Class – XI | 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 Sodium hydroxide Solution by Titrating it against a 0.1M Standard Solution of Oxalic acid
3	Determination of Concentration/Molarity of dilute hydrochloric acid Solution by Titrating it against a Standard Solution of Sodium carbonate
	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 MgSO4
7	To Identify the given inorganic salt ZnCl2
8	To Identify the given inorganic salt [(NH4)3PO4]
9	To Identify the given inorganic salt [(NH4)2CO3]
10	To Identify the given inorganic salt [Sr(NO3)2]
	EXPERIMENT BASED ON pH
11	To determine the pH of some fruit juices.
12	To observe the variation in the pH of acid/base with dilution.

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 $\begin{pmatrix} COOH \\ | \\ COOH \end{pmatrix} . 2H_2O = 126$

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.

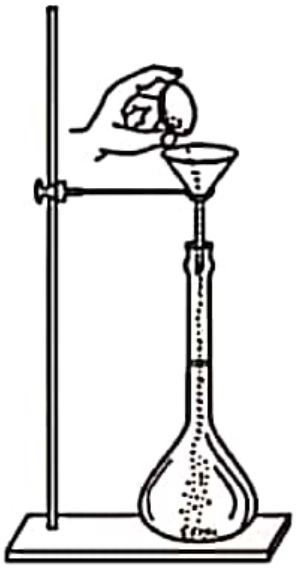


Fig. 11.14. Transferring oxalic acid to the flask.

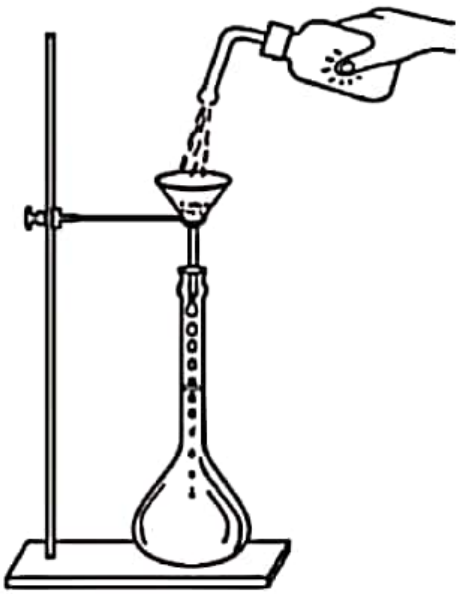


Fig. 11.15. Adding water.

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].**

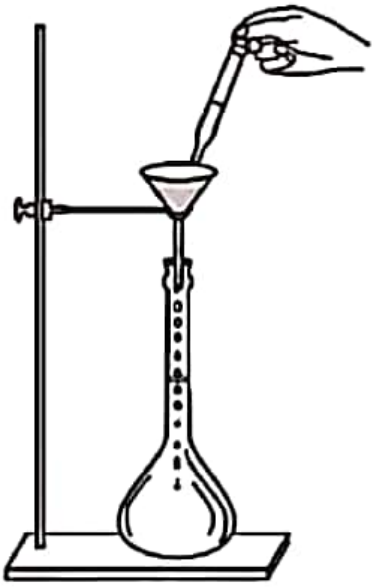


Fig. 11.16. Adding last small amount of water dropwise.

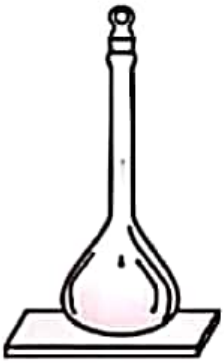


Fig. 11.17. Standard solution of oxalic acid.

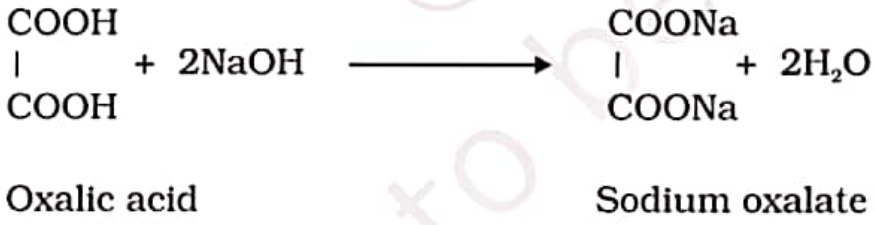
EXPERIMENT 6.1

Aim

Determination of the concentration (strength) of a given sodium hydroxide solution by titrating it against a standard solution of oxalic acid.

