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BHAGAT PUBLIC SR. SEC. SCHOOL

ALANIYA, KOTA

CHEMISTRY PRACTICAL

MAJOR EXPERIMENT

2020-21

CLASS - XII

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Experiment No: 1

AIM:- To prepare 250 ml of M/20 standard solution of F.A.S. Using this solution find out the molarity and strength of the given $KMnO_4$ solution.

Theory :- $KMnO_4$ oxidises fe^{++} ions into fe^{+++} ions in acidic medium in cold and itself reduced to colourless Mn^{++} ions

$$2\,KMnO_4 + 10\,Fe\,SO_4\,(NH_4)_2\,SO_4\,6H_2O + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5\,Fe_2(SO_4)_3 + 10\,(NH_4)_2\,SO_4 + 68\,H_2O$$

Or

$$MnO_4^- + 5\,fe^{++} + 8\,H^+ \rightarrow Mn^{++} + 5\,fe^{+++} + 4\,H_2O$$

Molecular Mass of $KMnO_4$ = 158

Molecular Mass of F.A.S. = 392

Mass of required FAS for preparing 250 ml of

$$M/20 \text{ solution} = \frac{392}{20} \times \frac{250}{1000} = 4.9 \text{ gm}$$

Apparatus: - Chemical balance, weight box, watch glass, measuring flask, funnel, burette, pipette, conical flask, tile, burette stand etc.

Materials- F.A.S Crystals (Mohr's Salt), Dilute H_2SO_4, Distilled H_2O, $KMnO_4$ solution.

Indicator – $KMnO_4$ solution act as a self indicator.

End point – colourless to Permanent pink

Observation –
(i) Mass of watch glass (a) = 18.6192 gm
(ii) Mass of mohr's salt required (b) = 4.9 gm
(iii) Mass of (a) + (b) = 23.5192 gm
(iv) Volume of mohr's salt solution prepared = 250 ml
(v) Molarity of mohr's salt solution = M/20

Observation table –

S.N.	Volume of F.A.S. Solution(v_1 ml)	Reading of $KMnO_4$ solution			Concordant volume of $KMnO_4$ (V_2 ml)
		Initial (a) (ml)	final (b) (ml)	Used (b-a) (ml)	
1	20 ml	0.0	19.8	19.8 ml	
2	20 ml	0.0	19.6	19.6 ml	19.6 ml
3	20 ml	0.0	19.6	19.6 ml	

Calculations- (A) Molarity of $KMnO_4$ solution (M_2) = ?.

Using formula $M_1V_1 = 5\,M_2V_2$

$$M_2 = \frac{M_1V_1}{5 \times V_2} = \frac{1}{20} \times \frac{20}{5 \times 19.6}$$

$M_2 = 0.0102$ M

$M_1 = M/20$
$V_1 = 20$ Ml
$M_2 = ?$
$V_2 = 19.6$ ml

(due to 2 moles of $kMnO_4$ reacts with 10 moles of FAS in overall balance equation)

(B) Strength of $KMnO_4$ Solution in gm \lit = ?

= molarity (M_2) × molecular mass

= 0.0102 × 158

= 1.6116 gm /lit

Result – (1) Molarity of the given $KMnO_4$ solution = 0.0102 M

(2) Strength of the given $KMnO_4$ solution = 1.6116 gm/lit.

Precaution

(i) All the volumetric apparatus should be washed well before use.

(ii) Rinse burette with the solution of $KMnO_4$ and pipette with the solution of FAS. And wash the titration flash with distilled H_2O after every titration

(iii) Always read the upper meniscus in case of coloured solutions.

(iv) Always use freshly prepared $KMnO_4$ as it decomposed on keeping.

(v) Excess of dilute H_2SO_4 should be add in FAS.

Experiment No : 2

AIM:- To prepare 250 ml of M/30 standard solution of F.A.S. Using this solution find out the molarity and strength of the given $KMnO_4$ solution.

Theory :- $KMnO_4$ oxidises fe^{++} ions into fe^{+++} ions in acidic medium in cold and itself reduced to colourless Mn^{++} ions

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

Or

$$MnO_4^- + 5\,fe^{++} + 8\,H^+ \rightarrow Mn^{++} + 5\,fe^{+++} + 4\,H_2O$$

Molecular Mass of $KMnO_4$ = 158

Molecular Mass of F.A.S. = 392

Mass of required FAS for preparing 250 ml of

$$M/30 \text{ solution} = \frac{392}{30} \times \frac{250}{1000} = 3.26 \text{ gm}$$

Apparatus: - Chemical balance, weight box, watch glass, measuring flask, funnel, burette, pipette, conical flask, tile, burette stand etc.

Materials- F.A.S Crystals (Mohr's Salt), Dilute H_2SO_4, Distilled H_2O, $KMnO_4$ solution.

Indicator – $KMnO_4$ solution act as a self indicator.

End point – colourless to Permanent pink

Observation – (i) Mass of watch glass (a) = 18.5974 gm
(ii) Mass of mohr's salt required (b) = 3.26 gm
(iii) Mass of (a) + (b) = 21.8574 gm
(iv) Volume of mohr's salt solution prepared = 250 ml
(v) Molarity of mohr's salt solution = M/30

Observation table –

S.N.	Volume of F.A.S. Solution(v_1 ml)	Reading of $KMnO_4$ solution			Concordant volume of $KMnO_4$ (V_2 ml)
		Initial (a) (ml)	final (b) (ml)	Used (b-a) (ml)	
1	20 ml	0.0	19.9	19.9 ml	
2	20 ml	0.0	19.7	19.7 ml	19.7 ml
3	20 ml	0.0	19.7	19.7 ml	

Calculations- (A) Molarity of $KMnO_4$ solution (M_2) = ? .

