COMMON DISTINCTION TESTS IN ORGANIC CHEMISTRY

I. R – Cl *vs* R – Br *vs* R – I (R ≡ alkyl or aryl)

SNo.	Test	R – Cl	R – Br	R – I
a)	Dil $AgNO_3$	$R-Cl \xrightarrow{AgNO_3} AgCl$ (White ppt)	$R-Br \xrightarrow{AgNO_3} AgBr$ (Pale yellow ppt)	$R-I \xrightarrow{AgNO_3} AgI$ (Yellow ppt)
b)	NH_4OH test	above ppt of AgCl + liq. NH_3 or NH_4OH ↓ ppt dissolves	above ppt of AgBr + liq. NH_3 or NH_4OH ↓ ppt partially dissolves	above ppt + liq. NH_3 or NH_4OH ↓ ppt remains insoluble

II. Ethylidene chloride (Geminal) *vs* Ethylene Dichloride (Vicinal)

SNo.	Test	$CH_3-CH(Cl)_2$ (Ethylidene chloride)	$Cl-CH_2-CH_2-Cl$ Ethylene dichloride
a)	Aq KOH test (Hydrolysis)	$CH_3-CH(Cl)_2 \xrightarrow{aq\ KOH} CH_3-CH(OH)_2$ $\xrightarrow{H_2O} CH_3-C(H)=O$ $\xrightarrow[-H_2O]{O_2N-C_6H_3(NO_2)-NHNH_2}$ 2, 4 dinitro phenyl hydrizine $\rightarrow O_2N-C_6H_3(NO_2)-NHN=CH-CH_3$ Yellow ppt	$CH_2(Cl)-CH_2(Cl) \xrightarrow{aq\ KOH} CH_2(OH)-CH_2(OH)$ $O_2N-C_6H_3(NO_2)-NHNH_2$ 2, 4 dinitrophenyl hydrazine ↓ No reaction

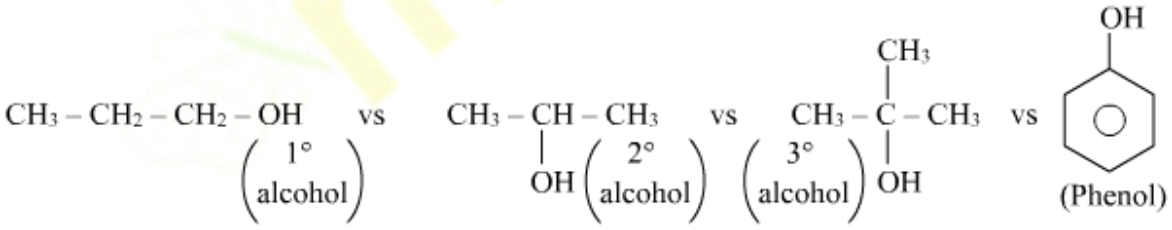
III. $CHCl_3$ *vs* $CH_3Cl/CCl_4/CH_3OH$

SNo.	Test	$CHCl_3$	$CH_3Cl/CCl_4/CH_3OH$
a)	Carbylamine test	(+ve) $R–NH_2$ (1° amine) + $3KOH$ (aq) + $CHCl_3$ → $R–NC$ alkyl isocyanide + $3KCl$ + $3H_2O$ Pungent Smelling	(–ve) No reaction

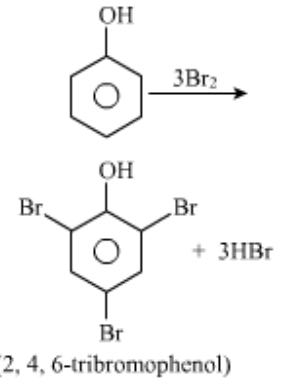
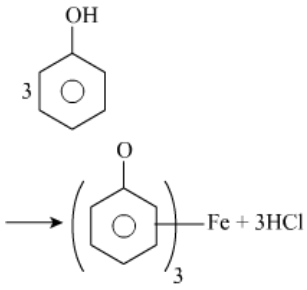
IV. $CH_3 – CH_2 – OH$ (Alcohol) *vs* $CH_3 – O – CH_3$ (Ether)

