ORGANIC ANALYSIS

	Experiment	**Observation**	**Inference**
1.	Colour of the substance	Yellow	May be Nitro compound
2.	Odour of the substance	(i)Fruity Odour (ii)Fishy Odour (iii)Phenolic Odour (iv)Pleasant smell	May be (i) carbonyl compound (ii) Amine (iii) Phenol (iv) Nitro compound
3.	**Solubility Test** (a) Substance + water	Soluble	May be Carbohydrate or Diamide.
	(b) (If the substance is not soluble in water), substance is added with saturated $NaHCO_3$ solution	Soluble with brisk effervescence	May be Carboxylic acid
	(c) (If the substance is not soluble in $NaHCO_3$), substance is added with NaOH solution	Soluble	May be Carboxylic acid or Phenol
	(d) (If the substance is not soluble in NaOH), add substance with dil. HCl	Soluble	May be Amine
	(e) Substance is dissolved in all the above 4 solvents separately.	Insoluble in all solvents	May be Nitro compound, Aromatic amide, Anilide or Carbonyl compound
4.	**Test for Aliphatic / Aromatic Compound - Ignition Test** A small quantity of the substance is heated on a nickel spatula	Burns with a sooty flame	Presence of Aromatic compound
		No sooty flame	Presence of Aliphatic compound
	Nitration Test To 1ml of conc.HNO_3 in a dry test tube, 2ml of conc. H_2SO_4 is added slowly while cooling the tube under the tap. This mixture is added to small amount of the substance and warmed in a water bath. Then it is poured into a beaker containing excess of water.	Yellow precipitate (or) yellow colouration	Presence of Aromatic compound
		No yellow precipitate (or) colouration	Presence of Aliphatic compound
5.	**Detection of Elements :** **(i) Lassaigne's Test : (If the substance does not dissolve in water)** **Preparation of sodium fusion extract :** A small bit of metallic Sodium is taken and melted in a fusion tube by gentle warming. To the molten sodium, a small quantity of the substance is added and heated. Gradually, it is heated to red hot condition and then plunged into 10 ml of distilled water in a china dish. It is boiled, cooled and filtered. The filtrate is used for the detection of elements. **(ii) Use of Zinc dust and Sodium Carbonate: (If the substance dissolves in water)** Organic sample(about 50 mg) is thoroughly mixed with an intimate mixture of Zn dust (200 mg) and Na_2CO_3 (300 mg) powder in a fusion tube, heated first gently and then strongly in the flame till it		

	becomes red hot and kept at red hot condition for two minutes. The bottom part of the fusion tube is plunged into 5 ml of distilled water, mixed well and filtered.		
	(a)Test for Nitrogen To 2ml of the extract, 1ml of freshly prepared $FeSO_4$ solution is added. Then dil.H_2SO_4 is added and shaken well	Bluish green solution or precipitate	Presence of Nitrogen
		No bluish green solution or precipitate	Absence of Nitrogen
	Test for Halogens 2ml of the extract is boiled with dil. HNO_3 and cooled. Then $AgNO_3$ solution is added.	Curdy white precipitate, soluble in NH_4OH	Presence of Chloride ion
		Pale yellow precipitate, sparingly soluble in NH_4OH	Presence of Bromide ion
		Yellow precipitate, insoluble in NH_4OH	Presence of Iodide
		No characteristic Change	Absence of Halogens
	Test for sulphur To 1ml of the extract, freshly prepared Sodium nitroprusside solution is added	Pink colouration	Presence of Sulphur
		No pink colouration	Absence of Sulphur
6.	**Test for Saturation / Unsaturation** A small quantity of the substance is suspended in water and bromine water is added in drops	(i) Yellow colour is not decolourised	Presence of saturated compound
		(ii) Yellow colour is decolourised and a colourless precipitate is formed.	Presence of saturated and easily brominable compounds, like phenol, amine, anilide.
		(iii) Yellow colour is decolourised	Presence of unsaturated compound
	Tests for functional group - For compounds having N**o nitrogen**		
7.	**Test for Carboxylic Acid** A small quantity of the substance is dissolved in water and a pinch of $NaHCO_3$ is added	Brisk effervescence	Presence of Carboxylic acid
		No Brisk effervescence	Absence of Carboxylic acid
	Test for Phenol A small amount of the substance is treated with water and then neutral $FeCl_3$ is added in drops	Violet or green colouration	Presence of Phenol
		No Violet or green colocarbonuration	Absence of Phenol