Using formula $M_1V_1 = 5\ M_2V_2$

$$M_2 = \frac{M_1V_1}{5 \times V_2} = \frac{1}{30} \times \frac{20}{5x19.7.}$$

$M_2 = 0.0067$ M

M_1 = M/30

V_1 = 20 Ml

M_2 = ?

V_2 = 19.7 ml

(due to 2 moles of $KMnO_4$ reacts with 10 moles of FAS in overall balance equation)

(B) Strength of $KMnO_4$ Solution in gm \lit = ?

= molarity (M_2) × molecular mass

= 0.0067 × 158

= 1.0586 gm /lit

Result – (1) Molarity of the given $KMnO_4$ solution = 0.0067 M

(2) Strength of the given $KMnO_4$ solution = 1.0586 gm/lit.

Precaution

(i) ii the volumetric apparatus should be washed well before use.

(ii) Rinse burette with the solution of $KMnO_4$ and pipette with the solution of FAS. And wash the titration flash with distilled H_2O after every titration

(iii) Always read the upper meniscus in case of coloured solutions.

(iv) Always use freshly prepared $KMnO_4$ as it decomposed on keeping.

(v) Excess of dilute H_2SO_4 should be add in FAS.

Experiment No. 3

AIM:-

To prepare 250 ml of M/20 standard solution of Oxalic acid.
Using this solution, find out the Molarity and strength of the given $KMnO_4$ solution.

Theory – $KMnO_4$ Oxidises Oxalic acid into CO_2 in acidic medium at a temperature around 60^0 c and itself get reduced to colourless Mn^{++} ions

$$2\,KMnO_4 + 3\,H_2SO_4 + 5\,(COOH)_2 \rightarrow K_2SO_4 + 2\,MnSO_4 + 10\,CO_2 + 8\,H_2O$$

OR

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

Molecular mass of $kMnO_4$ = 158

Molecular mass of Oxalic acid = 126

Mass of required Oxalic acid for preparing 250 ml of M/20 solution = $\frac{126}{20} \times \frac{250}{1000}$ = 1.575 gm

Apparatus: - Chemical balance, weight box, watch glass, measuring flask, funnel, burette, pipette, conical flask, tile, burette stand etc.

Materials- Hydrated oxalic acid Crystals (Mohr's Salt), dilute H_2SO_4, distilled H_2O, $KMnO_4$ solution.

Indicator – $KMnO_4$ solution act as a self indicator.

End point – Colourless to Permanent pink

Observation – (i) Mass of watch glass (a) =18.6202. gm
(ii) Mass of required oxalic acid (b) = 1.575 gm
(iii) Mass of (a) + (b) = 20.1952 gm
(iv) Volume of oxalic acid solution prepared = 250 ml
(v) Molarity of oxalic acid solution = M/20

Observation table –

S.N.	Volume of oxalic acid Solution(v_1 ml)	Reading of $KMnO_4$ solution			Concordant volume of $KMnO_4$ (V_2 ml)
		Initial (a) (ml)	final (b) (ml)	Used (b-a) (ml)	
1	20 ml	0.0	19.7	19.7 ml	
2	20 ml	0.0	19.5	19.5 ml	19.5 ml
3	20 ml	0.0	19.5	19.5 ml	

Calculations- (A) Molarity of $KMnO_4$ solution (M_2) = ?

Using formula $2M_1v_1 = 5\,M_2V_2$

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

$$M_2 = \frac{2}{20} \times \frac{20}{5 \times 19.5}$$

M_1 = M/20
V_1 = 20 ml
M_2 = ?
V_2 = 19.5 ml

M_2 = 0.0205 M

(due to 2 mole of $KMnO_4$ reacts with 5 moles of oxalic acid in overall balance equation)

(B) Strength of $KMnO_4$ Solution in gm/lit

= Molarity (M_2) × molecular mass.

= 0.0205 × 158

= 3.2390 gm/lit

Result (A) The Molarity of the given $KMnO_4$ solution = 0.0205 M

(B) The Strength of the given $KMnO_4$ solution = 3.2390 gm/lit

Precautions

(i) All the volumetric apparatus should be washed well before use.

(ii) Rinse burette with the solution of oxalic acid and pipette with the solution of oxalic acid and wash the titration flash with distilled H_2O after every titration

(iii) Always read the upper meniscus in case of coloured solution.

(iv) Always use freshly prepared $KMnO_4$ as it decomposes on keeping.

(v) Dilute H_2SO_4 should be add in oxalic acid solution.

(vi) Heat the conical flask should be slowly on a wire gauze unit the moisture appears on the neck of the flas the temperature of the solution should be between $60^0 - 70^0$ c

Experiment No. 4

AIM:- To prepare 250 ml of M/30 standard solution of Oxalic acid.
Using this solution, find out the Molarity and strength of the given $KMnO_4$ solution.

Theory – $KMnO_4$ Oxidises Oxalic acid into CO_2 in acidic medium at a temperature around 60^0 c and itself get reduced to colourless Mn^{++} ions

$2\ KMnO_4 + 3\ H_2SO_4 + 5\ (COOH)_2 \rightarrow K_2SO_4 + 2\ MnSO_4 + 10\ CO_2 + 8\ H_2O$

OR

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

Molecular mass of $kMnO_4$ = 158

Molecular mass of Oxalic acid = 126

Mass of required Oxalic acid for preparing 250 ml of M/30 solution = $\frac{126}{30} \times \frac{250}{1000}$ = 1.05 gm

Apparatus: - Chemical balance, weight box, watch glass, measuring flask, funnel, burette, pipette, conical flask, tile, burette stand etc.

