No	Experiment	Observation	Inference
1	**Odour**: Note the odour of the organic compound.	Fish odour	May be an amine
		Bitter almond odour	May be benzaldehyde
		Phenolic odour	May be phenol
		No characteristics odour	Absence of phenol, amine, benzaldehyde
2	**Test with litmus paper:** Touch the moist litmus paper with an organic compound.	**Blue** litmus turns **red**	May be a carboxylic acid or phenol
		Red litmus turns **blue**	May be an amine.
		No colour change is noted	Absence of carboxylic acid, phenol and amine
3	**Action with $NaHCO_3$:** Organic compound + $NaHCO_3$ solution	Brisk effervescence	Presence of a carboxylic acid.
		No brisk effervescence	Absence of a carboxylic acid.
4	**Action with Borsche's reagent:** Organic compound + Borsche's reagent + conc.HCl + warm, cool.	**Red** precipitate is obtained	Presence of an aldehyde or ketone
		No characteristic precipitate	Absence of an aldehyde or ketone
5	**Charring test:** Organic compound + Conc. H_2SO_4 to it, and heat the mixture.	Charring takes place with smell of burnt sugar	Presence of carbohydrate
		No charring takes place with smell of burnt sugar	Absence of carbohydrate
6	**Ignition test:** Organic compound in a Nickel spatula and burn it in Bunsen flame.	Burns with sooty flame	Presence of an aromatic compound.
		Burns with non-sooty flame	Presence of an aliphatic compound
7	**Test with bromine water:** Organic compound + distilled water + bromine water.	**Orange-yellow** colour of bromine water is decolourised.	Substance is unsaturated.
		No decolourisation takes place	Substance is saturated.
		Decolourisation with formation of white precipitate.	Presence of an aromatic amine or phenol
8	**Test with $KMnO_4$ Solution:** organic compound +distilled water + dilute alkaline $KMnO_4$ solution	**Pink colour** of $KMnO_4$ solution is decolourised.	Substance is unsaturated
		No decolourisation takes place	Substance is saturated
	Test for selected organic functional groups		
	Test for phenol		
9	**Neutral $FeCl_3$ test:** Organic compound + neutral $FeCl_3$	**Violet** colouration is seen.	Presence of phenol
	Test for carboxylic acids		
10	**Esterification reaction:** Organic compound + C_2H_5OH + conc. H_2SO_4 then heat 5	A pleasant fruity odour	Presence of carboxylic group.

	minutes. Then pour the mixture into dil. Na_2CO_3		
	Test for aldehydes		
11	**Tollen's reagent test:** Tollen's reagent + organic compound, warm the mixture on a water bath for about 5 minutes.	**Shining silver** mirror is formed.	Presence of an aldehyde
12	**Fehling's test:** Fehling's solution A and B + organic compound, warm the mixture on a water bath for about 5 minutes.	**Red precipitate is formed.**	Presence of an aldehyde.
	Test for ketones		
13	**Legal's test:** Organic compound + sodium nitro prusside + NaOH	**Red** colouration.	Presence of a ketone
	Test for an amine		
14	**Dye test:** Organic compound + HCl + $NaNO_2$ cool the mixture in ice bath + ice cold solution of β-naphthalin NaOH	**Scarlet red** dye is	Presence of an aromatic primary amine
	Test for diamide		
15	**Biuret test:** Organic compound heat and cool + water + dil $CuSO_4$ solution+ 10% NaOH.	**Violet colour** is appeared.	Presence of a diamide
	Test for carbohydrates		
16	**Molisch's test:** Organic compound + water + α- naphthol + conc. H_2SO_4	**Violet or purple** ring is formed at the junction of the two liquids.	Presence of carbohydrates.
17	**Osazone test:** Organic compound+ phenyl hydrazine warm the mixture on a water bath for about 5 minutes.	Yellow crystals are obtained	Presence of carbohydrates.