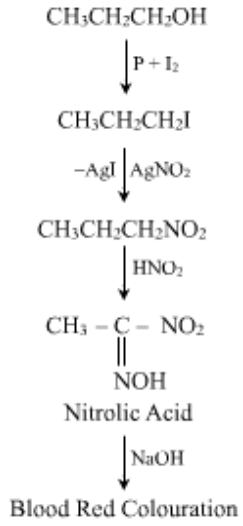
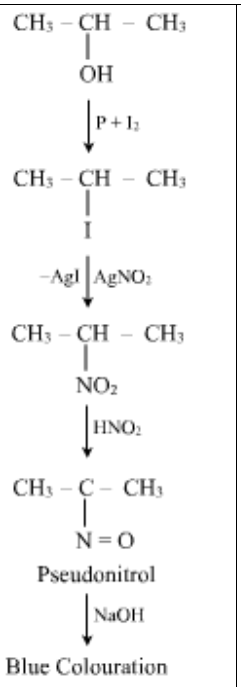
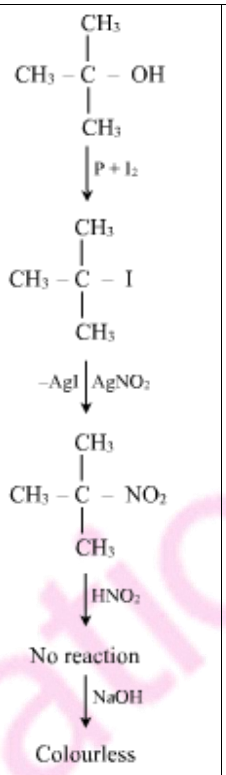
SNo.	Test	$CH_3 – CH_2 – OH$	$CH_3 – O – CH_3$
a)	**Na metal test**	(+ve) $CH_3 – CH_2 – OH + Na \longrightarrow CH_3 – CH_2 – ONa + \frac{1}{2}H_2\uparrow$	(–ve)
b)	**Iodoform test (for alcohols having $CH_3 –CH – OH$)**	(+ve) $CH_3CH_2OH + 6NaOH + 4I_2 \xrightarrow{\Delta} CHI_3\downarrow +$ (iodoform) $HCOONa + 5NaI + 5H_2O$	(–ve)

V.

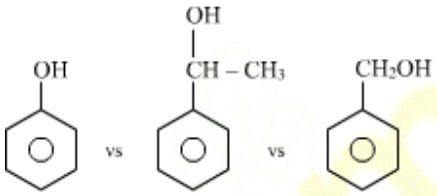


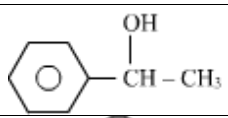
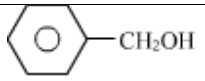
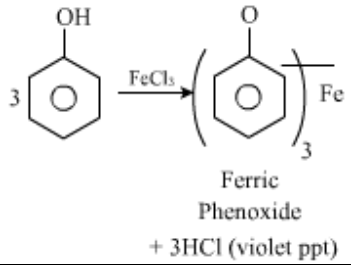
SNo.	Test	$CH_3 – CH_2 – CH_2$ (1°) alcohol	$CH_3 – CH – CH_3$ (2°) alcohol	$CH_3 – C(CH_3)(OH) – CH_3$ (3°) alcohol	(Phenol)