Materials- Hydrated oxalic acid Crystals (Mohr's Salt), dilute H_2SO_4, distilled H_2O, $KMnO_4$ solution.

Indicator – $KMnO_4$ solution act as a self indicator.

End point – Colourless to Permanent pink

Observation –
(i) Mass of watch glass (a) = 18.6192. gm
(ii) Mass of required oxalic acid (b) = 1.05 gm
(iii) Mass of (a) + (b) = 19.6692 gm
(iv) Volume of oxalic acid solution prepared = 250 ml
(v) Molarity of oxalic acid solution = M/30

Observation table –

S.N.	Volume of oxalic acid Solution(v_1 ml)	Reading of $KMnO_4$ solution			Concordant volume of $KMnO_4$ (V_2 ml)
		Initial (a) (ml)	final (b) (ml)	Used (b-a) (ml)	
1	20 ml	0.0	19.9	19.9 ml	
2	20 ml	0.0	19.7	19.7 ml	19.7 ml
3	20 ml	0.0	19.7	19.7 ml	

Calculations- (A) Molarity of $KMnO_4$ solution (M_2) = ?

Using formula $2M_1V_1 = 5M_2V_2$

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

$$M_2 = \frac{2}{30} \times \frac{20}{5 \times 19.7}$$

$M_1 = M/30$
$V_1 = 20$ ml
$M_2 = ?$
$V_2 = 19.7$ ml

$M_2 = 0.0135$ M

(due to 2 mole of $Kmno_4$ reacts with 5 moles of oxalic acid in overall balance equation)

(B) Strength of $KMnO_4$ Solution in gm/lit

= Molarity (M_2) × molecular mass.
= 0.0135 × 158
= 2.1330 gm/lit

Result (A) The Molarity of the given $KMnO_4$ solution = 0.0135 M
(B) The Strength of the given $KMnO_4$ solution = 2.1330 gm/lit

Precautions

(i) All the volumetric apparatus should be washed well before use.
(ii) Rinse burette with the solution of oxalic acid and pipette with the solution of oxalic acid and wash the titration flash with distilled H_2O after every titration
(iii) Always read the upper meniscus in case of coloured solution.
(iv) Always use freshly prepared $KMnO_4$ as it decomposes on keeping.
(v) Dilute H_2SO_4 should be add in oxalic acid solution.
(vi) Heat the conical flask should be slowly on a wire gauze unit the moisture appears on the neck of the fla the temperature of the solution should be between $60^0 - 70^0$ c

Experiment No. 5

Exercise – Identify the functional group present in the given organic compound.

Physical Properties –

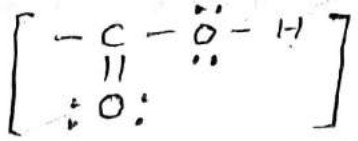
1. Physical State - Liquid
2. Colour – Colour less
3. Odour – Smell like vinegar
4. Solubility in water – Soluble in water.

S.N	Experiment	Observations	Inference
1	Nature of the compound-Put a crystal of the compound on moist blue litmus paper	Litmus paper turns red	Organic compound is acidic in nature may be -COOH or Ar-OH Functional group.

S.N	Experiment	Observations	Inference
2	Burning Test – Take some organic compound on copper wire and bring it in to the flame.	The compound burns with non- sooty blue flame	Compound is aliphatic.
3	Detection of element (1) Lassaigne solution + NaOH + Fe SO_4 (Freshly prepared)	Green ppt	
	(ii) Add few drops of dil. H_2SO_4	Colour less solution is obtained	N-absent
4	Test for functional group		
	Aqueous solution of compound + a pinch of NaHCO3	Brisk effervescence colourless odourless gas evolved	Ar-OH group absent- -COOH group in present.
5	Ester test Organic compound + 2-3 drops H_2SO_4+0.5 ml C_2H_5OH. Warm	Fruity smell	-COOH group present

Result – Carboxylic acid [-COOH] group is present in the given organic compound.

Structural Formula



Experiment No. 6

Exercise – Identify the functional group present in the given organic compound.

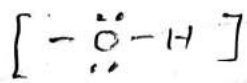
Physical Properties –

1. Physical State - Liquid
2. Colour – Colour less
3. Odour – Pleasant smell like that of spirit
4. Solubility in water – Soluble in water.

S.N	Experiment	Observations	Inference
1	Nature of the compound-Put a drop of liquid on moist blue litmus paper and moist red litmus paper respectively	No reaction	Organic comp. is neutral.

S.N	Experiment	Observations	Inference
2	Burning Test – Burning a copper wire dipped in the given liquid into the flame.	The compound burns with non- sooty blue flame	Compound is aliphatic.
3	Detection of element-1. Lassaigne solution + NaOH + Fe SO_4 (Freshly prepared)	Green ppt	
	(ii) Add few drops of dil. H_2SO_4	Solution does not turns green or blue.	N-absent
4	Test for functional group		
	Sodium metal test-Organic liquid + Na piece	Brisk effervescence with the evaluation of H_2 gas	-OH (alchoholic) group is present.
5	**Ceric ammonium nitrate test** A aqueous solution of the compound + ceric ammonium nitrate solution.	Solution turns red	-OH group is present.
6	Ester Test – Compound + solid CH_3COONa + few drops of cone. H_2SO_4 and heat.	Fruity smell	-OH group is present.