	Test for Carbonyl compound i) A small amount of semicarbazide hydrochloride is dissolved in 5ml of water and about 0.5g of sodium acetate is added. To this a small amount of the substance dissolved in alcohol is added. The tube is gently heated and then cooled.	White precipitate	Presence of Carbonyl compound
		No White precipitate	Absence of Carbonyl compound
	ii) To a small quantity of the substance, 1ml of Schiffs reagent is added	Pink colouration	Presence of Aldehyde
		No Pink colouration	Presence of Ketone
	Test for Ester To a small amount of the substance, NaOH is added and heated	White precipitate	Presence of Ester
		No White precipitate	Absence of Ester
	Test for Carbohydrate **Molisch's Test:** A small quantity of α-naphthol is added to alcohol in a test tube. To this, substance dissolved in water is added. Then conc.H_2SO_4 is added along the sides of the tube	Violet ring is formed	Presence of Carbohydrate
		No Violet ring	Absence of Carbohydrate
	Tests for functional group **-** For compounds **containing nitrogen**		
8.	a) **Test for Amine** A small amount of the substance is shaken with dil. HCl	The substance readily dissolves and on adding 10% NaOH the substance is regenerated.	Presence of Amine
		No characteristic change	Absence of Amine
	b) **Test for Nitro compound** A small quantity of the given Substance is dissolved in alcohol. To this Zn dust and NH_4Cl are added and boiled. The solution is cooled and filtered. The filtrate is mixed with Tollen's reagent and heated in a water bath	Bright silver mirror or Black precipitate	Presence of Nitro compound
		No silver mirror or Black precipitate	Absence of Nitro compound
	c) **Test for Amide** A small amount of the substance is added to about 2ml of NaOH, shaken well and heated to boiling	Ammonia is evolved on continued boiling	Presence of Amide
		No Ammonia gas	Absence of Amide
	d) **Test for Anilide** A small amount of the substance is mixed with dil. HCl and heated gently	Oily globules appear	Presence of Anilide
		No Oily globules	Absence of Anilide
	CONFIRMATORY TESTS FOR FUNCTIONAL GROUPS		

9.	**Confirmatory tests for Carboxylic Acids** **a) Ester formation** Substance is mixed with the 1ml of alcohol and a few drops of con.H_2SO_4 and gently warmed. It is then poured into 30 ml of dil. Na_2CO_3 solution.	Pleasant fruity smelling ester is formed	Presence of Carboxylic Acid
		No fruity Smell	Absence of Carboxylic Acid
	b) Phthalein Fusion Test (For Dicarboxylic Acid) The substance is mixed with an equal amount of resorcinol and a few drops of conc. H_2SO_4 in a dry test tube and heated. It is then poured into a dilute solution of NaOH	Greenish yellow fluorescein	Presence of Dicarboxylic acid
		No greenish yellow fluorescein	Presence of Mono carboxylic acid
	c) **Derivative for Carboxylic acid:** **(i) Anilide derivative:** 1 g substance is mixed with 8 ml aniline in boiling test tube along with porcelain bit. Fitted with air condenser and heated for 30 minutes in a sand bath. Hot mixture is poured into 50 ml dil. HCl and stirred well. Mixture is allowed to cool for 10 – 15 min. White precipitate (anilide) separated out is filtered, washed with cold water and recrystallised from hot ethanol.		
	(ii) Nitro derivative: Unsaturated acid (like cinnamic acid) can be nitrated using fuming nitric acid slowly with constant stirring in dry test tube. The mixture is kept aside for 10-15 minutes and poured into 50 ml distilled water in beaker. Yellow crystals separated out is filtered at pump, washed with water and recrystallised from ethanol.		
	(iii) Bromo derivative: For aromatic acid (like salicyclic acid and cinnamic acid) bromo derivatives can be prepared. About 1 g substance is mixed with 5 ml Br_2 in glacial acetic acid slowly, with constant stirring, till yellow colour develops. The mixture is shaken well for 10-15 min. and poured into 50 ml water with stirring. Yellow crystals are filtered, washed with water, recrystallised from dil. ethanol.		
10.	**Confirmatory tests for Phenols** **a) Phthalein Fusion Test** The substance is mixed with an equal amount of phthalic anhydride. To this 2 drops of conc. H_2SO_4 is added, gently heated and cooled. This is poured into excess of 10% NaOH solution	Red or blue Colouration	Presence of Monohydric phenol
		Green fluorescein	Presence of Dihydric phenol
	b) Libermann's Test To a few crystals of $NaNO_2$ in a dry test tube, the substance and 2 drops of sulphuric acid are added. It is then gently heated, cooled and poured into a beaker containing excess of dil. NaOH	Deep blue or green colouration, which on dilution becomes red. On adding excess of dil. NaOH, blue or green colouration reappears	Presence of Phenol
	c) Derivative for Phenols: **(i) Benzoyl Derivative:** About 0.5 g of the substance is dissolved in 5 ml of dil. NaOH in a boiling tube and 1ml of benzoyl chloride is added. The test tube is tightly corked and shaken well for some time. White precipitate is formed.		
	(ii) Bromo Derivative: Dissolved 1g of the substance in 3ml of glacial acetic acid. Added 1ml of Bromine in acetic acid. Shaken well and poured into 10ml of water. Pale yellow precipitate is formed.		
11.	**Confirmatory tests for Carbonyl compounds**		