REPORT: The given organic compound contains

i)Aromatic/Aliphatic **ii) Saturated/ Unsaturated** **iii)----------functional group**

1. Benzaldehyde **C_6H_5CHO** Aromatic /saturated/aldehyde
2. Cinnamaldehyde C_6H_5 CH=CHCHO Aromatic/ Unsaturated/aldehyde
3. Acetophenone **$C_6H_5COCH_3$** Aromatic/saturated/ketone
4. Benzoic acid **C_6H_5COOH** Aromatic/saturated/ carboxylic acid
5. Cinnamic acid **C_6H_5 CH=CHCOOH** Aromatic/ Unsaturated/ carboxylic acid
6. Urea H_2NCONH_2 Aliphatic /saturated/ diamide
7. Glucose **$C_6H_{12}O_6$** Aliphatic /saturated/ aldehyde & carbohydrate
8. Aniline **$C_6H_5NH_2$** Aromatic/saturated/ amine
9. Salicylic acid C_6H_4OH COOH Aromatic/saturated/ carboxylic acid & phenol

***LIQUID** – Benzaldehyde, cinnamaldehyde(yellow), acetophenone(colourless), aniline(rosy yellow)*

1. Estimation of Ferrous sulphate

Aim: To Estimate the amount of **ferrous sulphate** dissolved in **750 ml of** the given unknown solution volumetrically. For this you are given with a **standard solution of ferrous ammonium sulphate** (FAS) of normality **0.1102N** and **potassium permanganate solution as link** solution.

Short procedure

S.N	Contents	Titration-I	Titration-II
1	Burette solution	$KMnO_4$	$KMnO_4$
2	Pipette solution	20ml of std FAS	20ml of unknown $FeSO_4$
3	Acid to be added	20 ml of 2N H_2SO_4	20 ml of 2N H_2SO_4
4	Indicator	Self-indicator ($KMnO_4$)	Self-indicator ($KMnO_4$)
5	Temperature	Lab temperature	Lab temperature
6	End point	Appearance of permanent pale pink colour	Appearance of permanent pale pink colour
7	Equivalent mass of $FeSO_4$ = 278		

Titration -I

Link $KMnO_4$ Vs std FAS **Indicator :** Self indicator ($KMnO_4$)

S.NO	Volume of *Std FAS* (ml)	Burette reading		Volume of $KMnO_4$ (ml)	Concordant value (ml)
		Initial (ml)	Final (ml)		
1	20 ml	0			
2	20 ml	0			

Calculation:

Volume of $KMnO_4$ solution V_1= ml
Normality of $KMnO_4$ solution N_1= N_1
Volume of FAS solution V_2= 20 ml
Normality of FAS solution N_2= 0.1102N

According normality equation: $V_1N_1=V_2N_2$

$N_1=V_2N_2/V_1$

Titration –II

Link $KMnO_4$ Vs Unknown $FeSO_4$ **Indicator :** Self indicator ($KMnO_4$)

S.NO	Volume of $FeSO_4$ (ml)	Burette reading		Volume of $KMnO_4$ (ml)	Concordant value (ml)
		Initial (ml)	Final (ml)		
1	20	0			
2	20	0			

Calculation:

Volume of $FeSO_4$ V_1= 20 ml
Normality of $FeSO_4$ N_1= N_1
Volume of $KMnO_4$ V_2= ml
Normality of $KMnO_4$ N_2= N

According normality equation: $V_1N_1=V_2N_2$

$N_1=V_2N_2/V_1$

Amount of $FeSO_4$ present in 750ml of the given solution = Equivalent mass x Normality x 750/1000

Result:

i) Normality of $KMnO_4$ = N

ii) Normality of $FeSO_4$ = N

iii) Amount of $FeSO_4$ present in 750ml of the given solution= g.

