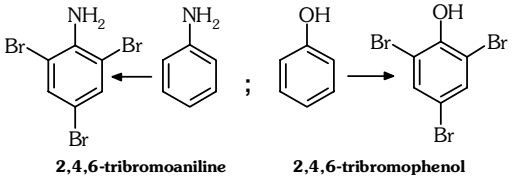
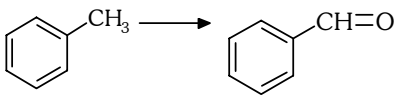
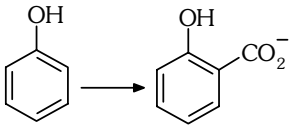
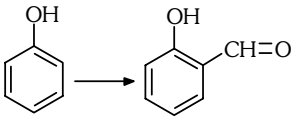
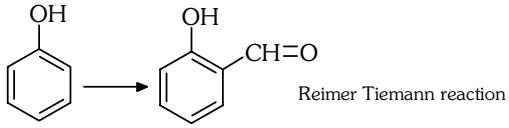
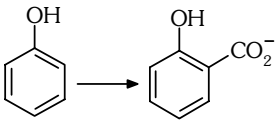
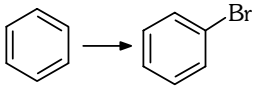
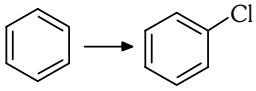
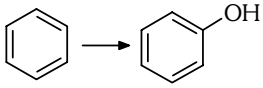
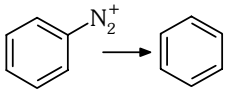
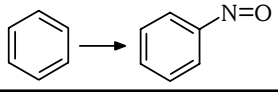
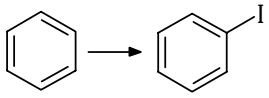
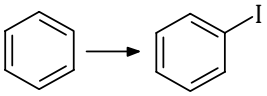
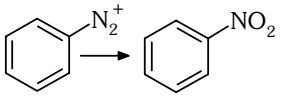
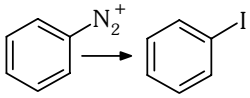
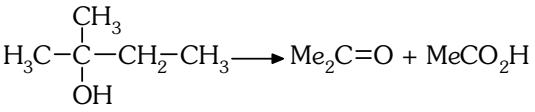
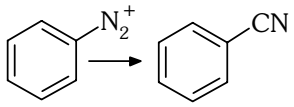
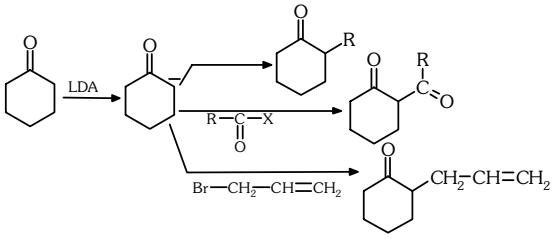
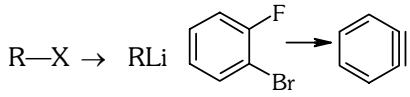
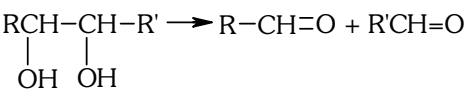
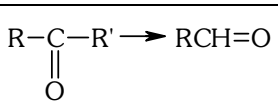
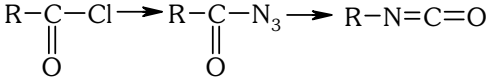
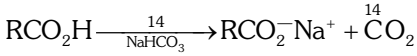
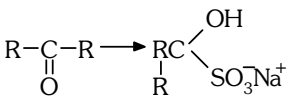
Nutshell Review and Preview of
ORGANIC REAGENTS

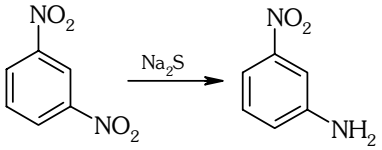
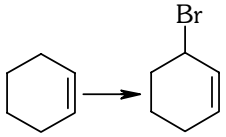
1.	Acetic Anhydride	Dehydrating Reagent
2.	Acetic Anhydride + Sodium Salt of acetic acid	$PhCH=O \rightarrow PhCH=CH—CO_2H$ Aldehyde (Aromatic) $\rightarrow \alpha, \beta$ unsaturated acid Perkin Reaction
3.	Alcoholic KOH	$R—X \rightarrow$ Alkene ; Elimination
4.	Alkyl Lithium 1, 1-elimination	$CH_3—CD_2–CH_2–X \rightarrow CH_3–CD=CHD$
5.	Aluminium tert-butoxide $[Al(OBu^t)_3]$ $+Me_2C=O$	$R_2CHOH \rightarrow R_2C = O$ 2° / 1° Alcohol $\rightarrow$ Ketone / Aldehyde oppeneuer oxidation
6.	Aluminium Ethoxide	$RCH=O \longrightarrow R-\underset{\underset{O}{\|}}{C}-O-CH_2R$ Aldehyde $\rightarrow$ Ester (Tischenko Reaction)
7.	Aluminium Isopropoxide / Isopropanol	$R_2C=O \rightarrow R_2CHOH$ Ketone $\rightarrow 2^\circ$ Alcohol M.P.V. Reduction
8.	Aqueous KOH/NaOH	$R—X \rightarrow ROH$ Nucleophilic substitution S_N reaction Also used for Cannizaro reaction
9.	$AlPO_4$	Dehydrating Reagent
