Title: Qualitative Organic Chemistry.

Aim: To identify the elements present in an organic compound and determine its functional group.

Experiment	Observation	Inference
1. Soda lime test: Heat substance and soda lime (1:2) in a test tube.	Smell of NH_3: (a) turns red litmus blue (b) turns mercurous nitrate paper black.	Nitrogen is present.
2. Lassaigne's Test: Fuse a little amount of substance with a pea-size metallic solution in a fusion tube. Heat gently at first, then strongly. Extract the melt with distilled water and filter.		

1. $CH_3CONH_2 + NaOH \xrightarrow{CaO} CH_3COONa + NH_3 \uparrow$

Experiment	Observation	Inference
a) To 5 ml of filtrate, add 2-3 drops of NaOH, 1-2 drops of $FeSO_4$ and boil. Add 2-3 drops of $FeCl_3$ and acidify with HCl.	Blue/green precipitate or colouration (prussian blue)	Nitrogen present.
b) To a part of ~~fil~~ filtrate, add fresh solution of sodium nitroprusside.	Violet precipitate	Sulphur present
To another part, acidify with acetic acid and add lead acetate solution.	Black precipitate	Sulphur present
c) To a 2 ml ~~solution~~ of filtrate, add dil. HNO_3 and boil for a few minutes. Cool and add $AgNO_3$ solution.	(i) Curdy white precipitate (ii) Curdy yellow precipitate	(i) Chlorine present (ii) Bromine/Iodine present.
d) To a 2 ml of filtrate add H_2SO_4, then few drops of fresh chlorine water and 2 ml of $CHCl_3$ or CCl_4 or CS_2 and shake well.	(i) Organic layer turns ~~yellow~~ violet.	Iodine present
	(ii) Organic layer turns yellow	Bromine present
If the organic layer is violet, add more chlorine water and shake well until colour is discharged	Organic layer turns yellow	Iodine and Bromine both present

Teacher's Signature : _____

a) $Na + C + N \longrightarrow NaCN$

$6\,NaCN + FeSO_4 \longrightarrow Na_4[Fe(CN)_6] + Na_2SO_4$

$Na_4[Fe(CN)_6] + Fe^{3+} \longrightarrow Fe_4[Fe(CN)_6]_3$

(prussian blue)

b) $2Na + S \longrightarrow Na_2S$

$Na_2S + Na_2[Fe(CN)_5NO] \longrightarrow Na_4[Fe(CN)_5NOS]$

(violet colour)

$Na_2S + (CH_3COO)_2Pb \longrightarrow 2CH_3COONa + PbS\downarrow$

(black)

c) ~~$AgNO_3 + Cl^- \longrightarrow NO_3^-$~~ $AgNO_3 + NaCl \rightarrow NaNO_3 + AgCl\downarrow$

(curdy white)

$AgNO_3 + NaBr \longrightarrow NaNO_3 + AgBr\downarrow$

(curdy yellow)

(d) $2\,NaBr + Cl_2 \longrightarrow 2NaCl + Br_2$

(yellow colouration of organic layer)

$2\,NaI + Cl_2 \longrightarrow 2NaCl + I_2$

(violet colouration of organic layer)

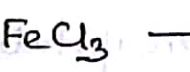
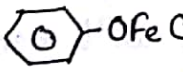
	Experiment	Observation	Inference
3.	Test for -COOH group:		
	a) Test a little of the sample with blue litmus	Blue litmus turns red	-COOH group present
	b) Dissolve or suspend the sample in water, add solid or aqueous solution of $NaHCO_3$, small quantity at a time.	Effervescence with evolution of CO_2	
4.	Test for Phenolic -OH group: Dissolve the substance in water or alcohol and add a drop of $FeCl_3$ solution	(i) Reddish colouration or precipitate. (ii) Green, blue or violet colouration	(i) Simple carboxylic acid (ii) Phenolic -OH group present
5.	Test for Ester group: Add two beads of NaOH to a little of the sample in ~~volum~~ minimum volume of water and boil for a few minutes. Cool and then acidify with dilute HCl.	White solid	-COOR group present.

3. b) $CH_3-COOH + NaHCO_3 \rightarrow CH_3-COONa + H_2O + CO_2\uparrow$

4. (i) $CH_3COOH + NH_4OH \longrightarrow CH_3COONH_4 + H_2O$

$3\,CH_3COONH_4 + FeCl_3 \longrightarrow (CH_3COO)_3Fe + 3\,NH_4Cl$

(red colouration)

4. (ii)  $+ FeCl_3 \longrightarrow HCl +$ 

(violet)

