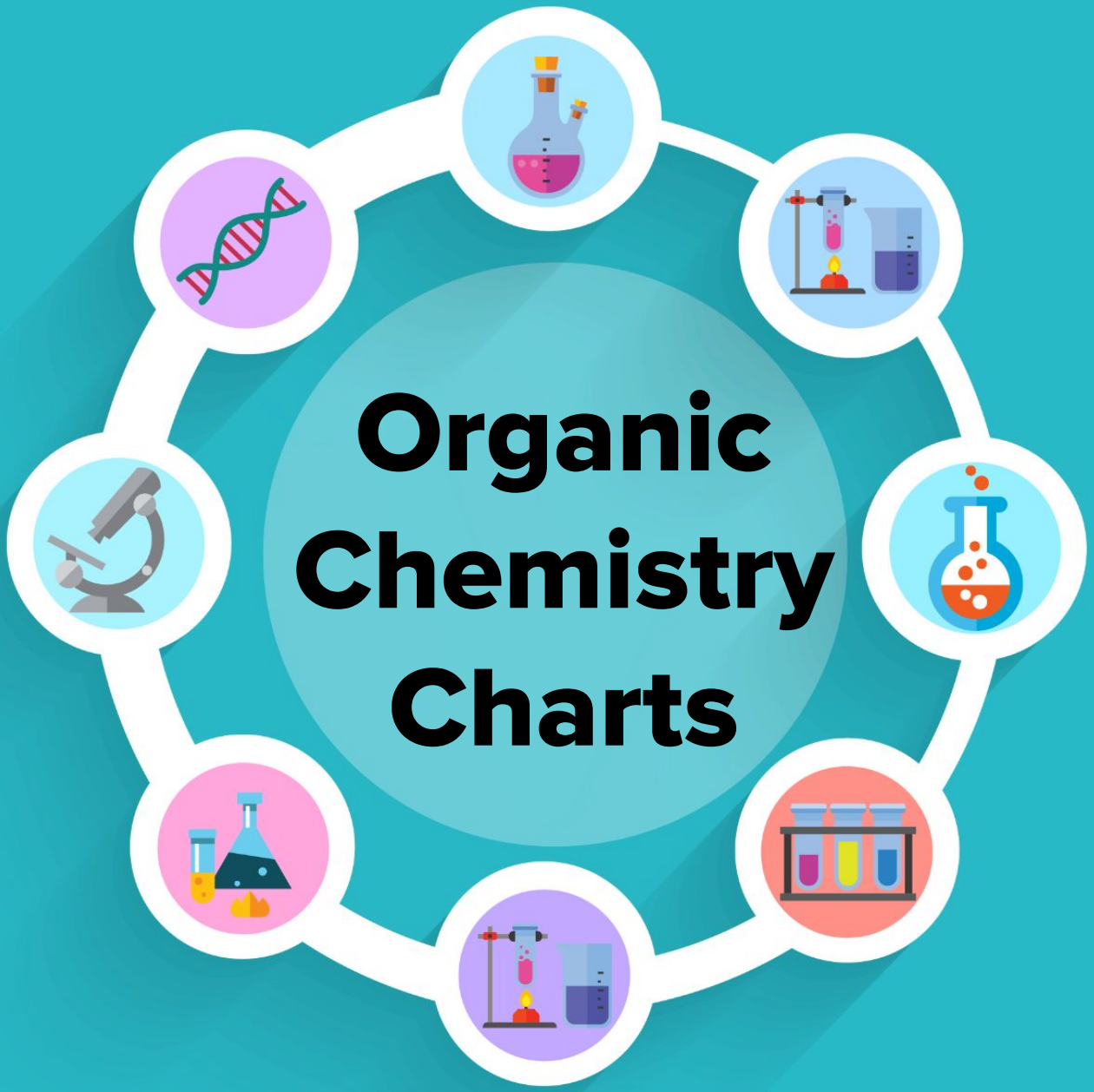
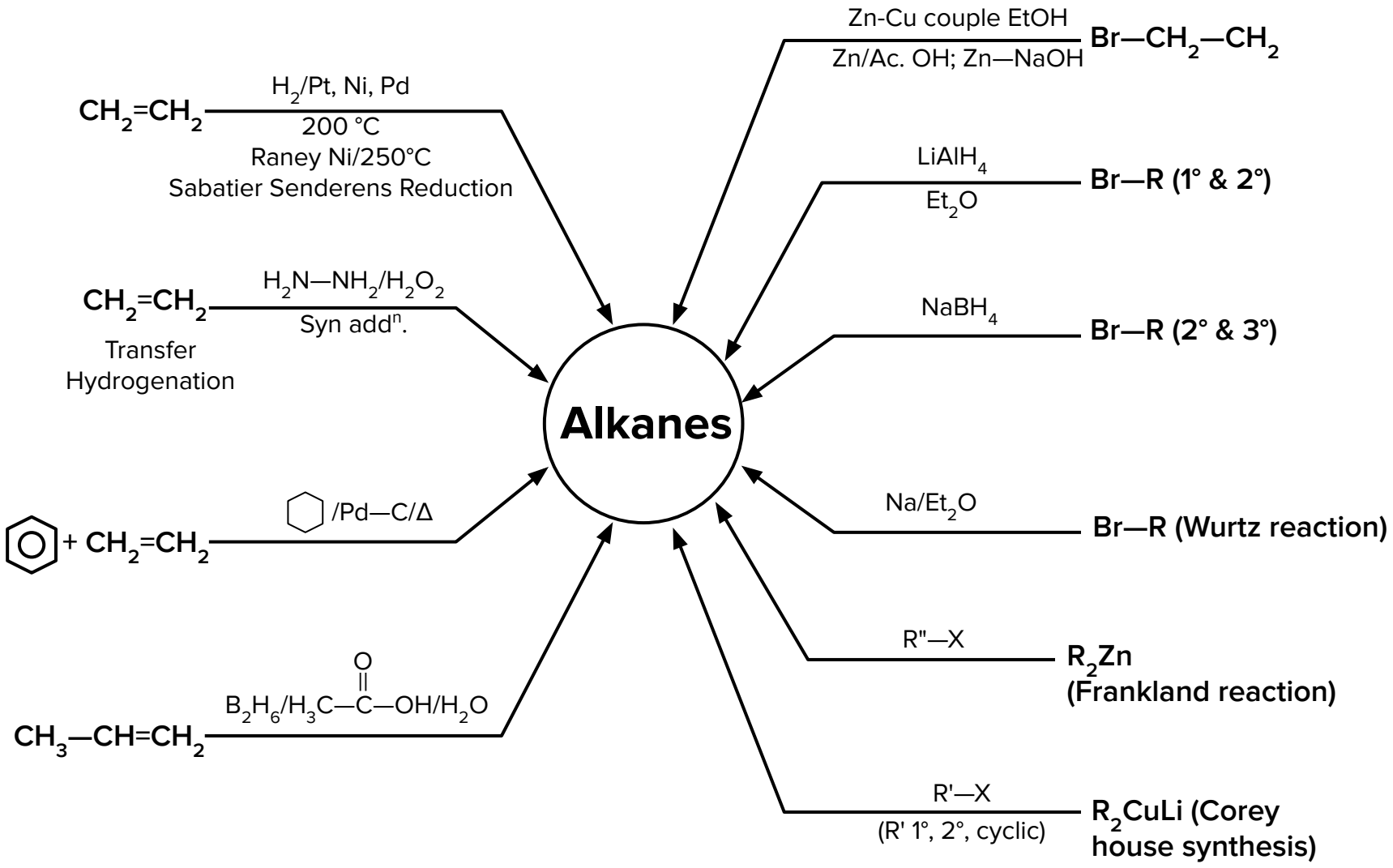