10.	Baryta Water	$Ba(OH)_2$ also having same purpose as that of NaOH
11.	Baeyer's Reagent (Alkaline cold dilute $KMnO_4$)	$RCH=CHR' \longrightarrow \underset{\underset{OH}{\|}}{RCH}—\underset{\underset{OH}{\|}}{CHR'}$ alkene $\rightarrow$ 1, 2 diol (used to detect unsaturation)
12.	Bromine water	used to detect unsaturation;  **2,4,6-tribromoaniline** **2,4,6-tribromophenol**
13.	Benedict's solution	Used to detect aldehyde group $RCHO \rightarrow RCO_2^-$ [ketone gives -ve test]
14.	Brosyl Chloride	$ROH \rightarrow ROBs$ bad leaving group– OH becoming good leaving group.
15.	$Cu_2Cl_2 + NH_4OH$	Used to Detected Terminal Alkyne Red Precipitate observed
16.	CrO_2Cl_2	 Etard reaction

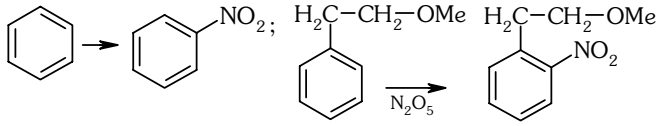
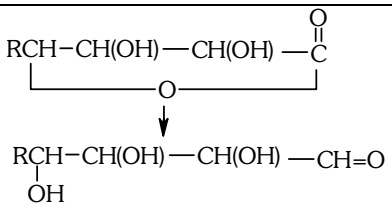
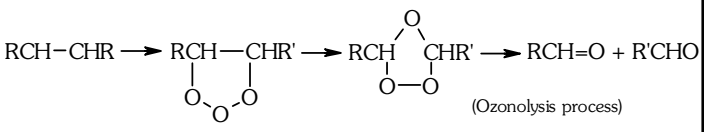
17.	CrO_3	$RCH_2OH \rightarrow RCHO$, $R_2CHOH \rightarrow R_2C{=}O$ $R_3COH \rightarrow$ no reaction
18.	$Cu_2Cl_2 + NH_4Cl$	Linear polymerization of alkyne
19.	$CCl_4 + \overline{O}H$	 + p– product Reimer Tiemann Reaction
20.	$CO + HCl + AlCl_3$	 + p– product Gatterman koch reaction
21.	$CHCl_3 + KOH$	 Reimer Tiemann reaction $RNH_2 \rightarrow RNC$ **Carbyl amine Test** (used to detect 1° Amine; obnoxious small of RNC)
22.	$CO_2 + OH^-$ (high temp. + pressure)	 + p– product Kolbes Schimdt reaction
23.	$Ca(OCl)Cl + X_2$	$RC(=O)-CH_3 \rightarrow RCO_2^-$ $\quad R-C(=O)-NH_2 \rightarrow RNH_2$ $RCH(OH)-CH_3 \rightarrow RCO_2^-$ (Hoffman Degradation) (Haloform Reaction)
24.	Cu/Δ	$RCH_2OH \rightarrow RCHO$, $R_2CHOH \rightarrow R_2C{=}O$ $H_3C-C(CH_3)_2-OH \rightarrow H_2C{=}C(CH_3)_2$ **Polymerisation of alkyne** $H-C{\equiv}C-H \rightarrow$  ; $H_3C-C{\equiv}CH \rightarrow$ 
25.	2,4, D.N.P.	used to detect carbonyl group (orange ppt observed)
26.	D.N.F.B.	used to detect N terminal residue of amino acid
27.	DHP + H^+ 	Protection of alcohol from base
28.	Diazomethane	Used to convert –OH $\rightarrow$ OCH_3 group; Source of carbine $R-C(=O)-Cl \rightarrow R-C(=O)-CHN_2 \xrightarrow[Ag_2O]{H_2O} R-CH_2-CO_2H$