Result – The given organic compound has alchoholic (-OH) functional group in it.

Structural formula - 

Experiment No.7

Exercise – Identify the functional group present in the given organic compound.

Physical Properties –

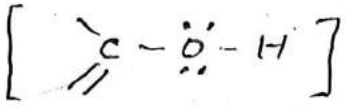
1. Physical State – Solid
2. Colour – Light Pink
3. Odour – Pheolic smell
4. Solubility in water – Soluble in water.

S.N	Experiment	Observations	Inference
1	Nature of the compound-Put a drop of liquid on moist blue litmus paper	Litmus paper turns red	The given comp. is acidic. May –COOH or Ar-OH group in it.

S.N	Experiment	Observations	Inference
2	Burning Test – Put a crystal of the compound on glass rod and bring it in to the flame	The compound burns with sooty flame	Organic Compound is aromatic.
3	Detection of element-(1) Lassaigne solution + NaOH + Fe SO_4 (Freshly prepared)	Green ppt	
	(ii) Add few drops of dil. H_2SO_4	Solution does not turn green or blue.	N-absent
4	**Test for functional group**		
	$FeCl_3$ test-Aqueous solution of the compound + neutral $FeCl_3$ solution	Solution turns green	Phenolic (Ar-OH) group is present.
5	Libermann Nitroso Test (i) Compound + solid $NaNO_2$+ dilute H_2SO_4 (ii) Dilute the solution with H_2O (iii) Above red solution + NaOH solution	[Blue coloured solution is obtained.] [Solution becomes red] [The colour of the solution again becomes blue.]	Phenolic group is present.

Result – Phenolic (Ar-OH) group is present in the given organic compound.

Structural Formula -



Experiment No. 8

Exercise – Identify the functional group present in the given organic compound.

Physical Properties –

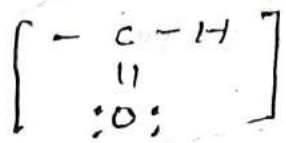
1. Physical State – liquid
2. Colour – Colourless
3. Odour – Pungent smell
4. Solubility in water – Soluble in water.

S.N	Experiment	Observations	Inference
1	Nature of the compound-Put a drop of liquid on moist blue and red litmus paper separately	No action	Organic compound is neutral.

S.N	Experiment	Observations	Inference
2	Burning Test – Put a crystal of the compound on glass rod and bring it in to the flame	The compound burns with non- sooty blue flame	Organic Compound is aliphatic.
3	Detection of element 1. Lassaigne solution + NaOH + Fe SO_4 (Freshly prepared)	Green ppt	
	(ii) Add few drops of dil. H_2SO_4	Solution does not turn green or blue.	N-absent
4	**Test for functional group**		
(i)	Compound + 2,4- dinitrophenyl hydrazine, shake	Yellow ppt is formed	Carbonyl (>C=O) group is present may be –CHO or > C=O group.
(ii)	Compound + sod. Nitroprusside+NaoH	No reaction	> C=O group is absent.
(iii)	Compound + Tollen's reagent warm in a water bath.	Silver mirror is formed.	-CHO group is present.
(iv)	Equal amount of Fehling's solution A and B in a test tube and add it to 1 ml given compound and heat.	Red ppt is formed.	-CHO present.
(v)	Schiffs reagent and the given organic liquid	Red colouration	Aldehyde group (-CHO) is present.

Result – Aldehyde group (-CHO) is present in the given organic compound.

Structural Formula -



Experiment No. 9

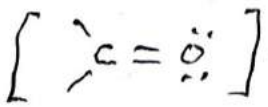
Exercise – Identify the functional group in the given organic compound.

Physical Properties –

1. Physical State – liquid
2. Colour – Colourless
3. Odour – Smell like nail polish remover
4. Solubility in water – Insoluble in water.

S.N	Experiment	Observations	Inference
1	Nature of the compound-Put a drop of given liquid on moist blue and red litmus paper separately	No action	Organic compound is neutral.
2	Burning Test – Put a crystal of the compound on glass rod and bring it in to the flame	The compound burns with non- sooty blue flame	Organic Compound is aliphatic.
3	Detection of element-1. Lassaigne solution + NaOH + Fe SO_4 (Freshly prepared)	Green ppt	
	(ii) Add few drops of dil. H_2SO_4	Solution does not turn green or blue.	N-absent
4	**Test for functional group**		
(i)	Compound + 2,4- dinitrophenyl hydrazine, shake	Yellow ppt is formed	Carbonyl (>C=O) group is present may be –CHO or > C=O group.
(ii)	Totten's Test Organic compound + Tollen reagent	No reaction	-CHO group absent.
(iii)	Nitroprusside test – Organic compound + sodium nitroprusside solution + NaOH	A wine red colouration.	> C=O group is present.
(iv)	m-dinitrobnezene test – Organic compound + powdered m-dimitrobenzene + dil. NaOH in excess, shake well.	A violet colour appears	(>C=O) ketonic group is present.

Result – The given organic liquid has Ketonic (>C=O) functional group.

Structural Formula - 

Experiment No. 10

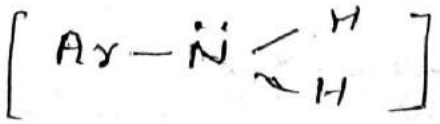
Exercise – Identify the functional group in the given organic compound.