1. Estimate the amount of **Ferrous sulphate** dissolved in **750 ml** of the given unknown solution volumetrically. For this you are given with a standard solution of **Ferrous ammonium sulphate (FAS)** of normality **0.1102N** and **Potassium permanganate ($KMnO_4$)** solution as a link solution.
2. Estimate the amount of **Ferrous ammonium sulphate** (FAS) dissolved in 1500 ml of the given unknown solution volumetrically. For this you are given with a standard solution of Ferrous sulphate of normality **0.1024N** and **Potassium permanganate ($KMnO_4$)** solution as a link solution.
3. Estimate the amount of **oxalic acid** dissolved in 500 ml of the given unknown solution volumetrically. For this you are given with a standard solution of **Ferrous Ammonium sulphate (FAS)** of normality **0.1N** and **Potassium permanganate ($KMnO_4$)** solution as a link solution.
4. To estimate the amount of **Sodium hydroxide** dissolved in **250ml** of the given unknown solution volumetrically. For this you are given with a **standard solution of sodium carbonate** normality **0.0948 N** and **hydrochloric acid as link solution**.
5. To estimate the amount of **Oxalic acid** dissolved in **1250 ml** of the given unknown solution volumetrically. For this you are given with a **standard solution of HCl** solution of normality **0.1010N** and **sodium hydroxide solution as link** solution.

Experiment	Titration-I	Titration-II	Equivalent weight
1. Estimation of $FeSO_4$	**V_1N_1 $KMnO_4$** **V_2N_2 FAS**	**V_1N_1 $FeSO_4$** **V_2N_2 $KMnO_4$**	**Ferrous sulphate =278**
2. Estimation of FAS	**V_1N_1 $KMnO_4$** **V_2N_2 $FeSO_4$**	**V_1N_1 FAS** **V_2N_2 $KMnO_4$**	**FAS =392**
3. Estimation of $H_2C_2O_4$	**V_1N_1 $KMnO_4$** **V_2N_2 FAS**	**V_1N_1Oxalic acid ($H_2C_2O_4$)** **V_2N_2 $KMnO_4$**	**Oxalic acid =63**
4. Estimation of NaOH	**V_1N_1 HCl** **V_2N_2 Na_2CO_3**	**V_1N_1 NaOH** **V_2N_2 HCl**	**Sodium hydroxide=40**
5. Estimation of $H_2C_2O_4$	**V_1N_1 NaOH** **V_2N_2 HCl**	**V_1N_1 Oxalic acid ($H_2C_2O_4$)** **V_2N_2 NaOH**	**Oxalic acid =63**

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CALCULATIONS

Estimation of Ferrous sulphate

Aim: To Estimate the amount of **ferrous sulphate** dissolved in **750 ml of** the given unknown solution volumetrically. For this you are given with a **standard solution of ferrous ammonium sulphate** (FAS) of normality **0.1102N** and **potassium permanganate solution as link** solution.

Short procedure

S.N	Contents	Titration-I	Titration-II
1	Burette solution	$KMnO_4$	$KMnO_4$
2	Pipette solution	20ml of std FAS	20ml of unknown $FeSO_4$
3	Acid to be added	20 ml of 2N H_2SO_4	20 ml of 2N H_2SO_4
4	Indicator	Self-indicator ($KMnO_4$)	Self-indicator ($KMnO_4$)
5	Temperature	Lab temperature	Lab temperature
6	End point	Appearance of permanent pale pink colour	Appearance of permanent pale pink colour
7	Equivalent weight of $FeSO_4$ = 278		

Titration –I

Link $KMnO_4$ Vs std FAS **Indicator :** Self indicator ($KMnO_4$)

S.NO	Volume of *Std FAS* (ml)	Burette reading		Volume of $KMnO_4$ (ml)	Concordant value (ml)
		Initial (ml)	Final (ml)		
1	20 ml	0	19.4	19.4	
2	20 ml	0	19.2	19.2	19.2
3	20 ml	0	19.2	19.2	

Calculation:

Volume of $KMnO_4$ solution V_1= 19.2ml
Normality of $KMnO_4$ solution N_1= N_1
Volume of FAS solution V_2= 20 ml
Normality of FAS solution N_2= 0.1102N