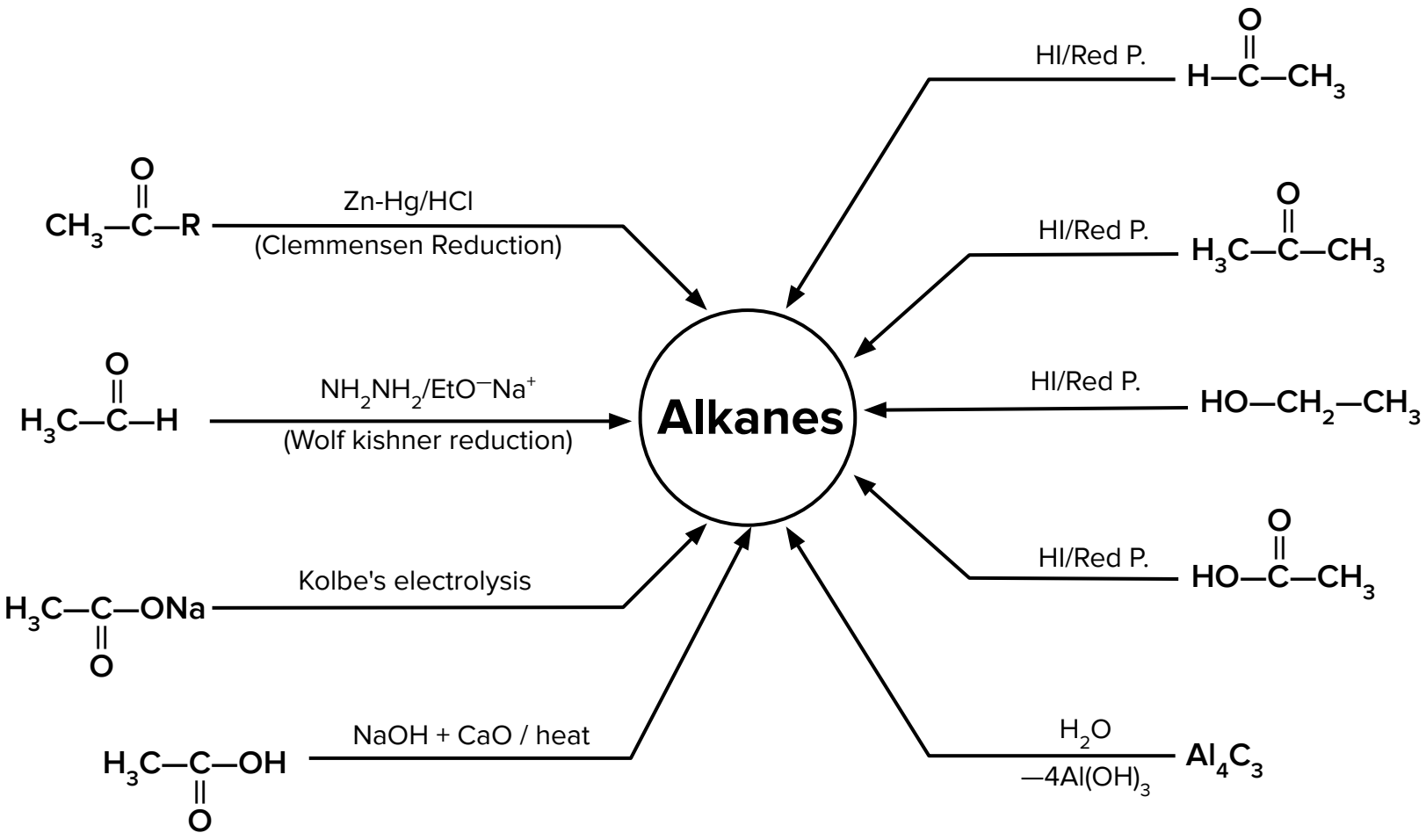