Physical Properties –

1. Physical State – liquid
2. Colour – Brownish red (Colourless when pure)
3. Odour – Pungent smell
4. Solubility in water –Partly soluble in water.

S.N	Experiment	Observations	Inference
I	Nature of the compound-Put a drop of given liquid on moist blue and red litmus paper separately	Red litmus paper turns blue	The compound in basic in nature.
2	Burning Test – Bring a glass red dipped in the given liquid into the flame.	Compound burns with sooty flame	Given compound is aromatic
3	Detection of element Lassaigne solution + NaOH + Fe SO_4 (Freshly prepared) add few drops of dil. H_2SO_4	Green ppt A blue colour appears	N- is present.
4	**Test for functional group**		
(i)	Organic compound + few drops of conc. HCl + solid $NaNO_2$. Cool the solution in ice bath. Add alkaline B napthol is cold.	Orange red dye is formed.	Aromatic amino (Ar-NH_2) group is present.

Result – Amino (-NH_2) group is present attached to aromatic ring i.e. Aromatic amine (Ar-NH_2) is present.

Structural Formula - 

Experiment No.11

Exercise – Analyze the given mixture for one acid and one basic radical by dry and wet tests.

S.N	Experiment	Observations	Inference
1.	**Test for acid Radicals.** Mixture + dil. H_2SO_4	No reaction	Dilute add group is absent.
2	Mixture + conc. H_2SO_4. Heat	Yellow brown fumes with pungent smell evolved	Conc. Acid group is present may be Br^-
3	Confirmatory test Silver Nitrate Test – Sodium Carbonate extract + dil HNO_3 + $AgNO_3$ solution.	Light yellow ppt is formed.	
4	Add NH_4OH in excess into above ppt.	Yellow ppt is partly dissolve.	Br^- confirmed.
5	CCl_4 layer test – Sodium carbonate extract + dil. HNO_3+CCl_4+Cl_2 water drop by drop and shake	CCl_4 layer turns yellowish orange.	Br^- confirmed.
	Test for basic Radical		
1	Mix + NaOH solution. Heat	Smell of NH_3	Zero group is present may be NH^+_4
	Confirmatory Test		
2	Bring a glass rod dipped in HCl near the mouth of the test tube.	White fumes of NH_4Cl formed	NH^+_4 confirmed.
3	Bring a piece of filter paper moistened with Nesslar's. Reagent near the mouth of the test tube.	Filter paper turns reddish brown	NH_4 confirmed
4	Bring a piece of filter paper moistened with $CuSO_4$ solution near the mouth of the test tube.	Filter paper turns deep blue	NH^+_4 confirmed

Result – The given mixture contains bromide (Br^-) acid radical and Ammonium (NH^+_4) as basic radical.

Experiment No. 12

Exercise : Identify one acid and one basic radical in the given mixture.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1.	**Tests for acid radicals** Mixture + dil H_2SO_4	Smell like vinegar is given out	Dilute acid group is present may be CH_3COO^-
2	Confirmatory Test Palm test – Take the mixture on palm, add it to solid $H_2C_2O_4$, $2H_2O$ and 2-3 Drops of water. Rub it and smell	Smell of vinegar	CH_3COO^- confirmed
3	Feric Chloride test-Sodium carbonate extract + neutral $FeCl_3$ solution	Solution turns deep red	CH_3COO^- confirmed
4	Easter test – Mixture + C_2H_5OH + Few drops and conc. H_2SO_4 and heat.	A pleasant fruity smell.	CH_3COO^- confirmed
	Test for Basic Radical		
1	Mixture + NaOH solution & Heat.	No smell of NH_3	Zero group absent.
2	Original solution + dil. HCl	White ppt	I group present may be Pb^{2+}, Ag^+, Hg_2^{2+}
3	White ppt + water & boil	Ppt is soluble but reappear on cooling	May be Pb^{2+}
4	Divide the hot solution of the ppt into two parts.		
(i)	To part I add KI solution	Yellow part	Pb^{2+} confirmed
(ii)	To part II add K_2CrO_4 Solution Dry Test : Charcoal Cavity Test mixture + Na_2CO_3+2-3 drops of water in charcoal cavity. Heat it in reducing flame.	Yellow part A soft shining metallic bead is formed. It leaves mark on paper.	Pb^{2+} confirmed Pb^{2+} confirmed

Result : - Acetate (CH_3COO^-) and lead (Pb^{2+}) are present in the given mixture as acid and basic radicals.

Experiment No. 13

Exercise : Analyze the given salt for one acid and one basic radical by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Tests for acid radicals** Salt + dil H_2SO_4 and heat	No reaction	Dilute acid group is absent.
2	Salt + conc. H_2SO_4 and heat	No reaction	Conc. Acid group is absent.
3	Sodium carbonate extract + dill HCl+$BaCl_2$ solution	White ppt is obtained	General groups is present may be SO_4^{2-}
4	Confirmatory test – Divide the ppt in two parts. (i) To part I add conc. HCl & Heat. (ii) To part II add conc. HNO_3 and heat.	Ppt remains insoluble. Ppt remains insoluble.	$SO^2{}_4^-$ confirmed $SO^2{}_4^-$ confirmed.
	Test for Basic Radical		
1	Salt + NaOH solution & Heat.	No smell of NH_3	Zero group absent.
2	Original solution + dil. HCl	No ppt is obtained.	I group absent.
3	Pass H_2S gas into the above solution.	Black ppt is obtained	II group present may be Pb^{2+} or Cu^{2+}
4	Dissolve the ppt in 50% HNO3	Black ppt is dissolves	May be Pb^{2+} or Cu^{2+}
5	Divide the solution in two parts. (i) Part I + C_2H_5OH + dil. H_2SO_4 (ii) Part II + NH_4OH in excess.	No ppt Deep the colouration	Pb^{2+} absent may be Cu^{2+} Cu^{2+} confirmed
6	Deep blue solution + CH_3COOH till blue colour disappear. Now add $K_4[Fe(CN)_6]$ solution.	Chocolate brown ppt is formed.	Cu^{2+} confirmed
7.	Dry test – Perform charcoal cavity test.	Red bead is formed.	Cu^{2+} confirmed