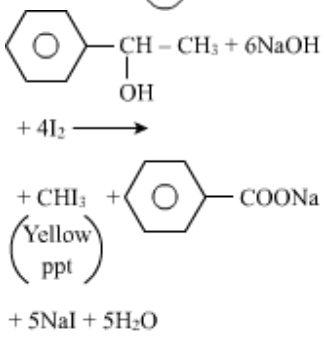
a)	**Lucas Test (Conc. HCl + anhyd $ZnCl_2$**	Turbidity appears on heating	Turbidity appears within in 5 – 10 min.	Turbidity appears spontaneously	No appearance of turbidity -ve
b)	**Iodoform test**	-ve	$CH_3 - \underset{\underset{OH}{|}}{CH} - CH_3 + 6NaOH + 4I_2 \longrightarrow CHI_3\downarrow + HCOONa$ Yellow $+ 5NaI + 5H_2O$	-ve	-ve
c)	**Br_2 water test**	-ve	-ve	-ve	 (2, 4, 6-tribromophenol)
d)	**Neutral $FeCl_3$ Test**	-ve	-ve	-ve	 Ferric Phenoxide (Violet ppt.)
e)	**Litmus Test**	-ve -ve -ve WEAK ACIDS			Turns blue litmus red

f)	**Victor Meyer Test**				

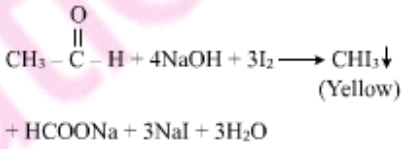
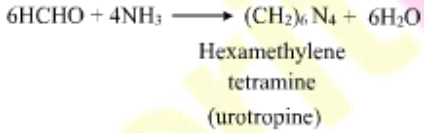
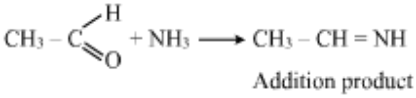
VI.



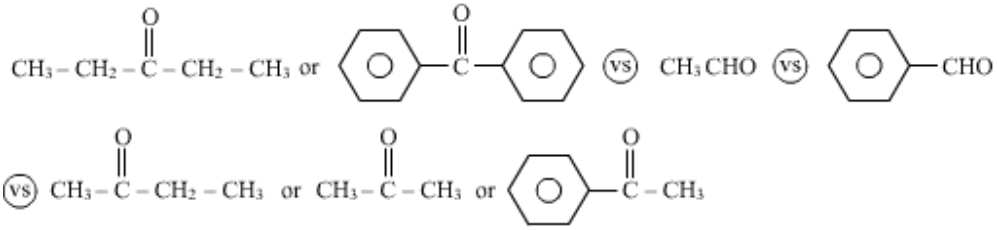
SNo.	Test			
a)	**Litmus Test**	Turns blue Litmus to red		
b)	**Neutral $FeCl_3$ test**			

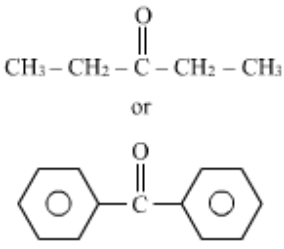
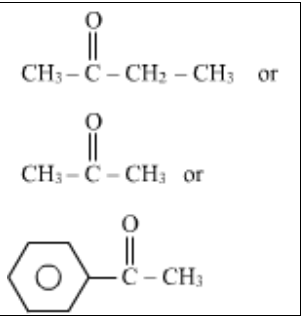
c)	**Iodoform Test**	(–ve)	(+ve)  	(–ve)

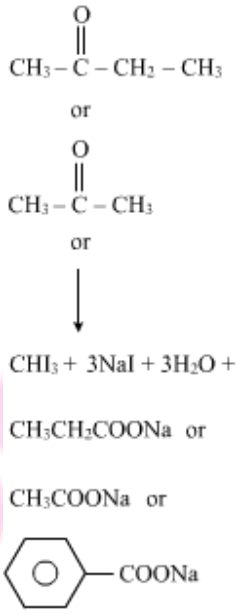
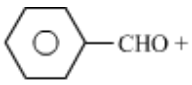
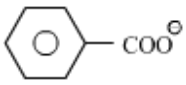
VII. HCHO vs CH_3CHO

SNo.	Test	HCHO	CH_3CHO
a)	**Iodoform test**	(–ve)	(+ve) 
b)	**Liquor Ammonia Test**	 	

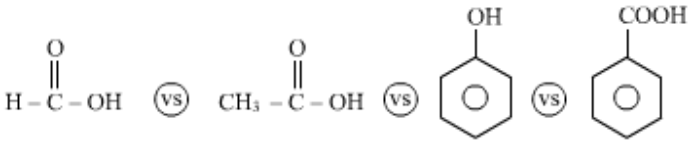
VIII.