Theory

In the titration of a strong acid with a strong base, the amount of acid and base becomes chemically equivalent at the end point and the chemical reaction is called neutralization reaction. Near the end point there is a sudden change in the pH of the solution. If after end point even a small amount of base/acid is added the solution would become slightly alkaline or acidic respectively. In the titration between oxalic acid (weak acid) and sodium hydroxide (strong base), following reaction takes place:



Oxalic acid — Sodium oxalate

In this titration phenolphthalein (HPh) is used as an indicator. The concentration of unknown solution is calculated in g/L. Molarity of the solution can be calculated by using the formula

$$a_1 M_1 V_1 = a_2 M_2 V_2 \quad \ldots(4)$$

where a_1, M_1, V_1 are respectively basicity, molarity and volume of acid used and a_2, M_2 and V_2 are acidity, molarity and volume respectively of base used in the titration.

Material Required

- Burette (50 mL) : One
- Pipette (10 mL) : One
- Conical flask (100 mL) : One
- Burette stand : One
- Funnel : One
- White glazed tile : One
- Measuring flask (100 mL) : One

- Oxalic acid : As per need
- Sodium hydroxide solution : As per need
- Phenolphthalein indicator : As per need

Procedure

Oxalic acid 

Sodium Hydroxide 

(A) Preparation of 0.1M Standard Solution of Oxalic Acid

Follow the procedure as described in Experiment No. 2.1.

(B) Titration of Sodium Hydroxide and Oxalic Acid Solution

(i) Clean the burette thoroughly, wash it with distilled water and finally rinse it with sodium hydroxide solution. (Always rinse the burette (Fig. 2.17) with the solution, which is to be taken in it). Clamp the burette vertically in a burette stand.

(ii) Fill sodium hydroxide solution into the burette through a funnel above the zero mark.

(iii) **Remove the air gap, if any, from the nozzle** of the burette by running the solution forcefully from the burette nozzle.

(iv) **Remove the funnel before noting initial reading of the burette.** Also while noting the reading, see that no drop of the liquid is hanging at the nozzle of the burette.

(v) Note the initial reading by keeping the eye exactly at the same level as the meniscus of the solution.

(vi) Pipette out 10 mL of oxalic acid solution in a washed and dried conical flask. Always wash the pipette with water and rinse (Fig. 2.21) with the liquid to be measured before pipetting out the liquid.

(vii) Add 1-2 drops of phenolphthalein indicator to the conical flask. Place the flask over the glazed tile as shown in Fig. 6.3 Titrate the acid with sodium hydroxide solution till a very faint permanent pink colour is obtained. Add sodium hydroxide solution in small amounts initially and then dropwise.

(viii) Read the lower meniscus of the solution in the burette again and record it as final reading.

(ix) Repeat the procedure until three concordant readings are obtained. Record your readings as in Table 6.1.

Table 6.1 : Titration of sodium hydroxide vs oxalic acid solution

Sl. No.	Volume of oxalic acid solution taken in conical flask each time V_1 mL	Burette readings		Volume of sodium hydroxide solution used V_2 mL = (y–x) mL	Concordant reading in mL
		Initial reading (x)	Final reading (y)		

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, $(COOH)_2.2H_2O = 126\ g\ mol^{-1}$ and Molar mass of sodium hydroxide (NaOH) = $40\ g\ mol^{-1}$

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

Concentration (strength) in g/L = Molarity Mola 8/14

Result

Concentration of NaOH solution is ———————— g/L.

Precautions

(a) Always rinse the burette with the solution, which is to be taken in it.
(b) Remove the air gap if any, from the burette before titrating the solution. Make sure that the nozzle of burette is also filled.
(c) Never forget to remove the funnel from the burette before noting the readings of the burette and ensure that no drop is hanging from the nozzle of the burette.
(d) Always read the lower meniscus for all transparent solutions and upper meniscus for coloured solutions.
(e) To note the burette readings place the eye exactly at the level of the meniscus.
(f) Never hold the pipette at the bulb.
(g) Never use the pipette and burette with a broken nozzle.
(h) Never suck a strong acid or an alkali with the pipette.
(i) Always keep the lower end of the pipette dipped in the liquid while sucking the liquid.
(j) Do not blow out the last drop of the solution from the jet end of the pipette into the flask.
(k) The concentration (strength) of the solution must be calculated up to the fourth place of decimal.