*For all competitive exams (Mains and NEET have lesser reactions in syllabus)*

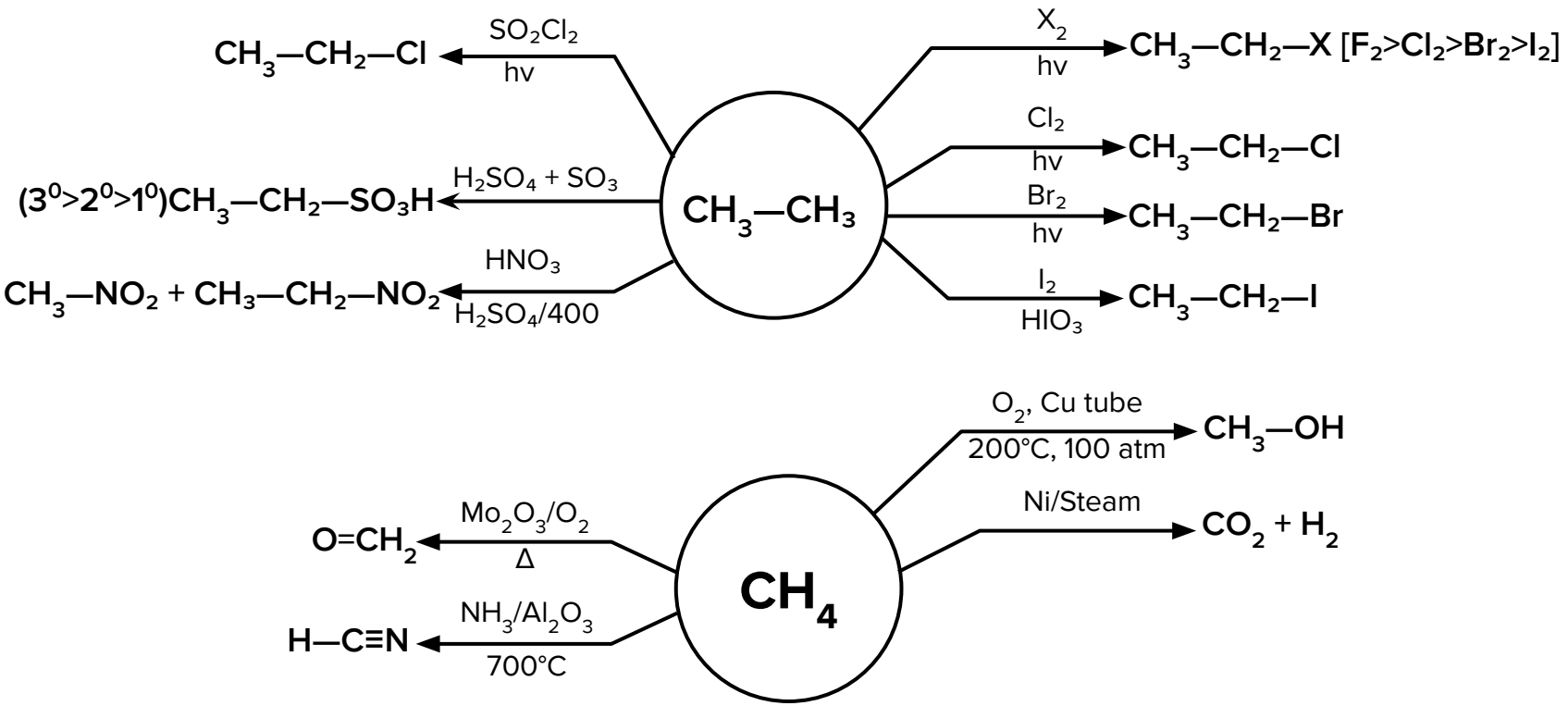
# Preparation of Alkanes



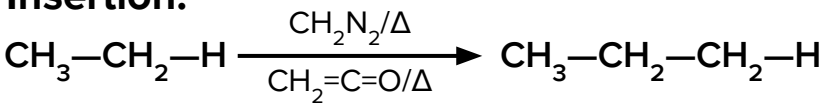
# Properties of Alkanes



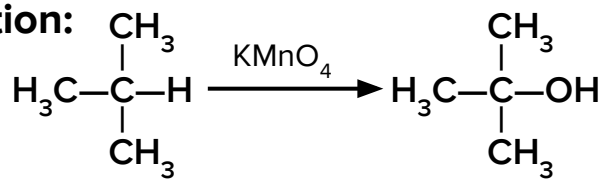
# Properties of Alkanes



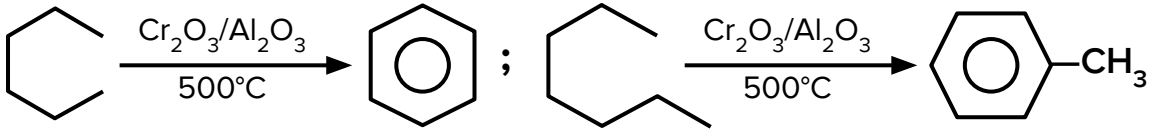

**Insertion:**



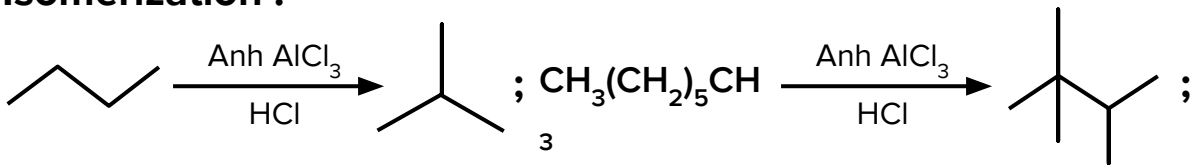

**Oxidation:**



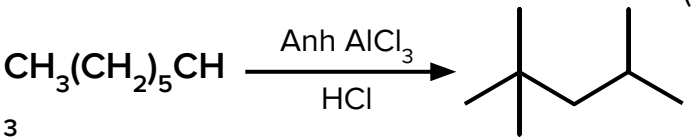