29.	DIBALH	$R-C(=O)-OH/G \rightarrow RCHO$, $RCN \rightarrow RCHO$

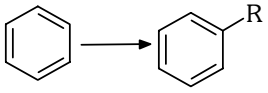
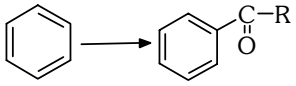
30.	Diborane	Reducing agent; It can not reduce $-\overset{\overset{O}{\|}}{C}-Cl$; RNO_2; $ArNO_2$; RX; ArX but can reduce $-CH=O, -\overset{\overset{O}{\|}}{C}-R, -\overset{\overset{O}{\|}}{C}-OH, -\overset{\overset{O}{\|}}{C}-OR, -CN$
31.	Diene & Dinophile	diels alder reaction (Addition of 2π & 4 electrons)
32.	DMSO	Aprotic solvent: favour S_N2 mechanism
33.	Fe+ $Br_2/FeBr_3$	
34.	Fe + HCl	 ; $RNO_2 \rightarrow RNH_2$
35.	Fehling solution	used to identify – CH=O group. PhCHO gives –ve test Observation: red ppt of Cu_2O formed
36.	Fenton Reagent	 ; α hydroxy acid → Aldehyde
37.	Grignard Reagent	Universal reagent; Alkane; All types of alcohol; acids can be prepared Towards RMgX : Acid Base : Reaction > Nu addition > S_N
38.	$H_2(Pd/CaCO_3)$	Lindlar catalyst : R—C≡C—R→ R—CH=CH—R (cis)
39.	H_3PO_2	 (Sodium stannite also can be used for this purpose)
40.	$HN_3 + H_2SO_4$	$R-\overset{\overset{O}{\|}}{C}-OH \longrightarrow RNH_2$ (Schmidt Reaction)
41.	H_3PO_4/Δ	$H_3PO_4 \Rightarrow$ Same as H_2SO_4/Δ
42.	H_2O_2	R' having more migrating tendency than R. H_2O_2 gives antimarkownikoff pdt in presence of HBr / RSH/ $CHCl_3$
43.	H_2O	RX → R—OH; $R-\overset{\overset{O}{\|}}{C}-G \longrightarrow R-\overset{\overset{O}{\|}}{C}-OH$ $-CHCl_2 \rightarrow -CH=O$; $-CCl_3 \rightarrow -CO_2H$ $-CH=NH \rightarrow -CH=O$
44.	H_2SO_4/Δ	$RCH(OH)-CH_3 \longrightarrow RCH=CH_2$ Saytzeff product; C^+ mechanism; Rearranged alkene can be formed
45.	HNO_2 ($NaNO_2$ + HCl)	$RNH_2 \rightarrow R—OH$; $PhNH_2 \rightarrow PhN_2^+$ (O— 5°C) $PhNH_2 \rightarrow PhOH$ (high temperature) 

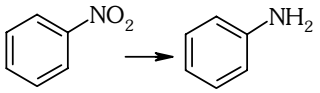
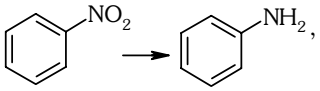
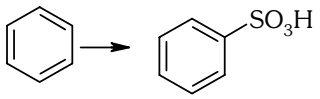
46.	HCN + Base	$RCH{=}O \longrightarrow RCH\begin{matrix}OH\\CN\end{matrix}$
