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All Conversions

i) $-Cl \xrightarrow{aq.KOH} -OH$ (S_N2)

ii) $-OH \longrightarrow -Cl$
i) PCl_5 (S_N2)
ii) PCl_3 (S_N2)
iii) $ZnCl_2/HCl$ (S_Ni)
iv) $SOCl_2$ (S_Ni)
v) $SeCl_2$ (Pyr) (S_N2)

iii) $-Cl \xrightarrow{K^{\oplus}CN^{\ominus}} -C\equiv N$ (S_N2)

iv) $-Cl \xrightarrow{AgCN} -N\equiv C$ (S_N2)

v) $-\overset{|}{\underset{|}{C}}-\overset{|}{\underset{|}{C}}- \longrightarrow \rangle C=C'\langle$
(i) alc KOH (E_2)
(ii) $HBr/ROOR^{\oplus}$ (Hof)

vi) $-\overset{|}{\underset{|}{C}}-\overset{|}{\underset{|}{C}}-OH \longrightarrow \rangle C=C'\langle$
(i) H_2SO_4 or H_3PO_4 / Δ (E_1) (ii) $Al_2O_3, P_2O_3, POCl_3$ (E_2)
(iii) ThO_2 (E_1cb) $\xrightarrow{\Delta}$

vii) $-C\equiv N \longrightarrow -CH_2-NH_2$
(i) $2H_2$ / Pd (ii) $LiAlH_4$

viii) $-C\equiv N \xrightarrow[(Full\ Hydro)]{2H_2O/\Delta} -C-OOH$

ix) $-C\equiv N \xrightarrow[(Part\ Hal)]{H_2O} -CONH_2$

x) $-CONH_2 \longrightarrow -CH_2NH_2$ (i) H_2 Pd (ii) $LiAlH_4$

xi) $-CONH_2 \xrightarrow[KOH]{Br_2} -NH_2$ (Hoffman Bromide Degradation)

xii) $R-NH_2 \xrightarrow[(NaNO_2+HCl)]{HNO_2} R-OH$ (Diazotization)

xiii) $Ar-NH_2 \xrightarrow[ii)\ Warm\ H_2O]{i)\ HNO_2\ (0-5^{\circ})} Ar-OH$ (Diazotization)

xiv) $-N_2Cl \longrightarrow -Cl$ i) Cu_2Cl_2 (Sand.) ii) Cu/HCl (Gattle)

xv) $-N_2Cl \longrightarrow -Br$ (i) Cu_2Br_2 (ii) Cu/HBr

xvi) $-N_2Cl \xrightarrow[ii)\ HBF_4]{i)\ NaBF_4} -F$ (Balz Schiman)

xvii) $-N_2Cl \xrightarrow{Cu(CN)_2} -CN$ (Sandmeyer)

xviii) $-CHO \xrightarrow{[O]} -COOH$
i) $KmnO_4(H^+)$ (ii) $K_2Cr_2O_7(H^+)$ (iii) $CrO_3(H_2SO_4)$ Acetone (Jones)
(iv) HNO_3
v) Tollen vi) Fehling vii) Benedicts

xix) $-CHO \xrightarrow{2[H]} -CH_2OH$
i) H_2 Pd ii) LAH iii) SBH

xx) $-CH_2OH \longrightarrow -CHO$
i) PCC ii) PDC iii) Collins iv) Cu/300° v) MnO_2 (Allylic) vi) NBS

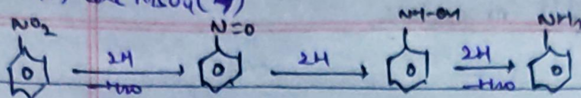
xxi) $-CH_2OH \longrightarrow -COOH$
i) $KmnO_4(H^+)$ ii) CrO_3 + H_2SO_4 (Acetone), iii) $K_2Cr_2O_7$

xxii) $-COOH \xrightarrow{LiAlH_4} -CH_2-OH$ (Red)

xxiii) $-NO_2 \longrightarrow -NH_2$

i) Sn/HCl ii) H_2Pd iii) Fe/HCl iv) LAH

v) Conc H_2SO_4 (?)



xxiv) $>C=O \longrightarrow >CH_2$

(i) NH_2-NH_2 / KOH (Wolff Kishner) (Base) *

~~(ii) Zn(Hg)/HCl (Clemmensen Redn)~~ *(Acid)

xxv)

$-CHO \xrightarrow[(Ag_2O)]{\text{(Tollens Test)}} -COOH + Ag\downarrow$ (Silver mirror Test)

xxvi)