	a) For Aldehyde The substance is mixed with 5 ml of alkaline $KMnO_4$ and heated. This solution is decolourised using sodium bisulphate solution and cooled. To this, excess of dil. HCl is added	White precipitate	Presence of aldehyde
	b) Tollen's Test Substance is mixed with 2ml of Tollen's reagent and heated in a water bath	Black precipitate	Presence of aldehyde
	c) For Ketones **(i) Iodoform test** Substance is mixed with dil. NaOH and 2 ml of Iodine solution is slowly added and warmed	Pale yellow precipitate	Presence of Methyl ketone
	(ii) To the substance, freshly prepared solution of sodium nitroprusside is added. To this, excess of dil. NaOH is added	Red colouration	Presence of Ketone
	iii) Legal's test: (for ketones only) A small amount of substance is dissolved in water and added 5 drops of sodium nitro prusside, NaOH and glacial acetic acid	Orange colour changes to purple	Presence of ketone.
	d) Derivative for carbonyl compound (Phenyl hydrazone derivative) Phenyl hydrazine is dissolved in glacial acetic acid. To this, a small amount of the substance is mixed, heated and then excess of water is added. Yellow precipitate is formed.		
12.	**Confirmatory tests for Ester** **a) Hydroxamic Acid Test** To a small amount of the liquid, added a pinch of hydroxylamine hydrochloride and 5ml of 10% of NaOH, boiled and cooled. Then added conc. HCl in drops and a few drops of $FeCl_3$ solution is added.	Violet or deep red colour is formed	Presence of ester
	b) Derivative for Ester (Acid Derivative) To a small amount of liquid, 10 ml of 20% NaOH is added, boiled and then acidified with conc. HCl . The acid formed is separated.		
13.	**Confirmatory tests for Carbohydrate** **a) Tollen's Test** Substance is mixed with 2ml of Tollen's reagent and heated in a water bath.	Bright silver mirror	Presence of carbohydrate
	b) Derivative for Carbohydrate: Osazone Derivative The substance is dissolved in water. To this, 1ml of phenylhydrazine in glacial acetic acid& sodium acetate are added. This mixture is heated on a water bath, yellow crystals appeared after 5 to 10 min.		
14.	**Confirmatory tests for Amine** **a) Dye Test** A small amount of the substance is dissolved in 1ml of conc. HCl and the precipitate is dissolved in water and cooled in ice water. To this, a cold solution of saturated sodium nitrite is	Bright Red dye	Presence of Aromatic Amine

	slowly added. To this mixture, a cold solution of β- Naphthol in NaOH is added		
	Derivative for Amine: Acetyl Derivative Substance is mixed with 1ml of acetic anhydride and 1ml of glacial acetic acid and heated for 10 minutes. It is then poured into excess of water. White crystals appear.		
15.	**Confirmatory tests for Nitro compound** **a) Dye Test** Small quantity of the substance is mixed with 2ml of conc. HCl and tin foils in a boiling test tube. A small bit of porcelain is added and strongly boiled for 5 min. and cooled in ice water. To the cold solution, saturated solution of sodium nitrite is added and cooled in an ice water. To this mixture β-naphthol in excess of NaOH is added	Red dye	Presence of nitro compound
	b) Test for dinitrobenzene The substance is dissolved in acetone and a few drops of NaOH is added	A deep violet colouration which changes to red on cooling	Presence of Dinitro compound
	c) Derivative for nitro compound: Acetyl Derivative The substance is reduced to amine by heating with tin foils and conc. HCl. To this, 1ml of acetic anhydride and 1ml of glacial acetic acid are added. Heated for about 10 min. This mixture is poured into excess of water. White Crystals appeared.		
16.	**Confirmatory tests for Amide** **a)** The substance is dissolved in 5ml of 10% NaOH solution. After cooling, excess of dil. HCl is added	Ammonia gas is evolved	Presence of Amide
		A white precipitate is formed	Presence of Aromatic Amide
		No white precipitate	Presence of Diamide
	b) Test for Diamide (Biuret Test) The given substance is gently heated in a dry test tube and ammonia gas is evolved. Heating is continued to get a residue. The residue is dissolved in dil. NaOH. To this, one drop of very dilute solution of $CuSO_4$ is added	A purple colouration	Presence of Diamide is confirmed
		No purple colouration	Presence of Aromatic Amide
	Derivative for Diamide: **i) Urea Nitrate**: To a concentrated solution of the given substance ,a few drops of conc. HNO_3 is added. White precipitate is formed. **ii) Urea Oxalate:** To a concentrated solution of the given substance, a strong solution of aqueous oxalic acid is added. The test tube is scratched to get a white precipitate.		

17.	**Confirmatory tests for Anilide** **a) Dye test** A small amount of the substance is mixed with 1ml of conc. HCl. Then a porcelain bit is added and heated in a boiling test tube. After cooling, it is diluted with water. To this cold solution, saturated sodium nitrite solution is slowly added. To this mixture, a cold solution of β- Naphthol in NaOH is added**.**	Bright red dye is formed	Presence of Anilide
	b) Derivative for Anilide: Bromo Derivative Dissolved 1g of the substance in 3ml of glacial acetic acid. Added 1ml of Bromine in acetic acid. Shaken well and poured into 10ml of water. Pale yellow precipitate is formed.		

REPORT: The given organic compound

(i) is aromatic / aliphatic

(ii) is saturated / unsaturated

(iii) contains / does not contain nitrogen

(iv) is a / an ……..

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