolving 1g of it in 20 mL water.	Clear solution formed	Water soluble salt is present.
12.	To a small part of the above salt solution added 2 mL of dil. HCl.	No white precipitate formed.	Group-I absent.
13.	Passed H <sub>2</sub> S gas through one portion of the solution of step 12.	No precipitate formed.	Group-II absent.
14.	Since salt is white, heating with conc. HNO <sub>3</sub> is not required. Added about 0.2 g of solid ammonium chloride and then added excess of ammonium hydroxide to the solution of step 12.	No precipitate formed.	Group-III absent.
15.	Passed H <sub>2</sub> S gas through the above solution.	No precipitate formed.	Group-IV absent.
16.	Added excess of ammonium hydroxide solution to the original solution and then added 0.5 g of ammonium carbonate.	No precipitate formed.	Group-V present.
17.	<b>Confirmatory test for Barium</b>		
	(a) <i>Pot. chromate test.</i> To one part of the above solution, added a few drops of pot. chromate solution.	Yellow ppt.	Ba <sup>2+</sup> conformed
	(b) <i>Flame test.</i> Performed flame test with the salt.	Persistent grassy green flame on prolonged heating.	Ba <sup>2+</sup> conformed

## Result

The given salt contains:

Acid Radical : SO<sub>4</sub><sup>2-</sup>

Basic Radical : Ba<sup>2+</sup>.



## EXPERIMENT-10

**Aim: To analyse the given salt for acidic and basic radicals.**

Experiment	Observations	Inference
<b>1. Physical examination :</b> (e) Noted the colour of the given salt. (f) Noted the smell of the salt.  <b>2. Dry heating test</b> Heated a pinch of the salt in a dry test tube and noted the following observations : (k) Gas evolved  (l) Sublimation  (m) Decrepitation  (n) Fusion  (o) Colour of the residue	White  No specific odour   A reddish brown gas evolved which turned freshly prepared $\text{FeSO}_4$ solution black. No sublimate formed.  No crackling sound observed.  Salt does not fuse.  White	$\text{Cu}^{2+}$ , $\text{Fe}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Ni}^{2+}$ , $\text{Mn}^{2+}$ , $\text{Co}^{2+}$ absent. $\text{NH}_4^+$ , $\text{S}^{2-}$ and $\text{CH}_3\text{COO}^-$ may be absent.  $\text{NO}_3^-$ may be present.  Ammonium halides, aluminum chloride, iodide may be absent. Lead nitrate, barium nitrate, sodium chloride, potassium chloride and potassium iodide may be absent. Alkali (sodium, potassium) salts may be absent. $\text{Zn}^{2+}$ , $\text{Pb}^{2+}$ may be absent.