# Properties of Alkanes

**Aromatization:** 


**Isomerization :**




(Triptane) (2,2,3-trimethyl butane)




**Combustion :**

$$C_nH_{2n+2} + \frac{3n+1}{2}O_2 \xrightarrow{\Delta} nCO_2 + (n+1)H_2O$$

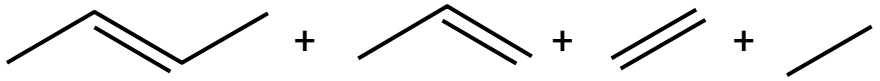
$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

$$CH_3{-}CH_3 + \frac{7}{2}O_2 \longrightarrow 2CO_2 + 3H_2O$$

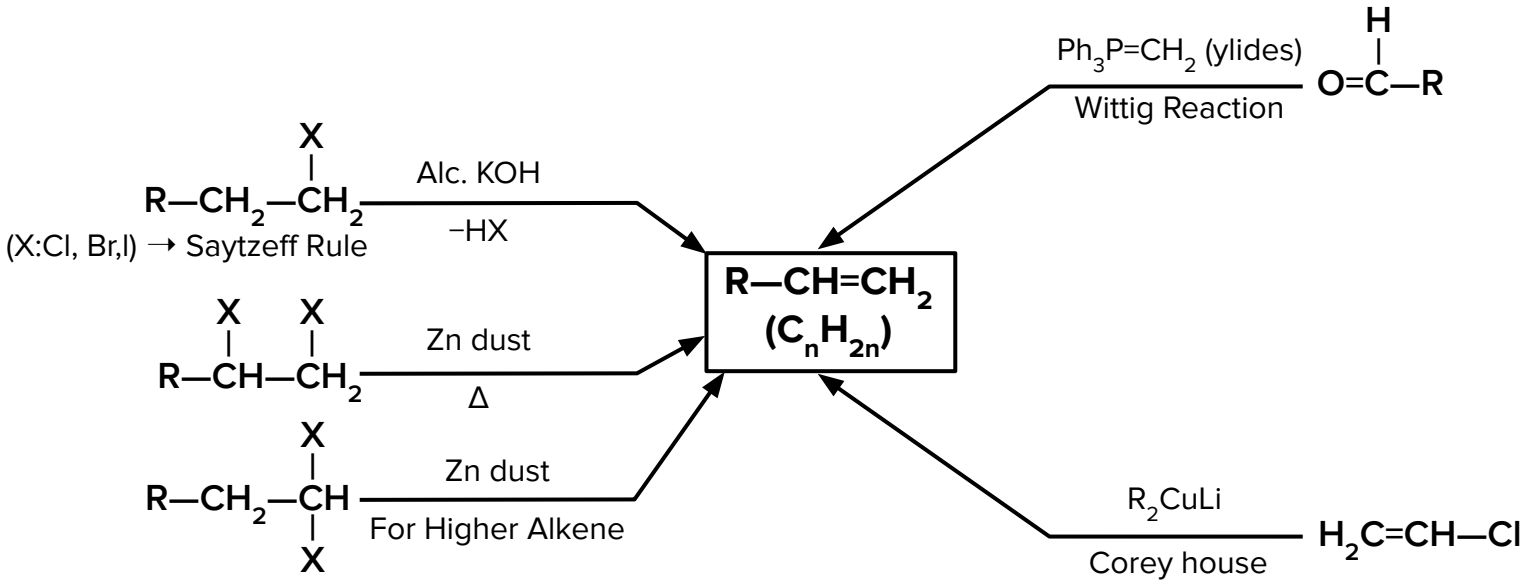
**Pyrolysis :**

$$2CH_3{-}CH_2{-}CH_3 \xrightarrow[600°C]{\Delta} CH_3{-}CH{=}CH_2 + CH_3{-}CH_3 + CH_4 + H_2$$