According normality equation: $V_1N_1=V_2N_2$

$$N_1=\frac{V2N2}{V1}$$

$$N_1=\frac{20X0.1102}{19.2}$$

$$N_1=0.1148N$$

Normality of $KMnO_4$ solution N_1= 0.1148 N

Titration –II

Link $KMnO_4$ Vs Unknown $FeSO_4$ **Indicator :** Self indicator ($KMnO_4$)

S.NO	Volume of $FeSO_4$ ml	Burette reading		Volume of $KMnO_4$ ml	Concordant value ml
		Initial ml	Final ml		
1	20 ml	0	21.5	21.5	
2	20 ml	0	21.2	21.2	21.2
3	20 ml	0	21.2	21.2	

Calculation:

Volume of $FeSO_4$ V_1= 20ml

Normality of $FeSO_4$ N_1= N_1

Volume of $KMnO_4$ V_2= 21.2 ml

Normality of $KMnO_4$ N_2= 0.1148N

According normality equation: $\mathbf{V_1N_1=V_2N_2}$

$$N_1 = \frac{V2N2}{V1}$$

$$N_1 = \frac{21.2X0.1148}{20}$$

$$N_1 = 0.1217N$$

Weight calculation:

The Amount of $FeSO_4$ present in 750ml of the given solution= $\frac{Equivalent\ mass\ x\ Normality\ x\ 750}{1000}$

$= \frac{278x\ 0.1217x\ 750}{1000}$

=25.37g.

Result:

Normality of $KMnO_4$ = 0.1148 N

Normality of $FeSO_4$ = 0.1217 N

Amount of $FeSO_4$ present in 750ml of the given solution= 25.37 g.

2. Estimation of Ferrous Ammonium sulphate (FAS)

Aim: To Estimate the amount of **ferrous Ammonium sulphate** dissolved in **1500 ml of** the given unknown solution volumetrically. For this you are given with a **standard solution of ferrous sulphate** ($FeSO_4$) of normality **0.1024N** and **potassium permanganate solution as link** solution.

Short procedure (3mark)

S.N	Contents	Titration-I	Titration-II
1	Burette solution	$KMnO_4$	$KMnO_4$
2	Pipette solution	20ml of std $FeSO_4$	20ml of unknown FAS
3	Acid to be added	20 ml of 2N H_2SO_4	20 ml of 2N H_2SO_4
4	Indicator	Self-indicator ($KMnO_4$)	Self-indicator ($KMnO_4$)
5	Temperature	Lab temperature	Lab temperature
6	End point	Appearance of permanent pale pink colour	Appearance of permanent pale pink colour
7	Equivalent weight of FAS = 392		

Titration –I

Link $KMnO_4$ Vs std $FeSO_4$ **Indicator :** Self indicator ($KMnO_4$)

S.NO	Volume of *Std $FeSO_4$* (ml)	Burette reading		Volume of $KMnO_4$ (ml)	Concordant value (ml)
		Initial (ml)	Final (ml)		
1	20 ml	0	19.4	19.4	
2	20 ml	0	19.2	19.2	19.2
3	20 ml	0	19.2	19.2	

Calculation:

Volume of $KMnO_4$ solution V_1= 19.2ml
Normality of $KMnO_4$ solution N_1= N_1
Volume of ***$FeSO_4$*** solution V_2= 20 ml
Normality of ***$FeSO_4$*** solution N_2= 0.1024N

According normality equation: $\mathbf{V_1N_1=V_2N_2}$

$$N_1 = \frac{V2N2}{V1}$$

$$N_1 = \frac{20X0.1024}{19.2}$$

$$N_1 = 0.1067N$$

Normality of $KMnO_4$ solution N_1= 0.1067N

Titration –II

Link $KMnO_4$ Vs Unknown FAS **Indicator :** Self indicator ($KMnO_4$)

S.NO	Volume of FAS ml	Burette reading		Volume of $KMnO_4$ ml	Concordant value ml
		Initial ml	Final ml		
1	20 ml	0	21.5	21.5	
2	20 ml	0	21.2	21.2	21.2
3	20 ml	0	21.2	21.2	