Experiment	Observations	Inference
<p><b>17. Flame test</b> Prepared a paste of the salt in conc. HCl and performed flame test.</p> <p><b>18. Borax bead test</b> Did not perform this test since the given salt was white.</p> <p><b>19. Dil. sulphuric acid test</b> Treated a pinch of the salt with dil. H<sub>2</sub>SO<sub>4</sub> and warmed.</p> <p><b>20. KMnO<sub>4</sub> test</b> To a pinch of the salt added dil. H<sub>2</sub>SO<sub>4</sub> warm and then a drop of KMnO<sub>4</sub> solution.</p> <p><b>21. Conc. sulphuric acid test</b> Heated a pinch of the salt with conc. sulphuric acid and added to it a paper pellet.</p> <p><b>22. Confirmatory test for nitrate</b> (e) <i>Copper chips test.</i> Heated a pinch of the salt with conc. sulphuric acid and a few copper chips. (f) <i>Ring test.</i> To 2–3 ml of the salt solution, added freshly prepared FeSO<sub>4</sub> solution. Now added conc. sulphuric acid along the sides of the test tube.</p> <p><b>18. Heated a pinch of salt with conc. NaOH solution</b></p> <p><b>19. Preparation of Original Solution (O.S.)</b> Shook a pinch of the salt with water.</p> <p><b>20.</b> To a part of the O.S. added 1–2 mls of dilute hydrochloric acid.</p> <p><b>21.</b> Through a part of the above solution, passed H<sub>2</sub>S gas.</p> <p><b>22.</b> To the remaining solution, added a pinch of solid ammonium chloride. Boiled the solution, cooled it and added excess of ammonium hydroxide solution.</p>	<p>Red flame on prolonged heating.</p> <p>—</p> <p>No gas evolved.</p> <p>Pink colour of KMnO<sub>4</sub> was not discharged.</p> <p>A reddish brown gas evolved which turned FeSO<sub>4</sub> solution black.</p> <p>Reddish brown gas evolved.</p> <p>A dark brown ring formed at the junction of the two liquids.</p> <p>No ammonia gas evolved.</p> <p>Solution obtained</p> <p>No ppt. formed.</p> <p>No ppt. formed.</p> <p>No ppt. formed.</p>	<p>Sr<sup>2+</sup> present.</p> <p>Cu<sup>2+</sup>, Ni<sup>2+</sup>, Fe<sup>3+</sup>, Mn<sup>2+</sup>, Co<sup>2+</sup> may be absent.</p> <p>CO<sub>3</sub><sup>2-</sup>, S<sup>2-</sup>, NO<sub>2</sub><sup>-</sup>, SO<sub>3</sub><sup>2-</sup> may be absent.</p> <p>Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, Fe<sup>2+</sup> may be absent.</p> <p>NO<sub>3</sub><sup>-</sup> may be present.</p> <p>NO<sub>3</sub><sup>-</sup> confirmed.</p> <p>NO<sub>3</sub><sup>-</sup> confirmed.</p> <p>NH<sub>4</sub><sup>+</sup> absent.</p> <p>Labelled it as Original Solution (O.S.) Group I absent. (Pb<sup>2+</sup> absent)</p> <p>Group II absent (Pb<sup>2+</sup>, Cu<sup>2+</sup>, As<sup>3+</sup>, absent)</p> <p>Group III absent. (Fe<sup>3+</sup>, Al<sup>3+</sup> absent)</p>

<i>Experiment</i>	<i>Observations</i>	<i>Inference</i>
<p>16. Through a part of this solution, passed H<sub>2</sub>S gas.</p>	No ppt. formed.	Group IV absent. (Zn <sup>2+</sup> , Mn <sup>2+</sup> , Ni <sup>2+</sup> , Co <sup>2+</sup> , absent)
<p>17. To the remaining ammonical solution added ammonium carbonate solution.</p>	White ppt. formed.	Group V present. (Ca <sup>2+</sup> , Ba <sup>2+</sup> , Sr <sup>2+</sup> may be present)
<p><b>18. Confirmatory test for</b></p>		
<p><b>1. Amm. sulphate test</b> To the second part of the solution, add 1 ml of amm. sulphate solution and warm.</p>	White ppt.	Sr <sup>2+</sup> confirmed.
<p><b>2. Flame test</b> Perform the flame test with the original salt.</p>	Crimson red flame.	Sr <sup>2+</sup> confirmed.

**Result.** Acid radical: NO<sub>3</sub><sup>-</sup>

Basic radical: Sr<sup>2+</sup>

## **EXPERIMENT-11**

### **Aim:**

Purification of the impure Copper Sulphate by the process of crystallization.

### **Materials Required:**

50 mL capacity Beaker, filtration unit, watch glass, kerosene burner and  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

### **The procedure of crystallization of copper sulphate:**

1. Prepare a clear solution of copper sulphate.
2. Dissolve 0.8 g of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  in about 8 mL of water and add 1-2 drops of about 6 mL  $\text{H}_2\text{SO}_4$  to it.
3. Heat the solution for a while and filter it using a filtration unit.
4. Transfer the solution from the filtration unit to another beaker and allow it to cool to room temperature.
5. The crystals will appear.
6. Filter, wash these crystals and let them dry.
7. Weigh the crystals and report the yield.

### **Precautions to be taken during the experiment:**

- Ensure that the crystals are washed well.
- Avoid overheating of the solution.
- The filtrate should be evaporated slowly by gentle heating of the solution.
- The solution should be cooled slowly and do not use any rapid cooling procedures.

### **Observation**

Weight of copper sulphate obtained =
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