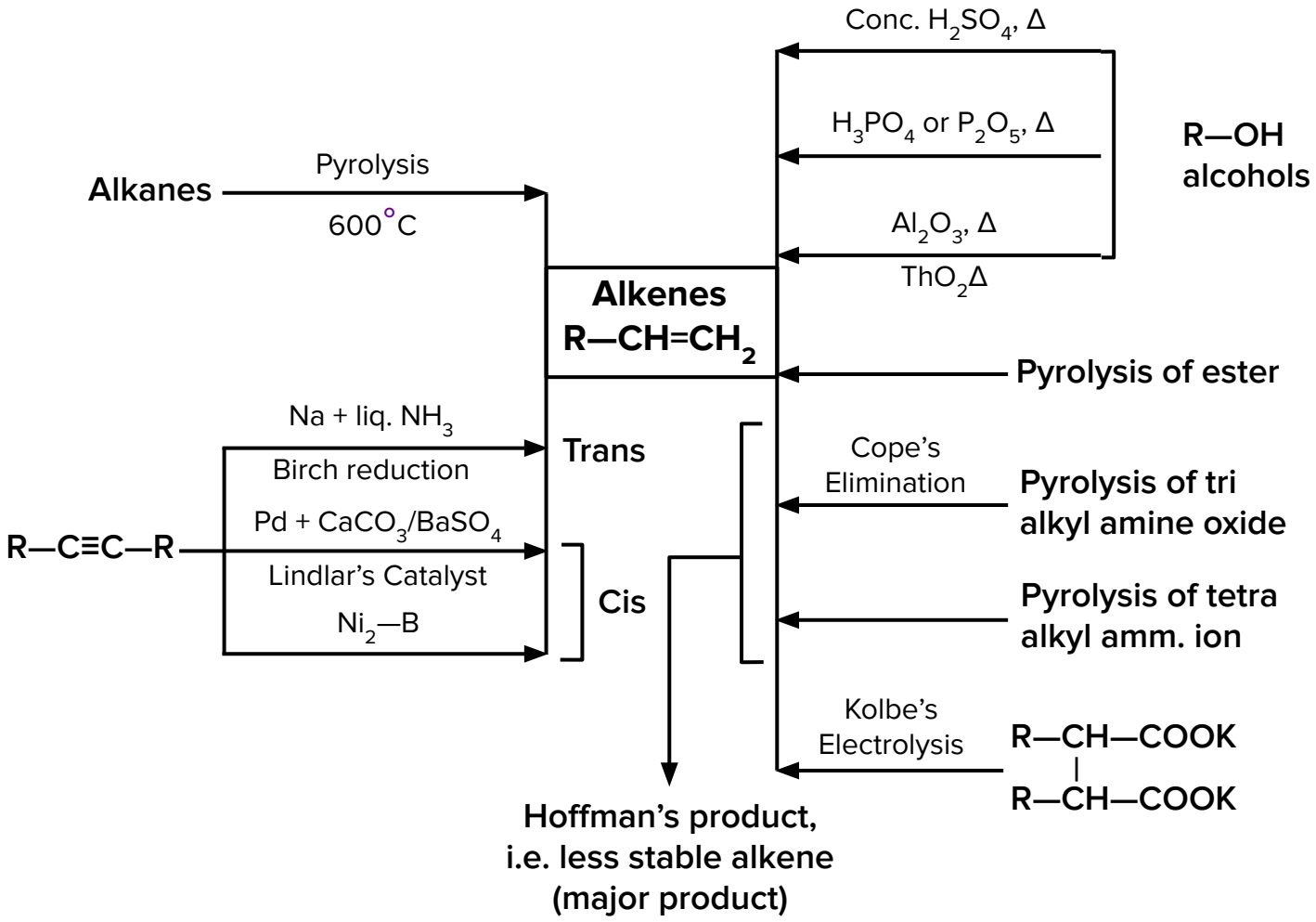
$$CH_3{-}CH_2{-}CH_2{-}CH_3 \xrightarrow[600°C]{\Delta} CH_3{-}CH_2{-}CH{=}CH_2$$