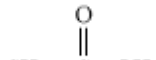
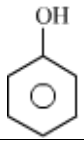
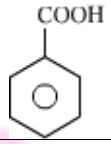
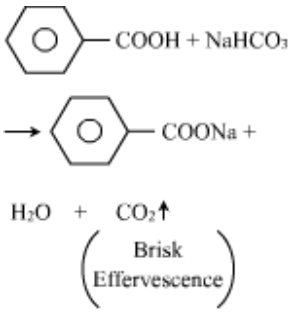


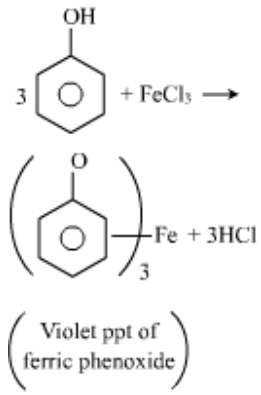
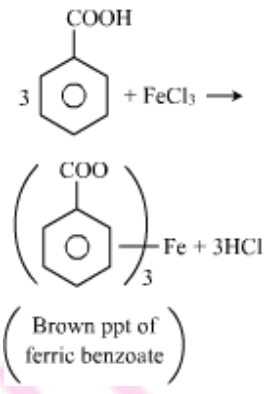
SNo.	Test				
		 	**CH_3CHO**		

a)	**Iodoform test**	–ve	+ve $CH_3 - CHO + 4NaOH +$ $3I_2 \longrightarrow CHI_3\downarrow + HCOONa$ (Yellow) $+ 3NaI + 3H_2O$	–ve	+ve  or $CHI_3 + 3NaI + 3H_2O +$ CH_3CH_2COONa or CH_3COONa or
b)	**Tollen's reagent (amm. silver nitrate)**	–ve	+ve $CH_3CHO +$ $2[Ag(NH_3)_2]^+$ $+ 2\overset{\ominus}{O}H \longrightarrow$ $CH_3COO^{\ominus} +$ $NH_4^{\ominus} + 2Ag\downarrow +$ $H_2O + 3NH_3$	+ve  $2[Ag(NH_3)_2]^+ +$ $2\overset{\ominus}{O}H \longrightarrow$  $+ NH_4^{\ominus} + 2Ag\downarrow +$ $H_2O + 3NH_3$	–ve
c)	**Fehling's solution (copper sulphate + sodium potassium tartarate)**	–ve	+ve $CH_3CHO +$ $2[Cu(OH)_2] + NaOH$ $\downarrow$ $CH_3COO^{\ominus} +$ $Na^{\ominus} + Cu_2O + 3H_2O$ (Red ppt)	+ve Oxidation is very difficult	–ve

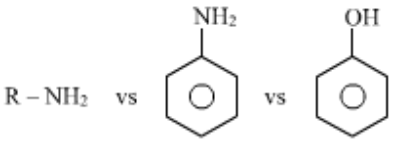
IX.