Calculation:

Volume of FAS V_1= 20ml

Normality of FAS N_1= N_1

Volume of $KMnO_4$ V_2= 21.2 ml

Normality of $KMnO_4$ N_2= 0.1067N

According normality equation: $\mathbf{V_1N_1=V_2N_2}$

$$N_1 = \frac{V2N2}{V1}$$

$$N_1 = \frac{21.2X0.1067}{20}$$

$$N_1 = 0.1131N$$

Weight calculation:

The Amount of FAS present in 1500ml of the given solution $= \frac{Equivalent\ mass\ x\ Normality\ x\ 1500}{1000}$

$= \frac{392x\ 0.1131x\ 1500}{1000}$

=66.50g.

Result:

Normality of $KMnO_4$ = 0.1067 N

Normality of FAS = 0.1131 N

Amount of FAS present in 1500ml of the given solution= 66.50g.

3. Estimation of Oxalic acid

Aim: To Estimate the amount of **Oxalic acid** dissolved in **1250ml of** the given unknown solution volumetrically. For this you are given with a **standard solution of HCl** of normality **0.1010N** and **potassium permanganate solution as link** solution.

Short procedure (3mark)

S.N	Contents	Titration-I	Titration-II
1	Burette solution	HCl(standard solution)	Oxalic acid(Unknown Solution)
2	Pipette solution	20ml of NaOH link Solution	20ml of NaOH link Solution
3	Temperature	Lab temperature	Lab temperature
4	Indicator	Phenolphthalein	Phenolphthalein
5	End point	Disappearance of pink colour	Disappearance pink colour
6	Equivalent weight of Oxalic Acid= 63		

Titration –I

Standard HCl Vs Link NaOH **Indicator :** Phenolphthalein

S.NO	Volume of *NaOH* (ml)	Burette reading		Volume of HCl (ml)	Concordant value (ml)
		Initial (ml)	Final (ml)		
1	20 ml	0	19.4	19.4	
2	20 ml	0	19.2	19.2	19.2
3	20 ml	0	19.2	19.2	

Calculation:

Volume of NaOH (link) solution V_1= 20ml

Normality NaOH (link) solution N_1= N_1

Volume of standard HCl solution V_2= 19.2 ml

Normality of standard HClsolution N_2= 0.1010N

According normality equation: $V_1N_1=V_2N_2$

$$N_1 = \frac{V2N2}{V1}$$

$$N_1 = \frac{19.2X0.1010}{20}$$

$$N_1 = 0.0969N$$

Normality of HCl solution N_1= 0.0969 N

Titration –II

Link NaOH Vs Unknown Oxalic acid solution **Indicator :** Phenolphthalein

S.NO	Volume of NaOH link (ml)	Burette reading		Volume of Oxalic acid ml	Concordant value ml
		Initial (ml)	Final (ml)		
1	20 ml	0	21.5	21.5	
2	20 ml	0	21.2	21.2	21.2
3	20 ml	0	21.2	21.2	

Calculation:

Volume of Unknown oxalic acid solution V_1= 21.2ml

Normality of Unknown oxalic acid solution N_1= N_1

Volume of NaOH solution V_2= 20ml

Normality of NaOH Solution N_2= 0.0969N

According normality equation: $\mathbf{V_1N_1=V_2N_2}$

$$N_1 = \frac{V2N2}{V1}$$

$$N_1 = \frac{20X0.0969}{21.2}$$

$$N_1 = 0.0914N$$

Weight calculation:

The Amount of Oxalic acid present in 1250ml of the given solution

$$= \frac{Equivalent\ mass\ x\ Normality\ x\ 1250}{1000}$$

$$= \frac{63x\ 0.0914x\ 1250}{1000}$$

=7.19g.

Result:

Normality of NaOH = 0.0969 N

Normality of Oxalic acid = 0.0914 N

Amount of OXALIC ACID present in 1500ml of the given solution= 7.19g.