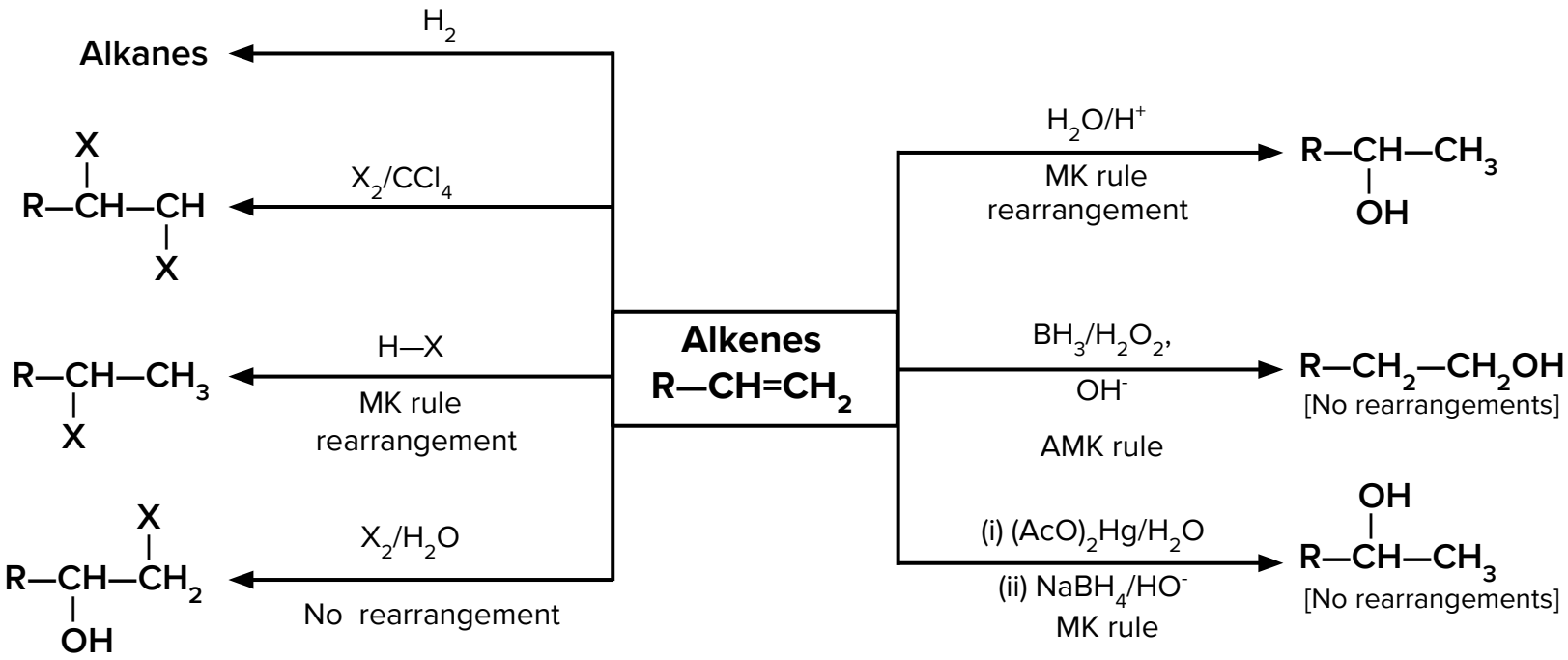
# Preparation of Alkenes



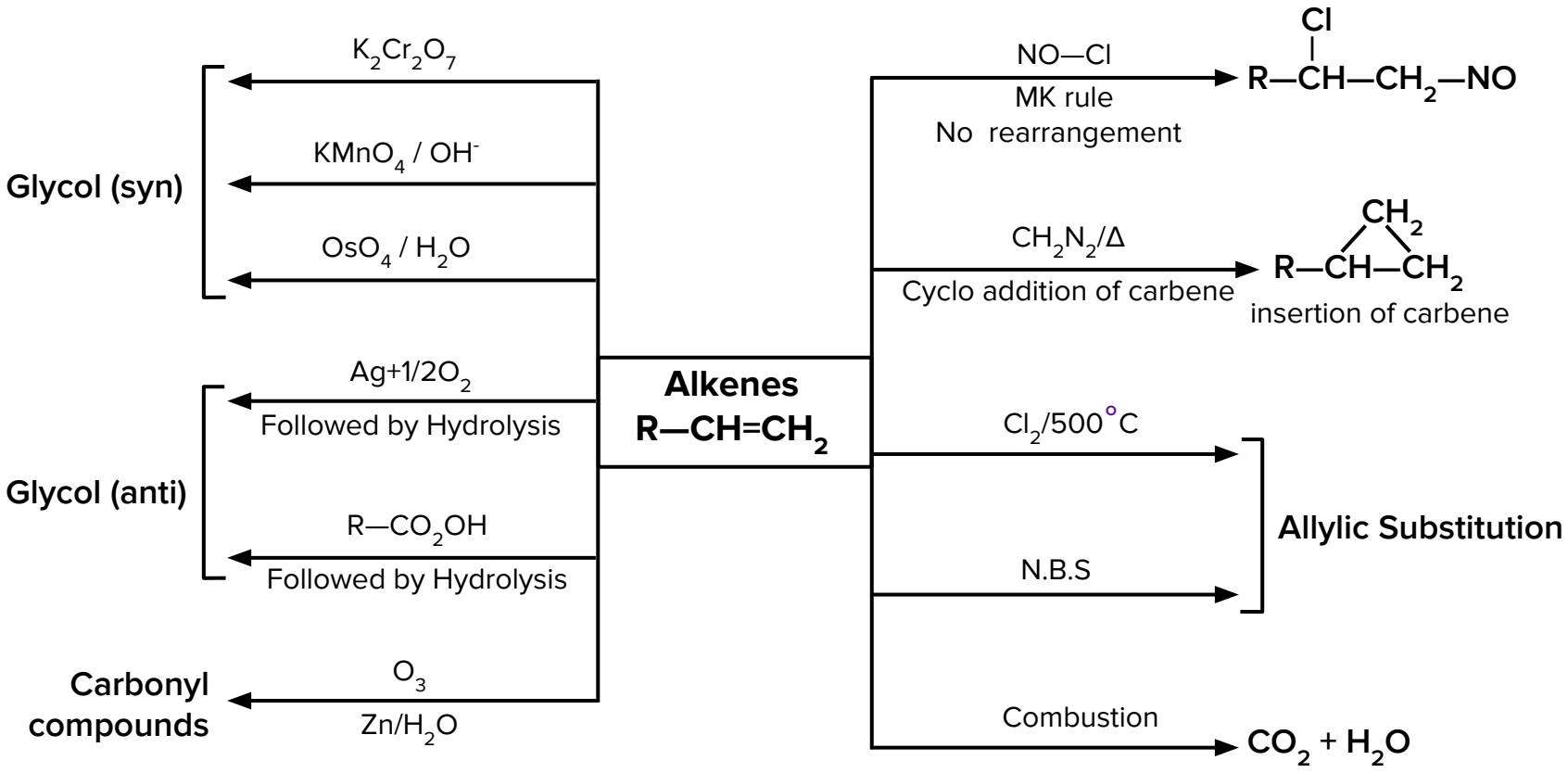