$-COOH \xrightarrow{NH_3} -CONH_2$

$-COO^{\ominus}\overset{\oplus}{N}H_4 \xrightarrow[\Delta]{-H_2O} -\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{P_2O_5} -C\equiv N$

xxvii) $Ar-C(\alpha H) \xrightarrow[K_2Cr_2O_7]{KMnO_4/H^+ \text{ or}} ArCOOH$

xxviii) $Ar-OH \xrightarrow{\text{Zn dust}} Ar-H$

xxix) $>C=C< \xrightarrow[\text{Ozonolysis}]{\text{Reductive}} >C=O + O=C<$

O_3 / $Zn\,H_2O$ / PPh_3 or Me_2S

xxx) $>C=O \xrightarrow[(4.6,\,-6\,pH)]{NH_2-Z} >C=N-Z$ (Z = Cl, SO_3H, OH, Ar)

Z = H_2N–⟨benzene⟩–NO_2, NO_2 (Brady's Reagent) 2-4 DNP

xxxi) $CH_3-CHO \xrightarrow[\text{(Aldol Rxn)}]{OH^{\ominus}} CH_3-\underset{OH}{\underset{|}{CH}}-CH_2-CHO$

$\downarrow \Delta$ (Aldol Conden^n)

$CH_3-CH=CH-CHO$

xxxii) (Cannizaro) $H-CHO \xrightarrow[\text{Conc (50\%)}]{NaOH} CH_3OH + HCOONa$

xxxiii) $Ar\overset{\oplus}{N_2}-Cl^{\ominus}$ + Ar-OH $\xrightarrow[\text{(Diazo)}]{\text{Coupling}}$ Ar–N=N–Ar-OH

(Deactivated) (Activated) orange

xxxiv) $-CHO \longrightarrow -COONa + Cu_2O$

i) Fehling ii) Benedicts

xxxv) $R-X + R'-ONa \xrightarrow[\text{(Low Temp)}]{(S_N2)} R-OR' + NaX$

(Williamson Ether Synthesis)

xxxvi) Ether $\xrightarrow{H^{\oplus}}$ (3° or Reso) → (+)

(1° or 2°) → (S_N2)

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xxxvii) $-Cl \xrightarrow[\text{Acetone}]{NaI} -I + NaCl\downarrow$ (Finkelstein) (Insoluble in $\succ$=O)

xxxviii) $-Cl \longrightarrow -F$
(Swarts Rxn) (Inorganic Fluorides)

xxxix) $-Cl \xrightarrow{AgNO_2} -NO_2$

XL) $-Cl \xrightarrow{KONO} -ONO$

XLi) $-Cl \xrightarrow{K\overset{\ominus}{C}N} -CN$

XLii) $-Cl \xrightarrow{AgCN} -NC$

XLiii) $2RX \xrightarrow[\text{Dry Ether}]{Na} R-R$ (Wurtz)

Ar-Ar Fittig $\xleftarrow{}$ 2ArX $\rightarrow$ Wurtz Fittig
Cu
(Zn) (Frankland)
R-Ar
(R_2CuLi) (Corey House Synthesis)
Ar-Ar (Ullmann)

XLiv) $RX \xrightarrow[\text{Dry ether}]{Mg} RMgX$

XLv) $RMgX \xrightarrow{H-Z} R-X + Mg\begin{smallmatrix}Br\\Z\end{smallmatrix}$
(Zerevitinoff Rxn)

C → SP Hybr. Carbon
O → H attached to (O)
N → H attached to (N)
S → H attached to (S)
N → H attached to (NO2)
A → Active methylene group $CH_2\begin{smallmatrix}(Z)\\(Z)\end{smallmatrix}$ (Z = EWG)
Q → Quasi Aromatic (NA) → (A)

XLvi) $CH\equiv CH \longrightarrow CH_3CHO$
① $HgSO_4/H_2SO_4/H_2O$ (Kucherov Rxn)
② ~~OMDM~~
③ HBO

XLvii) $RMgX \xrightarrow[H^{\oplus}]{CO_2} RCOOH$ (Carbon chain length ↑)

XLviii)
$-COOH \longrightarrow -COCl$
① PCl_3
② PCl_5
③ $SOCl_2$

XLix) $R-COONa \xrightarrow[CaO]{NaOH} R-H$ (Sodalime Decarboxylation)

L) $RCH_2COOH \xrightarrow[Cl_2]{\text{Red P}} \underset{\substack{|\\Cl}}{RCH}-COOH$
(HVZ)

ii) $>C=C<$ $\xrightarrow[(H_2O)]{O_3}$ $COOH$ (Oxidative ozonolysis)

iii) $-CN \longrightarrow -CHO$

(i) $SnCl_2$ / HCl (ii) H_2O → Stephen Method

(ii) DIBAL-H, H_2O

iv) $-COCl \longrightarrow -CHO$

(i) H_2 Pd / $BaSO_4$ (Rosenmund)
xylene

(ii) DiBALH

v) $-CHO \xrightarrow[\text{or } HCN+KOH]{KCN+H_2CN} -\underset{\underset{CN}{|}}{\overset{\overset{OH}{|}}{C}}-H$