EXPERIMENT 6.3

Aim

Determination of the strength of a given solution of dilute hydrochloric acid by titrating it against a standard solution of sodium carbonate.

Theory

The strength of hydrochloric acid is determined by titrating it against a standard solution of sodium carbonate. The following reaction takes place:

$$Na_2CO_3 + 2HCl \longrightarrow 2\,NaCl + CO_2 + H_2O$$

In this titration, methyl orange, a weak base (yellow in the unionised form) is used as an indicator.

In this experiment also, the titration follows the usual course, i.e., the proton furnished by the addition of the acid first neutralises sodium carbonate solution. When the entire sodium carbonate solution is neutralised, the last drop of the acid added from the burette produces the pinkish red colour change, which is the end point.

The concentration (strength) of the unknown solution is calculated in g/L. It is calculated from the molarity of the solution.

Here, the molarity equation is written as

Base		Acid
$a_1 M_1 V_1$	=	$a_2 M_2 V_2$

where, a_1 and a_2 are the acidity and basicity of the alkali and the acid respectively. M_1 and M_2 are the molarities, V_1 and V_2 are the volumes of the base and acid respectively used to neutralise each other.

Material Required

- Burette (50 mL) : One
- Pipette (10 mL) : One
- Conical flask (100 mL) : One
- Burette stand : One
- Funnel : One
- Glazed tile (white) : One
- Measuring flask (100 mL) : One

- Hydrochloric acid : As per need
- Sodium carbonate : As per need
- Methyl orange solution : As per need

Procedure

Hydrochloric acid 

(A) Preparation of 0.1 M standard solution of sodium carbonate

Follow the procedure as described in Experiment 2.1.

(B) Titration of hydrochloric acid and standard sodium carbonate solution.

Follow the procedure as given in the Experiment 6.1.

In this case, hydrochloric acid is taken in the burette and sodium carbonate solution in the conical flask. Methyl orange is used as an indicator. The colour change at the end point will be from yellow to pinkish-red. Record your observations in Table 6.2.

Table 6.2 : Titration of Hydrochloric acid with standard sodium carbonate solution

Sl. No.	Volume V_1 of Na_2CO_3 solution taken in the conical flask each time in mL	Burette readings		Volume of HCl solution used V_2 mL = (y–x) mL	Concordant reading in mL
		Initial reading (x)	Final reading (y)		

Calculations

Calculate the strength of HCl solution by using the equation

Na_2CO_3 solution HCl solution

$a_1M_1V_1 = a_2M_2V_2$

where M_1 and V_1 are the molarity and volume of sodium carbonate solution respectively and a_1 is the number of moles of OH^- (aq) ions supplied by one mole of the base (i.e. the acidity of the Na_2CO_3 solution).

$\therefore \quad a_1 = 2$

M_2 and V_2 are the molarity and volume respectively of hydrochloric acid solution.

a_2 is the number of moles of H^+ (aq) ions supplied by one mole of the acid (i.e. the basicity of HCl).

$\therefore \quad a_2 = 1$

Molar mass of Na_2CO_3 = 106 g mol^{-1}, Molar mass of HCl = 36.5 g mol^{-1},

$\therefore$ Concentration (Strength) of HCl solution in g/L = Molarity Molar mass

Result

The concentration (strength) of the given HCl solution is _____g/L.

Precautions

(a) Care should be taken while handling the acid and base.
(b) Always rinse the burette and the pipette with the solution which is to be taken in them.
(c) Remove the air gap if any, from the burette before titration.
(d) Never forget to remove the funnel from the burette before noting the initial reading of the burette and ensure that no drop is hanging from the nozzle.
(e) Always read the lower meniscus for all transparent solutions and upper meniscus for the coloured solutions.
(f) Never use burette and pipette with a broken nozzle.
(g) Never suck a strong acid or an alkali with the pipette, use pipette bulb.
(h) Always keep the lower end of the pipette dipped in the liquid while sucking the liquid.
(i) While transferring the solution to the flask, do not blow out the last drop of the solution from the jet of the pipette.
(j) The strength of the solution must be calculated up to the fourth decimal place.