# Preparation of Alkenes



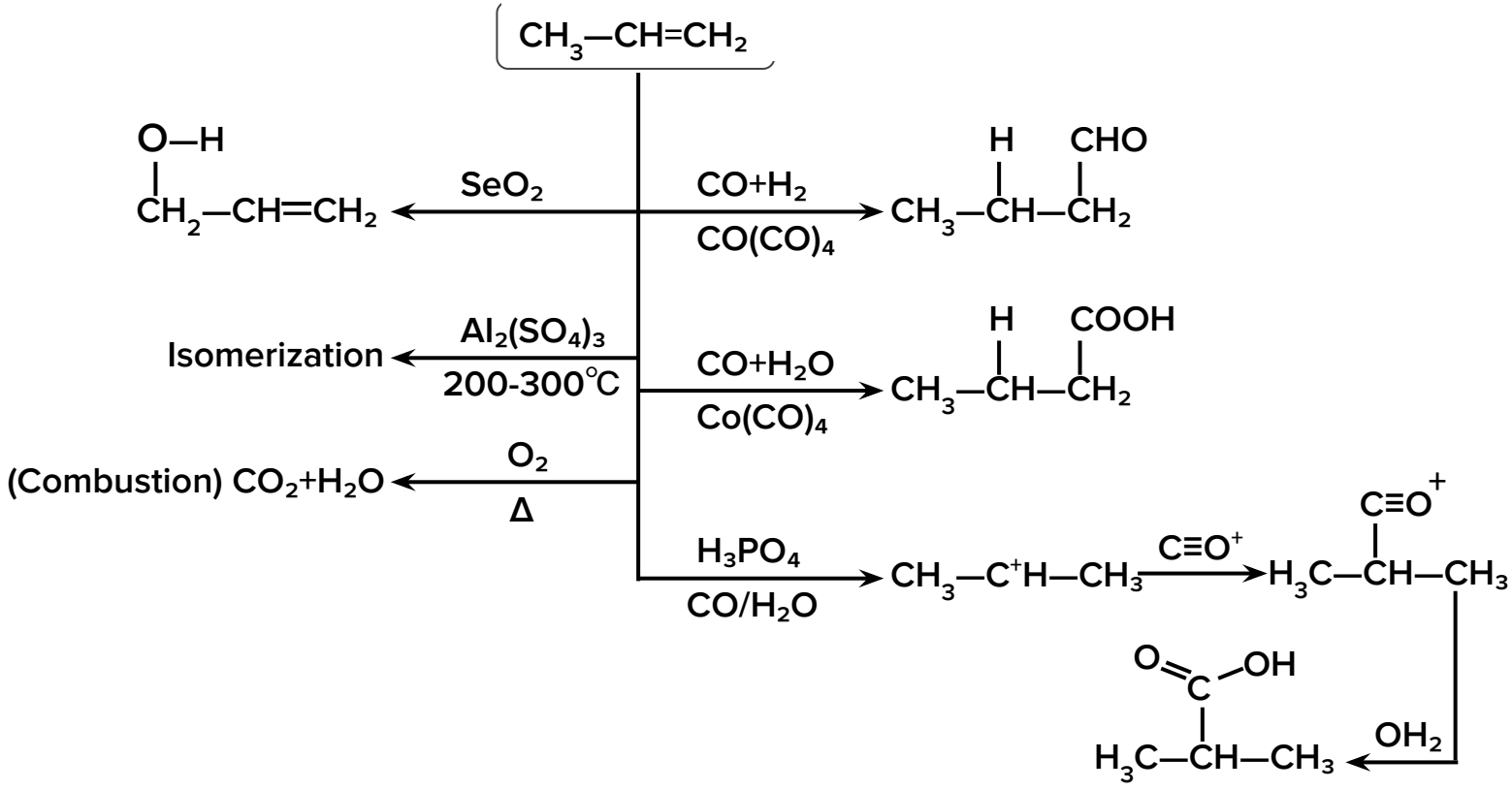
# Properties of Alkenes



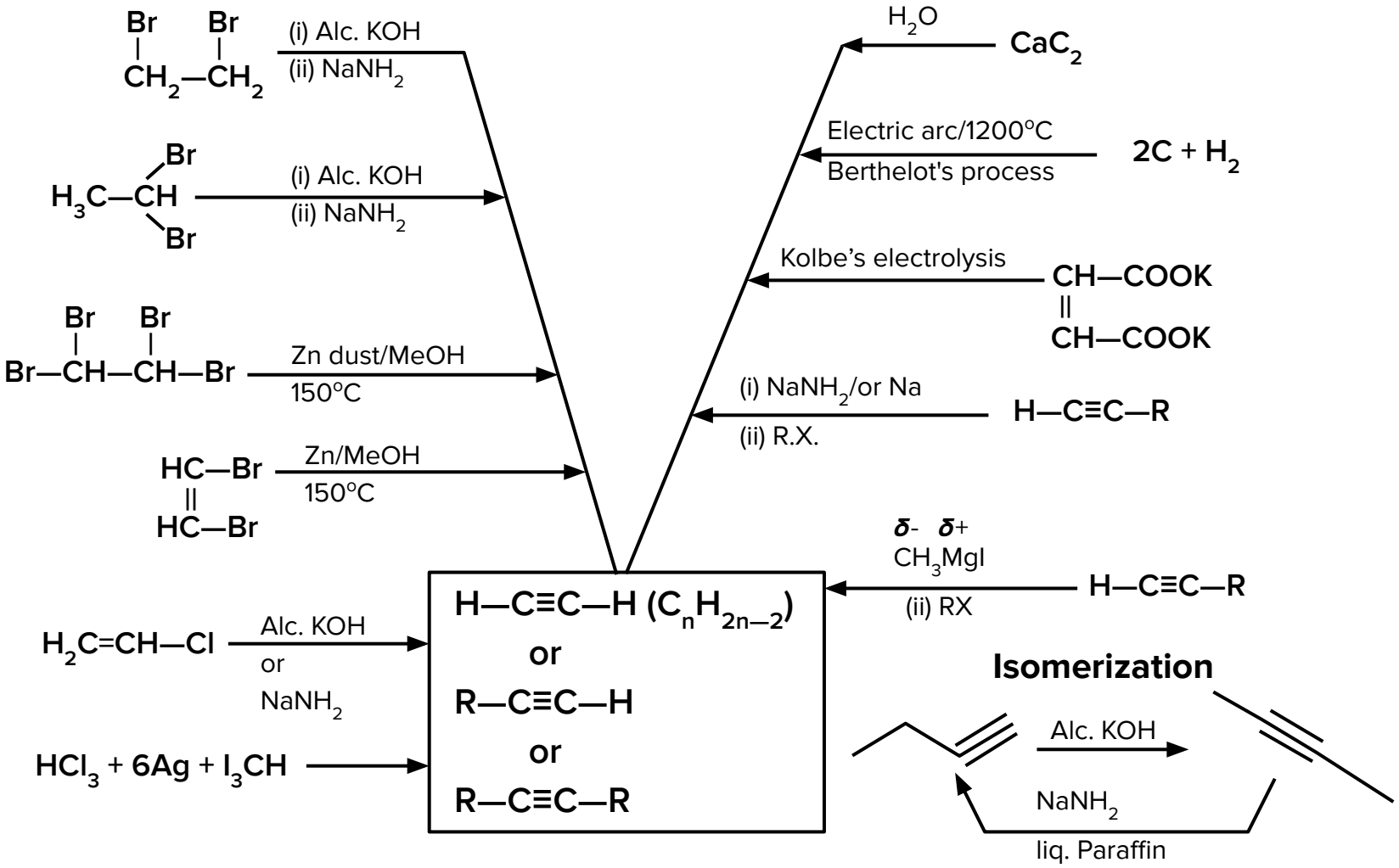