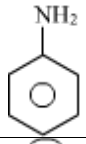
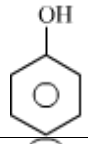
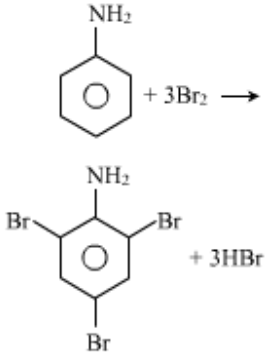
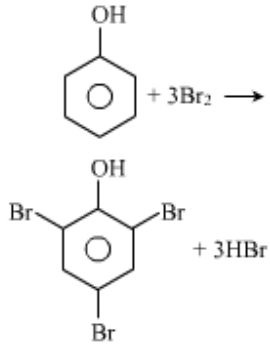


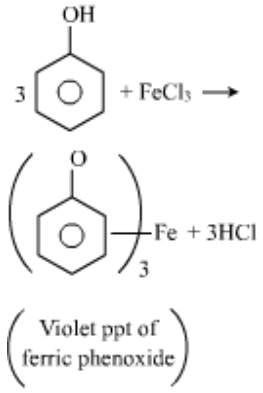
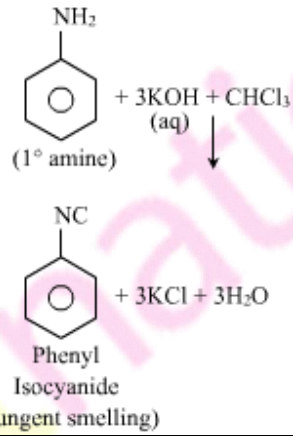
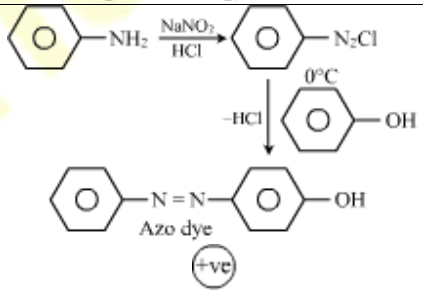
SNo.	Test				
a)	Tollen's test	+ve $HCOOH + Ag_2O \rightarrow CO_2 + H_2O + 2Ag\downarrow$	-ve	-ve	-ve
b)	Fehling's Solution test	+ve $HCOOH + 2CuO \rightarrow CO_2 + H_2O + Cu_2O\downarrow$ (Reddish Brown ppt)	-ve	-ve	-ve
c)	$NaHCO_3$ test	+ve $HCOOH + NaHCO_3 \rightarrow HCOONa + H_2O + CO_2\uparrow$ (Brisk Effervescence)	+ve $CH_3 - COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2\uparrow$ (Brisk Effervescence)	-ve	+ve 

d)	**Neutral $FeCl_3$ test**	–ve	–ve	+ve  Violet ppt of ferric phenoxide	+ve  Brown ppt of ferric benzoate

X.

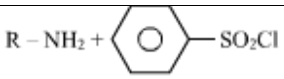
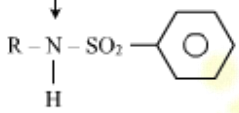
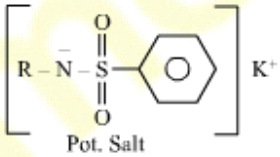
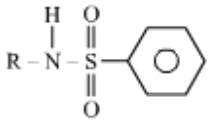
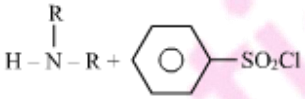
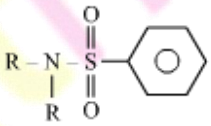
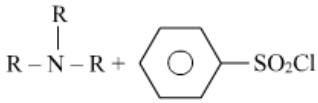


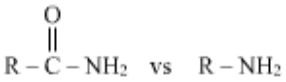
SNo.	**Test**	**R – NH_2**		
a)	**Bromine water**	–ve	+ve  2, 4, 6-tribromo aniline (White ppt)	+ve  2, 4, 6-tribromo phenol (White ppt)
b)	**Neutral $FeCl_3$**	–ve	–ve	+ve

				
c)	**Carbylamine test**	(+ve) R – NH2 + 3KOH + CHCl3 → RNC + 3KCl + 3H2O (1° amine) (aq) alkyl isocyanide (Pungent smelling)	(+ve) 	(-ve)
d)	**Azo Dye Text**	Azo dye formed is unstable, so cannot be removed from solution		(+ve)