5. $CH_3COOCH_2CH_3 + NaOH \rightarrow CH_3COONa + CH_3CH_2OH$

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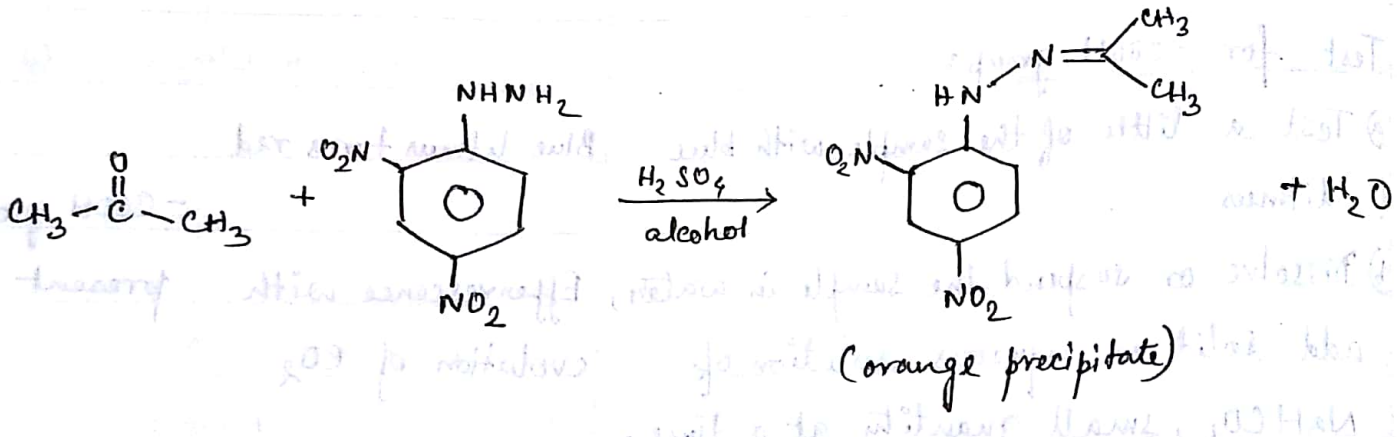
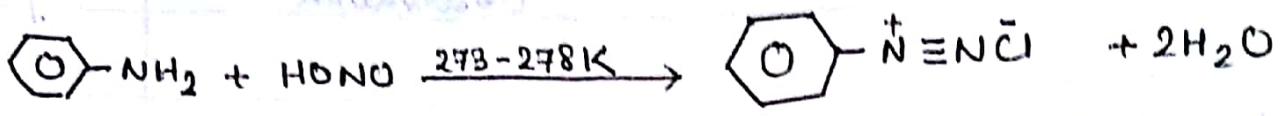
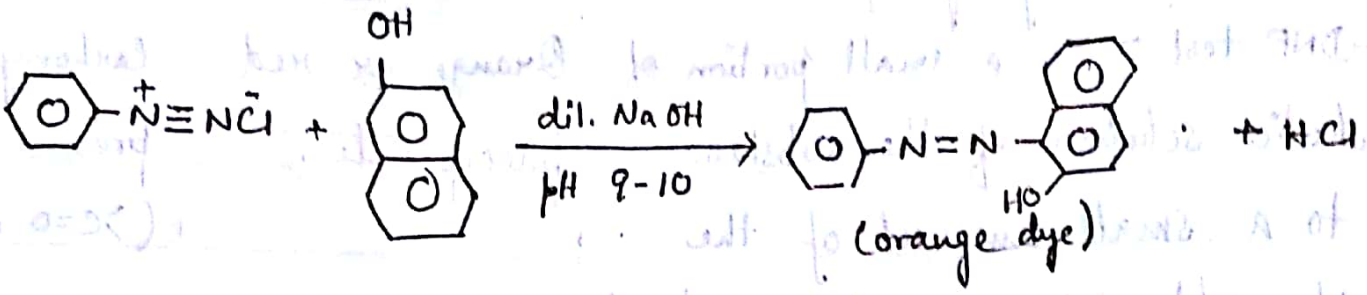
	Experiment	Observation	Inference
6.	**Test for Carbonyl group :**		
	2,4-DNP test – To a small portion of alcoholic solution of the substance or to a small amount of the sample, add minimum quantity of glacial acetic acid, warm till clear solution appears. Then add 2 ml of standard solution of 2,4-dinitrophenyl hydrazine. Shake gently and heat to boiling for few minutes. Allow to cool. If no precipitate appears, add 2 drops of conc. H_2SO_4. Warm for about five minutes again and scratch inside of the test tube with a glass rod. Cool and allow to stand.	Orange or red precipitate.	Carbonyl group present ($>C=O$ or $-CHO$)

6. 

(orange precipitate)

	Experiment	Observation	Inference
7.	Test for primary amine : Diazo reaction - Add a pinch of $NaNO_2$ to a well cooled HCl solution of the sample. Then pour a little of diazotised solution into excess of cold alkaline solution of β-napthol.	Immediately brilliant scarlet or red precipitate appears.	$-NH_2$ group present
8.	Test for amide group : (i) Heat 0.5 g of the sample with 2 ml 50% NaOH solution	(i) Smell of NH_3 - which turns $Hg_2(NO_3)_2$ paper ~~black~~ black	$-CONH_2$ group present
	(ii) Treat a little of the aqueous solution of the sample with a few drops of cold solution of HNO_2 (HCl and $NaNO_2$).	(ii) N_2 gas evolves	

7. 