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AIM:

EXPERIMENT-5

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

	EXPERIMENT	OBSERVATIONS	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 $FeSO_4$ soln 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 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.

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Teacher's Signature :

AIM			
11.	Preparation of (0.5) 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.

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Date

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.

Teacher's Signature :

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.

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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+}, Hg^{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.

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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 1.2ml 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 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 the remaining Soln add ammonium Carbonate.	No ppt formed	Group V absent (Ca^{+}, 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+}, Co^{2+} absent)

RESULT -

Acid Radical - SO_4^{2-}

Basic Radical - Mg^{2+}

Teacher's Signature : _____

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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.

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Date

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.

vision

Teacher's Signature :

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

Teacher's Signature : _____

AIM :

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

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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^{2+}, Ba^{2+}, 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^{2-}, SO_3^{2-}, 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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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.	Group 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.

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Date

AIM :

EXPERIMENT-~~18~~ 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^+.

vision

Teacher's Signature :

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Date _____

AIM :

PRECAUTIONS -

i) No heating of wet test-tubes.

ii) Use test-tube away from body.

iii) Handle reagents carefully.

Expt. No. 20-19

Page No. 47.

Date

AIM :

EXPERIMENT-20-19

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

	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+}, Ca^{2+}, Mg^{2+} may be present.
7.	Flame Test: Salt + Conc. HCl & perform test	Crimson Red flame	Sn^{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.

Teacher's Signature :

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Date _____

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.

Experiment 5.1

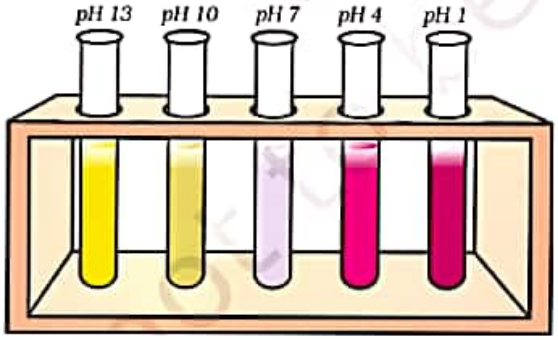
Aim

To determine the pH of some fruit juices.

Theory

Several dyes show different colours at different pH. These act as acid-base indicators. Solution of a mixture of dyes can be used to obtain approximate pH value of a solution. A solution of a mixture of dyes can be obtained to measure pH values from zero to 14. It is called universal indicator. Some universal indicators can measure the pH change of even 0.5. In fact, dyes themselves are weak acids or bases. Colour change occurs as a result of change in the structure of dye due to acceptance or release of protons. Different forms of a dye have different colours and hence, colour change is observed when pH of the solution changes. A standard chart for the colour change of the universal indicator with pH is supplied with the indicator paper or solution and the comparison of observed colour change with the chart provides a good estimate of the pH of the solution.

Natural pH Indicators



Red cabbage juice has vast pH range. It is a universal indicator of pH in aqueous solution.

The colour of these hydrangeas depends on the pH of the soil in which they grow. If pH of soil is acidic, flowers are blue and in alkaline pH, flowers are pink.

Material Required

- Beakers (100 mL) : Four
- Glass droppers : Four
- Test tubes : Four
- pH chart : One

- Fruit juice : Lemon, orange, apple, pineapple
- pH papers/universal indicator solution : As per need

Procedure

(i) Procure fresh juices of lemon, orange, apple and pineapple in separate beakers of 100 mL capacity each.

(ii) Transfer nearly 2 mL of the fresh juice (20 drops) with the help of a separate dropper for each juice in four different test tubes marked 1, 2, 3 and 4 respectively.

(iii) Add two drops of the universal indicator in each test tube and mix the content of each test tube thoroughly by shaking.

(iv) Match the colour appearing in each test tube with the standard pH chart.

(v) Record your observations in Table 5.1.

(vi) Repeat the experiment using pH papers to ascertain the pH of different juices and match the colour in each case with the one obtained with universal indicator.

(vii) Arrange the pH value of the four juices in increasing order.