47.	HIO_4	$RCH(OH)-CH(OH)-R' \longrightarrow RCH{=}O + R'CH{=}O$ Oxidative cleavage of diol
48.	H_2(Ni)	H_2(Ni) can reduce) $R-\underset{\underset{O}{\|}}{C}-R \longrightarrow R_2CHOH$; $R-\underset{\underset{O}{\|}}{C}-G \longrightarrow RCH_2OH$ $RCN \rightarrow RCH_2NH_2$; $-C{\equiv}C- \rightarrow CH_2-CH_2-$ $-HC{=}CH- \rightarrow -CH_2-CH_2-$
49.	H_2(C+Ru)	Only $RCO_2H \rightarrow RCH_2OH$
50.	$H_2(Pd/BaSO_4)$	$R-\underset{\underset{OI}{\|}}{C}-Cl \longrightarrow RCH{=}O$
51.	$I_2 + HNO_3$	
52.	ICl	$RCH{=}CH_2 \longrightarrow RCH(Cl)-CH_2I$; 
53.	Jones Reagent	$RCH_2OH \rightarrow RCH{=}O$; $R_2CHOH \rightarrow R_2C{=}O$
54.	KCN(Alcoholic)	$PhCHO \longrightarrow PhCH(OH)-\underset{\underset{O}{\|}}{C}-Ph$
55.	$KHSO_4$	Dehydrating Reagent $CH_2(OH)-CH(OH)-CH_2-OH \longrightarrow CH_2{=}CH-CH{=}O$
56.	KI + acetone	S_N2 mechanism favour
57.	$KMnO_4/H^+$	$RCH_2OH \rightarrow RCO_2H$; $RCHOH \rightarrow R_2C{=}O$ on prolong heating it is converted into mixture of acid. $H_3C-\underset{\underset{OH}{\|}}{\overset{\overset{CH_3}{\|}}{C}}-CH_2-CH_3 \longrightarrow Me_2C{-}O + MeCO_2H$ $Me_3CH \rightarrow Me_3COH$
58.	KNO_2, Cu powder	
59.	KI (Cu Powder)	

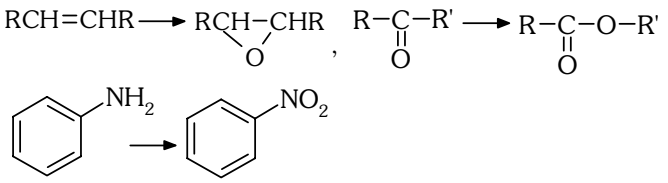
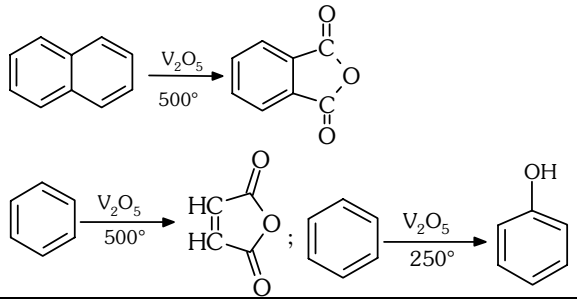
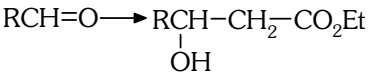
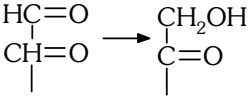
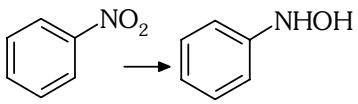
60.	$K_2Cr_2O_7/H^+$	$RCH_2OH \rightarrow RCO_2H$; $R_2CHOH \rightarrow R_2C$ on prolong heating it is converted into mixture of acid. 
61.	$K_3[Cu(CN)_4]$	
62.	Ketene	Source of carbene
63.	Lithium Diisopropyl Amide	LDA is used for direct aldol 
64.	Li	
65.	Lithium aluminium Hydride	LAH reduce all except double & triple bond; LAH in $AlCl_3$ can reduce triple bond
66.	Lead Tetra acetate	
67.	$LiAlH(O'Bu)_3$ at – 78°C	
68.	Mercuric Acetate + $NaBH_4$	Used for OMDM process
69.	MnO_2	$CH_3—CH=CH—CH_2—OH \rightarrow CH_3—CH=CH—CH=O$ $PhCH_2OH \rightarrow PhCH=O$ To oxidise allylic / benzylic hydroxyl group into corresponding carbonyl.