Result : - In the given salt sulphate ($SO^2{}_4^-$) and copper (Cu^{2+}) radicals are present.

Experiment No. 14

Exercise : Analyze the given salt for one acid and one basic radical by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Tests for acid radicals** Mixture + dil H_2SO_4 and heat	No reaction	Dilute acid group is absent.
2	Salt + conc. H_2SO_4 and heat	No reaction	Conc. Acid group is absent.
3	Sodium carbonate extract + dill $HCl+BaCl_2$ solution	White ppt is obtained	General groups is present may be SO_4^{2-}
4	**Confirmatory test –** Divide the ppt in two parts. (i) To part I add conc. HCl & Heat. (ii) To part II add conc. HNO_3 and heat.	Ppt remains insoluble. Ppt remains insoluble.	SO^2_4 confirmed SO^2_4 confirmed.
	Test for Basic Radical		
1.	Mixture + NaOH solution & Heat.	No smell of NH_3	Zero group absent.
2	Original solution + dil. HCl	No ppt	I group absent.
3	Pass H_2S gas into the above solution.	No ppt.	II group absent.
4	Boil the above solution to remove H_2S gas completely. Test it by a piece of filter paper moistened with $(CH_3COO)_2$ Pb solution.	Filter paper does not turn black.	H_2S is removed completely.
5	Now boil the above solution with 2 drops of conc. HNO_3+add solid NH_4Cl and then NH_4OH in excess after cooling.	Reddish brown ppt is obtained.	III group present may be Fe^{3+}
6	Confirmatory Test Dissolved the ppt in dil.HCl and divide it in two parts. (i) Part I + $K_4[F_e(CN)_6]$ solution. (ii) Part II + KCNS solution Dry test borex bead test Perform borax bead test.	Deep blue colouration. Blood red colouration. Yellow bead.	Fe^{3+} confirmed. Fe^{3+} confirmed. Fe^{3+} confirmed.

Result : - The given mixture contains sulphate (SO^2_4) and iron (Fe^{3+}) radicals.

Experiment No. 15

Exercise : Analyze the given mixture for one acid and one basic radical by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Tests for acid radicals** Mixture + dil H_2SO_4 and heat	No reaction	Dilute acid group is absent.
2	Mixture+ conc. H_2SO_4 and heat	Brown coloured gas with pungent smell is given out.	Conc. Acid group is present. May be NO_3^-
3	Add some copper turning to the test tube.	Brown gas becomes dense.	Br- absent. May be NO_3^-
4	**Confirmatory test –** Neutralize Sodium carbonate extract with CH_3COOH. Add to it freshly prepared $FeSO_4$. Solution and then conc. H_2SO_4 by the side of the test tube.	A brown ring is formed at the junction of two liquid due to the formation of $FeSO_4NO$	NO_3^- confirmed.
	Test for Basic Radical		
1.	Mixture + NaOH solution & Heat.	No smell of ammonia	Zero group absent.
2	Original solution + dil. HCl	No ppt .	I group absent.
3	Pass H_2S gas into the above solution.	No ppt.	II group absent.
4	Boil the above solution to remove H_2S gas completely. Test it by a piece of filter paper moistened with $(CH_3COO)_2$ Pb solution.	Filter paper does not turn black.	H_2S is removed completely.
5	Now boil the above solution with 2 drops of conc. HNO_3 add solid NH_4Cl and then NH_4OH in excess after cooling.	White gelatinous ppt is obtained.	III group present may be Al^{3+}
6	**Confirmatory Test** Dissolved the white ppt in dil.HCl and divide it in three parts. (i) Part I + solid NH_4Cl heat. (ii) Part II NaOH solution (iii) Lake test. Part III + 2 drops of blue litmus and then add NH_4OH drop by drop. Dry Test-Charcoal cavity cobalt nitrate test.	White ppt reappears. White ppt, which is soluble in excess if NaOH. Blue ppt floats on the solution. Blue mass is obtained.	Al^{3-} confirmed. Al^{3-} confirmed. Al^{3-} confirmed. Al^{3-} confirmed.

Result : - Nitrate (NO_3^-) and Aluminium (Al^{3+}) are present in the given mixture.