Table 5.1 : pH value of different fruit juices

Name of the Juice	Colour with universal indicator	pH	Inference
Lemon			
Orange			
Apple			
Pineapple			

Result

Increasing order of pH value of juices is _____.

Precautions

(a) Add equal number of drops of universal indicator to equal volumes of solutions in each of the test tubes.
(b) Match the colour of the solution with pH chart carefully.
(c) Store pH papers at a safe place to avoid contact with acidic and basic reagents kept in the laboratory.
(d) Use only fresh juice for the experiment.

Discussion Questions

(i) Out of the four juices, which one is least acidic? Explain.
(ii) If we dilute each of the juices, what effect is likely to be observed on the pH values?
(iii) On mixing any two juices, would the pH alter or remain the same? Verify your answer experimentally.
(iv) How can you ascertain the pH of a soft drink ?

EXPERIMENT 5.2

Aim

To observe the variation in pH of acid/base with dilution.

Theory

Hydrogen ion concentration per unit volume decreases on dilution. Therefore, change in pH is expected on dilution of the solution.

Material Reqiured

- Boiling tubes : Eight
- Glass droppers : Four
- Test tubes : As per need

- 0.1 M HCl solution : 20mL
- 0.1 M NaOH solution : 20mL
- 0.05 M H_2SO_4 solution : 20mL
- pH paper/universal indicator : As per need

Procedure

(i) Take four boiling tubes and mark them as A, B, C and D. (Fig. 5.1).
(ii) Take 2mL of 0.1 M HCl in boiling tube A.

(iii) Take 2mL of 0.1 M HCl in boiling tube B and add 18 mL water to it and mix thoroughly.

(iv) Take 5mL of dilute HCl solution from boiling tube B in boiling tube C and add 15mL water to it.

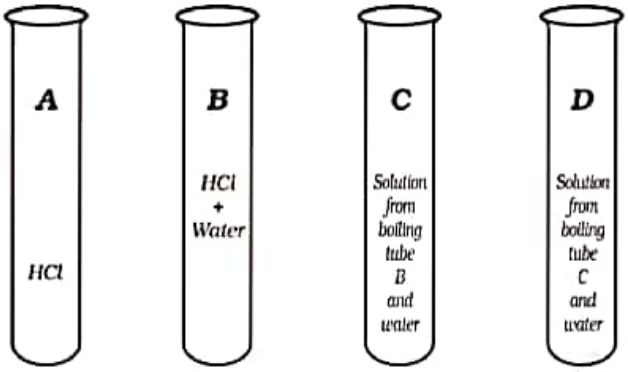


Fig. 5.1 : Set up for experiment 5.2

Hazard Warning

- *Never add water to the acid.*
- *For dilution add acid slowly into water.*

(v) Take 5mL of diluted HCl from boiling tube C in boiling tube D and add 15 mL water to it.

(vi) Cut a pH paper into small pieces and spread these on a clean glazed tile.

(vii) Take out some solution from boiling tube A with the help of a dropper and pour one drop on one of the pieces of pH paper kept on the glazed tile. Compare the colour of the pH paper with the standard chart.

(viii) Similarly test the pH of solutions of boiling tubes B, C, and D respectively and record your results as in Table 5.2.

(ix) Calculate the hydrogen ion concentration of solution B, C and D.

(x) Take out 1mL of solution from each boiling tube and transfer in separate test tubes. Add 2 drops of universal indicator to each of these test tubes. Shake the test tubes well and match the colour of these solutions with the standard pH chart to estimate the pH.

(xi) Similarly observe the change in pH of 0.05 M H_2SO_4 and 0.1M NaOH solution with dilution as detailed in steps (i) to (ix) above.

(xii) Record your observations in Table 5.2.

(xiii) Compare the result obtained by using universal indicator paper and that obtained by using universal indicator solution.

Table 5.2 : pH change on dilution

Boiling tube	HCl		H_2SO_4		NaOH	
	Colour	pH	Colour	pH	Colour	pH
A						
B						
C						
D						

Result

(i) Concentration of solutions of test tube B, C and D are _____.

(ii) Write your conclusion about the variation of pH with dilution.

Precautions

(a) Add equal number of drops of the universal indicator to equal amounts of solution in each of the boiling tubes.

(b) Match the colour of the solution with pH chart carefully.