70.	NaN_3/Δ	
71.	$NaHCO_3$	
72.	$NaHSO_3$	 [White crystals, soluble in water] Used to separate carbonyl from noncarbonyl system

73.	Na_2CO_3(aq)	Na_2CO_3 also having same purpose as that of NaOH; It gives $\bar{O}H$ also.
74.	NaOH(aq)	$R{-}X \rightarrow R{-}OH$; $R{-}\underset{\underset{O}{\|}}{C}{-}OR' \xrightarrow[(H_2O)]{NaOH} R{-}\underset{\underset{O}{\|}}{C}{-}\bar{O} + R'OH$ Basic hydrolysis of ester $HCHO \xrightarrow{\bar{O}H} HCO_2^- + CH_3OH$ (cannizaro) $H_3C{-}CH{=}O \xrightarrow[\Delta]{OH^-} H_3C{-}CH{=}CH{-}CH{=}O$ (Aldol condensation)
75.	Nihydrin	Detection of amino acid Observation : Purple coloured ion
76.	NaOR	Strong base : $RCH(X){-}CH_2{-}R \longrightarrow RCH{=}CH{-}R$ (Saytzeff Product : E_2 elimination) $H_3C{-}\underset{\underset{O}{\|}}{C}{-}OEt \longrightarrow H_3C{-}\underset{\underset{O}{\|}}{C}{-}CH_2{-}\underset{\underset{O}{\|}}{C}{-}OEt$ (claisen condensation) (β keto ester)
77.	Na_2S	 (Partial Reduction) Other reagents used for this purpose are $NaHS/(NH_4)_2S/NH_4HS$
78.	NaOH + X_2	$R{-}\underset{\underset{O}{\|}}{C}{-}CH_3 \xrightarrow[-CHI_3]{} RCO_2^-$; $R{-}\underset{\underset{O}{\|}}{C}{-}CH_3 \xrightarrow[-CHI_3]{} RCO_2^-$ (Haloform reaction) $R{-}\underset{\underset{O}{\|}}{C}{-}NH_2 \longrightarrow RNH_2$ (Hoffman Degradation)
79.	NaOH + CaO	$RCO_2H \rightarrow RH$
80.	NaOX	Same as NaOH + X_2
81.	NBS	 ; $PhCH_3 \rightarrow PhCH_2{-}Br$
82.	$NaNO_2$ + HCl	$RNH_2 \rightarrow R{-}OH$
83.	$N_2H_4 + H_2O_2$	$RCH{=}CHR \rightarrow RCH_2{-}CH_2R$ syn. addition
84.	$NaNH_2$ in paraffin	Non-terminal Alkyne → Terminal Alkyne (2 Butyne → 1 butyne)

85.	$N_2H_4 + \bar{O}H/\Delta$ or $N_2H_4 + \bar{O}Et/\Delta$	$R-\underset{\underset{O}{\|}}{C}-R \longrightarrow R-CH_2-R$
86.	NH_3	$R-X \rightarrow RNH_2$, $R-\underset{\underset{O}{\|}}{C}-Cl \longrightarrow R-\underset{\underset{O}{\|}}{C}-NH_2$
87.	$NaBH_4$ + ROH	Selective reducing agent $R-\underset{\underset{O}{\|}}{C}-Cl \longrightarrow RCH_2OH$, $RCH{=}O \rightarrow RCH_2OH$ $R-\underset{\underset{O}{\|}}{C}-R \longrightarrow R_2\underset{\underset{OH}{\|}}{CH}$
88.	N_2O_5; $HNO_3 + AC_2O$	
89.	Na(Hg) + dil. H_2SO_4	
90.	Na/EtOH	reduce all except double & triple bond
91.	Na(Hg) + HCl $\rightarrow$	$R-\underset{\underset{O}{\|}}{C}-R \longrightarrow R-CH_2-R$
92.	Na in Liq. NH_3	$R-C\equiv CR \longrightarrow \underset{H}{\overset{R}{}}C=C\underset{R}{\overset{H}{}}$ (trans alkene)
93.	$OsO_4 + H_2O \rightarrow$	$RCH{=}CHR \longrightarrow \underset{OH\ OH}{RCH-CH-R}$ (syn addition)
94.	O_2 followed by H^+	$RMgX \rightarrow ROH$
95.	O_3	 (Ozonolysis process)