Experiment No. 16

Exercise : Identify one acid and one basic radical from the given mixture by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Tests for acid radicals** Mixture + dil H_2SO_4 +Heat	Colourless gas with smell of vinegar is evolved	Dilute acid group is present may be CH_3COO^-
2	**Confirmatory test –** Palm test : Mixture + solid oxalic acid on palm then add 2-3 drops of water. Rub it and smell.	Smell of vinegar	CH_3COO^-
3	$FeCl_3$ solution : Neutralize sodium carbonate extract with dil. HCl and add $FeCl_3$ solution.	Dark red colouration	CH_3COO^- confirmed
4	Ester Test : Mixture + C_2H_5OH + few drops of conc. H_2SO_4. Heat	Pleasant fruity smell of ester formed	CH_3COO^- confirmed
	Test for Basic Radical		
1.	Mixture + NaOH solution & Heat.	No smell of ammonia	Zero group absent.
2	Original solution + dil. HCl	No ppt.	I group absent.
3	Pass H_2S gas into the above solution.	No ppt.	II group absent.
4	Boil the above solution to remove H_2S gas completely. Test it by a piece of filter paper moistened with $(CH_3COO)_2$ Pb solution.	Filter paper does not turn black.	H_2S is removed completely.
5	Now boil the above solution with 2 drops of conc. HNO_3 add solid NH_4Cl and then NH_4OH in excess after cooling.	No ppt	III group absent.
6	Pass H_2S gas in the above solution.	A white ppt is obtained	IV group present may be Zn^{2+}
7	Dissolve the ppt in dil. HCl and devide the solution in two parts.		
(i)	Part I + $K4[Fe(CN)_6]$ solution	Bluish white ppt is obtained	Zn^{2+} confirmed
(ii)	Part II + NaOH solution drop by drop	White ppt is formed which is soluble in excess of NaOH	Zn^{2+} confirmed
8	Dry test : Perform charcoal cavity test with cobalt nitrate.	Green residue is left.	Zn^{2+} confirmed

Result : - The given mixture contains acetate (CH_3COO^-) and Zinc (Zn^{2+}) in it.

Experiment No. 17

Exercise : Analyse the given salt for one acid and one basic radical by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Tests for acid radicals**		
2	Salt + dil H_2SO_4 and heat. Salt + conc. H_2SO_4 & heat. Bring a glass red dipped in NH_4OH near the mouth of the test tube.	No reaction Colourless pungent smelling gas evolved. White fumes formed.	Dilute acid group is absent. Conc. Acid group is present. May be Cl^- Cl^-confirmed.
3	**Confirmatory test –** Chromyl Chloride Test Salt + solid $K_2Cr_2O_7$ + conc. H_2SO_4 in a dry test tube and heat. Pass the red coloured gas in NaOH solution. To the yellow solution add CH_3COOH and $(CH_3COO)_2$ pb solution.	Dark red pungent smelling gas is evolved. Solution boomes yellow. A yellow ppt is formed.	Cl^-confirmed. Cl^-confirmed.
4	Silver Nitrate Test : Sodium Carbonate extract + dil. HNO_3 + $AgNO_3$ solution. Add excess of NH_4OH in the ppt.	A white ppt is formed. The ppt is soluble.	Cl^-confirmed. Cl^-confirmed.
	Test for Basic Radical		
1.	Salt + NaOH solution & Heat.	No smell of ammonia.	Zero group absent.
2	Original solution + dil. HCl	No ppt .	I group absent.
3	Pass H_2S gas into the above solution.	No ppt.	II group absent.
4	Boil the above solution to remove H_2S gas completely. Test it by a piece of filter paper moistened with $(CH_3COO)_2$ Pb.	Filter paper does not turn black.	H_2S is removed completely.
5	Now boil the above solution with 2 drops of conc. HNO_3 add solid NH_4Cl and then NH_4OH in excess after cooling.	No ppt	III group absent.
6	Pass H_2S gas in the above solution.	No ppt	IV group absent.
7	Boil off H_2S from the above solution and concentrate it. Now add excess of NH_4OH and saturated solution of $(NH_4)_2CO_3$.	A white ppt is obtained.	V group present. May be Ba^{2+}, Sr^{2+} and Ca^{2+}.
8	Dissolve the white ppt in hot CH_3COOH and divide it in to three parts.		
(i)	To part I add $K_2C_rO_4$ solution. Dry test – Perform flame test.	A yellow ppt is obtained Apple green flame.	Ba^{2+} confirmed. Ba^{2+} confirmed.

Result - The Given mixture contains chloride Cl^- and Barium Ba^{+2} radical.

Experiment No. 18

Exercise : Analyse the given salt for one acid and one basic radical by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Tests for acid radicals** Salt + dil H_2SO_4 and heat.	No reaction	Dilute acid group is absent.
2	Salt + conc. H_2SO_4 & heat. Bring a glass red dipped in NH_4OH near the mouth of the test tube.	Colourless pungent smelling gas evolved. White fumes formed.	Conc. Acid group is present. May be Cl^- Cl^- is confirmed.
3	**Confirmatory test –** Chromyl Chloride Test Salt + solid $K_2Cr_2O_7$ + conc. H_2SO_4 in a dry test tube and heat. Pass the red coloured gas in NaOH solution. To the yellow solution add CH_3COOH and $(CH_3COO)_2$ pb solution.	Dark red pungent smelling gas is evolved. Solution boomes yellow. A yellow ppt is formed.	Cl^- confirmed. Cl^- confirmed
4	Silver Nitrate Test : Sodium Carbonate extract + dil. HNO_3 + $AgNO_3$ solution. Add excess of NH_4OH in the ppt.	A white ppt is formed The ppt is soluble.	Cl confirmed Cl^- confirmed.
	Test for Basic Radical		
1.	Salt + NaOH solution & Heat.	No smell of ammonia.	Zero group absent.
2	Original solution + dil. HCl	No ppt .	I group absent.
3	Pass H_2S gas into the above solution.	No ppt.	II group absent.
4	Boil the above solution to remove H_2S gas completely. Test it by a piece of filter paper moistened with $(CH_3COO)_2$ Pb.	Filter paper does not turn black.	H_2S is removed completely.
5	Now boil the above solution with 2 drops of conc. HNO_3 add solid NH_4Cl and then NH_4OH in excess after cooling.	No ppt	III group absent.
6	Pass H_2S gas in the above solution.	No ppt	IV group absent.
7	Boil off H_2S from the above solution and concentrate it. Now add excess of NH_4OH and saturated solution of $(NH_4)_2CO_3$. Dissolve the white ppt in hot CH_3COOH and divide it in to three parts.	A white ppt is obtained.	V group present may be Ba^{2+}, Sr^{2+} or Ca^{2+}.
8	To part I add K_2CrO4 solution.	No ppt	Ba^{2+} absent.
(i)	To Part II add $(NH_4)_2SO_4$ solution	A white ppt is obtained.	Sr^{2+} confirmed.
(ii)	Dry test – Perform flame test with the salt or the ppt.	Consistent crimson red flame	Sr^{2+} confirmed.