XI. $R – NH_2$ vs R_2NH vs R_3N

SNo.	Test	$R – NH_2$ (1° amine)	R_2NH (2° amine)	R_3N

a)	**Carbylamine Test**	$R-NH_2 + CHCl_3 + 3KOH \xrightarrow{(aq)} R-NC + 3KCl + 3H_2O$ alkyl isocyanide (Pungent smelling)	–ve	–ve
b)	**Nitrous Acid Test**	$R-NH_2 + HO-N=O \rightarrow R-OH + N_2\uparrow + H_2O$ Evolution of nitrogen	$R_2-N-H + HO-N=O \rightarrow R_2N-N=O$ N-nitroso dialkyl amine (Yellow oily liquid) + Phenol $\xrightarrow{Warm}$ Green colour	$R_3N + HNO_2 \xrightarrow{Warm} R_3NHNO_2$ (Water Soluble)
c)	**Hinsberg's Test [Hinsberg's Reagent is a mixture of (i) Benzene sulphonyl chloride, (ii) KOH, and (iii) HCl**	$R-NH_2 +$  Benzene sulphonyl chloride $\downarrow -HCl$  N-alkylbenzene sulphonamide (Insoluble) $\downarrow -H_2O$ KOH  Pot. Salt (Soluble in KOH) $\downarrow -KCl$ HCl  N-alkylbenzene sulphonamide (insoluble)	 Benzene sulphonyl chloride $\downarrow -HCl$  N, N-dialkyl-benzene sulphonamide $\downarrow$ KOH No reaction (Insoluble) $\downarrow$ HCl No reaction (Insoluble)	 Benzene sulphonyl chloride $\downarrow$ No reaction (Insoluble) $\downarrow$ HCl $R_3\overset{+}{N}HCl^-$ Trialkyl-ammonium chloride (Soluble in HCl)



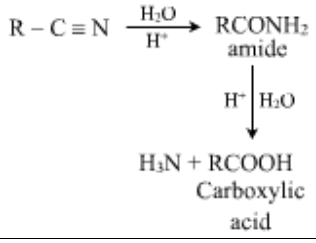
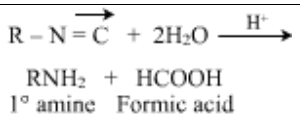
SNo.	Test	$R-\overset{\overset{O}{\|\|}}{C}-NH_2$	$R-NH_2$
a)	**Litmus Test**	No response to litmus	Red litmus changes to Blue
b)	**Carbylamine test**	-ve	$R-NH_2 + CHCl_3 + 3KOH\ (aq) \longrightarrow RNC + 3KCl + 3H_2O$ (RNC: alkyl isocyanide) Pungent Smelling

XIII. RNO_2 vs RONO

SNo.	Test	$R-NO_2$	RONO
a)	**Reduction (Sn/HCl)**	$R-NO_2 + 6H \longrightarrow RNH_2 + 2H_2O$	$RONO + 6H \longrightarrow ROH + NH_3 + H_2O$
b)	**NaOH**	Form's soluble sodium salt. $R-N(=O)-O \xrightarrow{NaOH} R=N(-ONa)-O$	Readily hydrolysed to give corresponding alcohol and sodium nitrite. $RONO + NaOH \longrightarrow ROH + NaNO_2$

XIV. RCN vs RNC

SNo.	Test	$R-NO_2$	RONO
a)	**Solubility in water**	Soluble	Insoluble
b)	**Reduction followed by nitrous acid treatment**	$RCN + 4H \longrightarrow RCH_2NH_2$ (1° amine) $\xrightarrow{HNO_2}$ $R-OH + N_2\uparrow + H_2O$ Evolution of nitrogen	$RCN + 4H \longrightarrow R-N(H)-CH_3 \xrightarrow{HNO_2} R-N(CH_3)-N=O + H_2O$ Yellow oily

c)	**Hydrolysis**		
d)	**Heating**	No effect	Alkyl cyanide is formed