96.	Oxirane followed by H^+	$RMgX \rightarrow RCH_2-CH_2-OH$
97.	PCC(CH_2Cl_2)	$RCH_2OH \rightarrow RCHO$, $R_2CHOH \rightarrow R_2C = O$ $R_3COH \rightarrow$ no reaction (Mild oxidizing reagent)
98.	PCC(H_2O)	$RCH_2OH \rightarrow RCO_2H$, $R_2CHOH \rightarrow R_2C = O$ $R_3COH \rightarrow$ no reaction
99.	P(red) + Br_2	$CH_3CO_2H \rightarrow \underset{Br}{H_2C-CO_2H}$ (HVZ reaction) $ROH \rightarrow R-Br$
100.	Peracid	$R-\underset{\underset{O}{\|}}{C}-R' \longrightarrow R-\underset{\underset{O}{\|}}{C}-OR'$ R' having more migrating tendency than R

101.	P (red) + HI	$CH_3CO_2H \rightarrow CH_3—CH_3$ (one of the strongest reducing agent) or $CH_3CH=O \rightarrow CH_3—CH_3$ (one of the strongest reducing agent) or $CH_3CH_2OH \rightarrow CH_3—CH_3$ (one of the strongest reducing agent)
102.	Perbenzoic acid	$R-\overset{\overset{O}{\|\|}}{C}-R' \longrightarrow R-\overset{\overset{O}{\|\|}}{C}-OR'$ R' having more migrating tendency than R
103.	P_4O_{10}	Dehydrating Reagent, Beckmann Rearrangement
104.	PCl_5	Dehydrating Reagent, Beckmann Rearrangement
105.	Ph_3P + RLi	$\underset{R}{\overset{R}{>}}C=O \xrightarrow{CH_3\overset{-}{C}H_2—X} \underset{R}{\overset{R}{>}}C=CH-CH_3$ [alkyl halide should not be 3°R]
106.	Ph_3SnH	R—X → R—H all alkyl halides converted with alkane
107.	Periodic acid	$RCH(OH)-CH(OH)-R' \longrightarrow RCH=O + R'CH=O$ Oxidative cleavage of diol
108.	$POCl_3$	Dehydrating Reagent, Beckmann Rearrangement
109.	Quaternary ammonium salt	Phase transfer catalyst to accelerate $nC_4H_9OBs + C\bar{N} \rightarrow nC_4H_9CN + O\bar{B}s$
110.	R_2O	Used as solvent in reaction of grignard; Wurtz reaction
111.	RCl + $AlCl_3$	
112.	RCOCl + $AlCl_3$	
113.	RO^- + R'Cl	Ether formation; ROR' Williamson synthesis : Reactivity of RX (1° > 2° > 3°)
114.	RX + NH_3(XS)	Preparation of 1° / 2° / 3° Amine
115.	RO_2Ag + Br_2	$RCO_2Ag + Br_2 \rightarrow RBr$
116.	RCO_2Ag + I_2	$RCO_2Ag + I_2 \rightarrow RCO_2R$
117.	RLi	used for 1, 1-elimination
118.	R_2Cd	Used for preparation of pure carbonyl from used impure carbonyl $R-\overset{\overset{O}{\|\|}}{C}-Cl \longrightarrow R-\overset{\overset{O}{\|\|}}{C}-R$
119.	R_2CuLi	R_2CuLi is formed as intermediate in Corey house method R' — + $R_2CuLi \rightarrow$ R'—R, R'—X should not be 3° R—X $R-\overset{\overset{O}{\|\|}}{C}-Cl \longrightarrow R-\overset{\overset{O}{\|\|}}{C}-R$

120.	$ROH+R-\underset{\underset{O}{\|}}{C}-OH$	Ester formed