Result : - Chloride (Cl^-) and strontium (Sr^{2+}) radicals are present in the given salt.

Experiment No. 19

Exercise : Analyze the given mixture for one acid and one basic radical by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
	Test for acid radical		
1	Salt + dil H_2SO_4 and heat.	Brisk effervesce with evolution of colourless and pungent smell like burning sulpher gas.	Dilute acid group is present may be SO_3^{2-}
2	Pass the above gas in lime water.	Lime water turn milky.	SO_3^{2-} confirmed.
3	Pass more of the gas in milky solution.	Milkyness disappeares.	SO_3^{2-} confirmed.
4	Bring acidity $K_2Cr_2O_7$ clipped filter paper on the mouth of the test tube.	Filter paper turn into green.	SO_3^{2-} confirmed.
	Test for Basic Radical		
1.	Salt + NaOH solution & Heat.	No smell of NH_3	Zero group absent.
2	Original solution + dil. HCl	No ppt.	I group absent.
3	Pass H_2S gas into the above solution.	No ppt.	II group absent.
4	Boil the above solution to remove H_2S gas completely. Test it by a piece of filter paper moistened with $(CH_3COO)_2$ Pb.	Filter paper does not turn black.	H_2S is removed completely.
5	Now boil the above solution with 2 drops of conc. HNO_3 add solid NH_4Cl and then NH_4OH in excess after cooling.	No ppt	III group absent.
6	Pass H_2S gas in the above solution.	No ppt	IV group absent.
7	Boil off H_2S from the above solution and concentrate it. Now add excess of NH_4OH and saturated solution of $(NH_4)_2CO_3$.	A white ppt is obtained.	V group present. May be Ba^{2+}, Sr^{2+} & Ca^{2+}
8	Dissolve the white ppt in hot CH_3COOH and divide it in to three parts.		
(i)	To part I + $KrCro_4$ solution.	No ppt.	Ba^{2+} absent.
(ii)	To Part II + (NH_4) So_4 solution.	No ppt.	Sr^{2+} absent.
(iii)	To Part III + (NH4)2C2O4 solution.	White ppt.	Ca^{2+} confirmed.
9.	Dry Test – Perform flame test.	Brick red flame.	Ca^{2+} confirmed.

Result : - The given mixture contains Sulphite (SO_3^{2-}) and calcium (Ca^{2+}) radicals.

Experiment No. 20

Exercise : Analyse the given salt for one acid and one basic radical by dry and wet tests.

S.N	EXPERIMENT	OBSERVATION	INFERENCE
1	**Tests for acid radicals** Salt + dil H_2SO_4 and heat.	Brick effervesence with the evolution of colour less and odourless gas.	Dilute acid group is present. May be Co_3^{2-}
2	**Confirmatory test –** Pass the evolved gas in lime water.	Lime water turns milky.	CO_3^{2-} Confirmed.
3	Pass more of the gas in milky solution.	Milkyness disappears.	CO_3^{2-} Confirmed.
	Test for Basic Radical		
1.	Salt + NaOH solution & Heat.	No smell of NH_3	Zero group absent.
2	Original solution + dil. HCl	No ppt .	I group absent.
3	Pass H_2S gas into the above solution.	No ppt	II group absent.
4	Boil the above solution to remove H_2S gas completely. Test it by a piece of filter paper moistened with $(CH_3COO)_2$ Pb.	Filter paper does not turn black.	H_2S is removed completely.
5	Now boil the above solution with 2 drops of conc. HNO_3 add solid NH_4Cl and then NH_4OH in excess after cooling.	No ppt	III group absent.
6	Pass H_2S gas in the above solution.	No ppt	IV group is absent.
7	Boil off H_2S from the above solution and concentrate it now add excess of NH_4OH and $(NH_4)_2 CO_3$	No ppt	V group absent.
8	To the solution obtained above add disodium hydrogen phosphate. (Na_2HPO_4)	White ppt is formed. Which is soluble in dil. HCl	VI group present may be Mg^{2+}
9	Solution of white ppt in dil. HCl + NaOH + Titan yellow.	Pinkish red ppt is obtained.	Mg^{2+} confirmed.
	Dry test – Perform charcoal cavity test with Cobalt Nitrate.	Pink residue is left in the cavity.	Mg^{2+} confirmed.

Result : - The given salt contains carbonate (CO_3^{2-}) and Magnesium (Mg^{2+}) radicals in it.