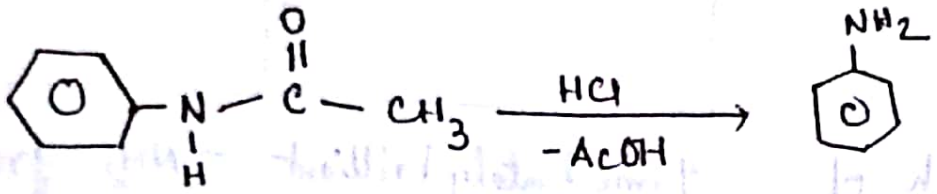


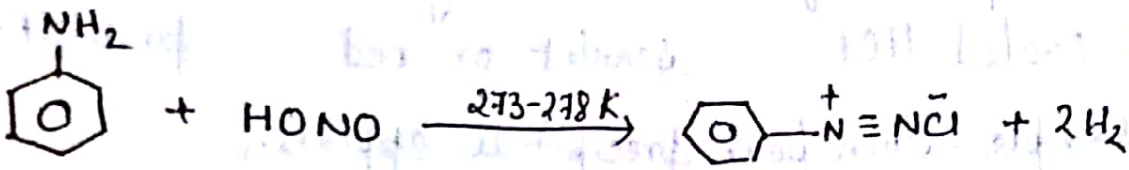
8. (i) $RCONH_2 + NaOH \longrightarrow RCOONa + NH_3 \uparrow$

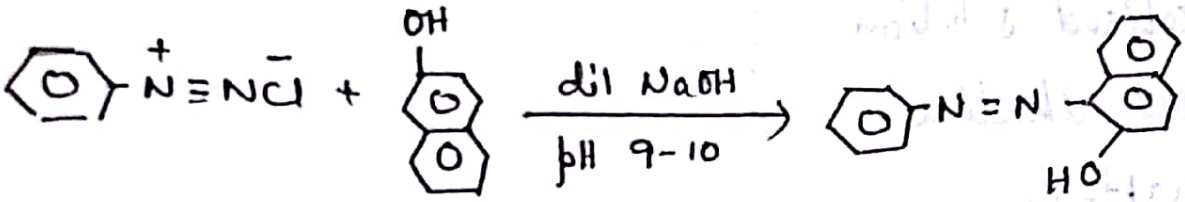
(ii) $RCONH_2 + HNO_2 \longrightarrow RCOOH + N_2 \uparrow + H_2O$

	Experiment	Observation	Inference
9.	Test for substituted amide (anilide): Hydrolyse 50 mg of the sample by boiling with 5 ml of conc. HCl or 50 % H_2SO_4 for a few minutes, cool, ~~ditto~~ dilute with water and perform diazo reaction.	Immediate brilliant scarlet or red precipitate.	Substituted amide ~~(-RCONH-)~~ (-CONHR) group present.
10.	Test for nitro group: Warm gently a little of the sample with a few pieces of metallic tin and 5 ml of conc. HCl till the reaction is complete. Cool, filter if necessary and then perform diazo reaction. [Perform this test when $-NH_2$ and R-CONH-Ar group are absent.	Immediate brilliant scarlet or red precipitate	$-NO_2$ group is present.

9.

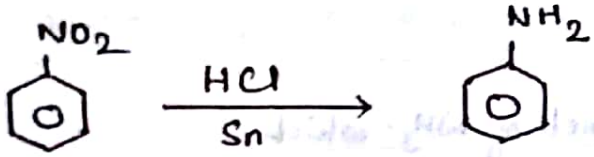


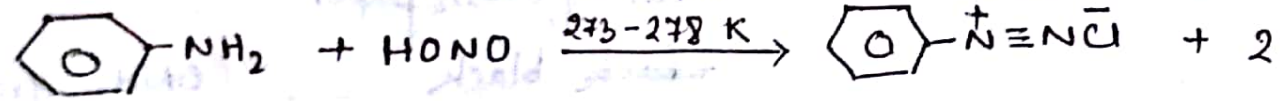


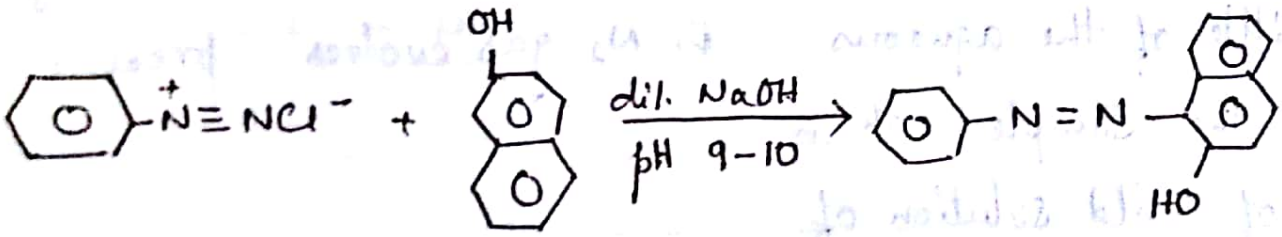


(orange dye)

10.







(orange dye)