121.	Selenium Dioxide (SeO_2)	$CH_3-CH=CH-CH_2-OH \rightarrow CH_3-CH=CH-CH=O$ $PhCH_2OH \rightarrow PhCH=O$ $H_3C-\underset{\underset{O}{\|}}{C}-CH_3 \longrightarrow H_3C-\underset{\underset{O}{\|}}{C}-CH=O$ $H_3C-\underset{\underset{O}{\|}}{C}-CH_2-CH_3 \longrightarrow H_3C-\underset{\underset{O}{\|}}{C}-\underset{\underset{O}{\|}}{C}-Cl$ [Her protic solvent is used]
122.	Sodium Borchydride	It reduce only $-CH=O$, $-\underset{\underset{O}{\|}}{C}-R$, $-\underset{\underset{O}{\|}}{C}-Cl$ group $-\overset{\overset{O}{\|}}{C}-Cl - CH_2OH$; $-CH=O$ $\longrightarrow -CH_2OH$; $-\underset{\underset{O}{\|}}{C}-R \longrightarrow -\underset{\underset{OH}{\|}}{CH}-R$
123.	Sodamide	$NaNH_2$ strong Base; Used for elimination purpose; Strong base : $RCH(X)-CH_2-R \longrightarrow RCH=CH-R$ (Saytzeff Product : E_2 elimination) $CH_3-C\equiv C-CH_3 \xrightarrow[\text{Paraffin}]{NaNH_2} CH_3-CH_2-C\equiv CH$ Non – terminal alkyne Terminal alkyne
124.	$SnCl_2$ + HCl	$R-N=N-R' \rightarrow RNH_2 + R'NH_2$  $RCN \rightarrow RCH = O$ Stephen reduction
125.	Sn + HCl	 , $RCN \rightarrow R-CH_2NH_2$
126.	Silver salt RCOOAg	$Br_2/CCl_4/\Delta \rightarrow RBr + CO_2 + AgBr$
127.	$AgNO_3\, NH_4OH$	Same as Tollen's Reagent
128.	$AgBF_4$	It abstract halide ion
129.	$AgOH$/moist Ag_2O	$R_4\overset{+}{N}\bar{X} \rightarrow R_4\overset{+}{N}\bar{O}H$; $RCH=CHR \longrightarrow RCH(OH)-CH(OH)-R$ (Anti addition) Used in Arndt Eistest reaction as one of the reagent to convert $RCO_2H \rightarrow RCH_2CO_2H$
130.	SO_3	
131.	$SOCl_2$	$R-\underset{\underset{O}{\|}}{C}-OH/R-OH \longrightarrow R-\underset{\underset{O}{\|}}{C}-Cl/R-Cl$
132.	SO_2Cl_2	$R-H \rightarrow RCl$

133.	Swern Reagent	$R—CH_2OH \rightarrow RCH=O$, $R_2CHOH \rightarrow R_2C=O$
134.	Tollens Reagent	—CH=O → $—CO_2^-$ + Ag (Shining silver mirror) ketone gives -ve test; α- hydroxy ketone gives +ve test also PhNOH, HCO_2H gives positive test & it is used to distinguish (i) —CH=O vs —C(=O)—R (ii) HCO_2H vs other acid
135.	Tosyl Chloride	—OH → —OTs bad L.G. converted into good L.G. (L.G. = leaving group) Also it used to protect the ring from oxidation towards HNO_3 + H_2SO_4
136.	Benzene sulfonyl chloride	It is used to detect all types of amine group ref : Hinsberg Test Also it is used to separate RNH_2, R_2NH & R_3N
137.	Tetra ethyl lead	Used as antiknowk compound
138.	Trifluoroperacetic acid	
139.	V_2O_5	
140.	Wilkinson Catalyst	Hydrogenation of alkene
141.	Zn + α-haloester	 Aldehyde → β–hydroxyl ester
142.	Zn (dil. ACOH)	 reducing aldehyde not ketone
143.	Zn (Hg) + conc. HCl	>C = O → > CH_2 > C=O system should not contain (—OH; C=C group)
144.	Zeigler Nalta Catalyst	Polymerisation of alkene
145.	Zn dust + NH_4Cl (Aq.)	 Mulliken Barker Test
146.	Zn + NaOH