# Properties of Alkenes



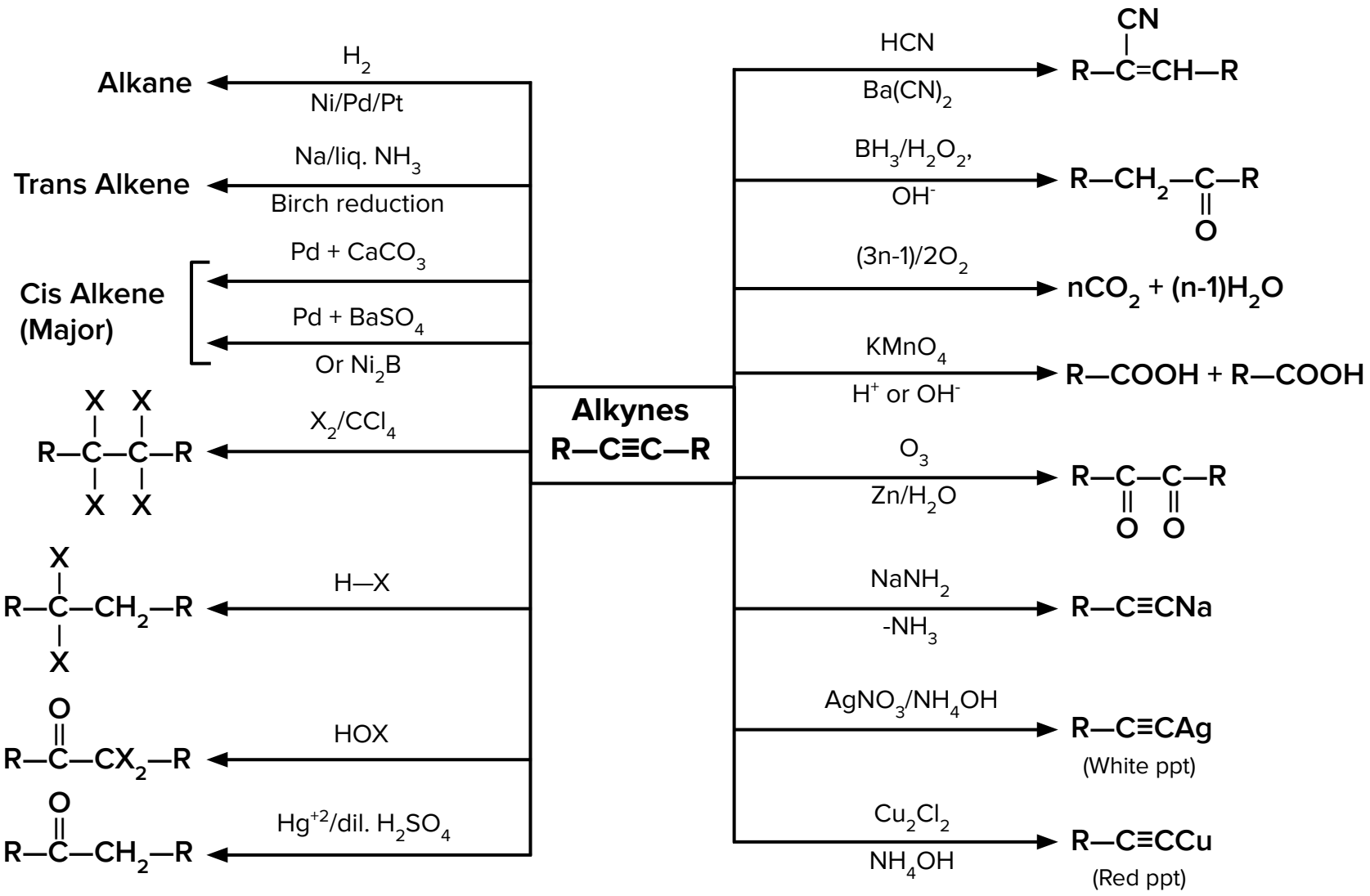
# Properties of Alkenes



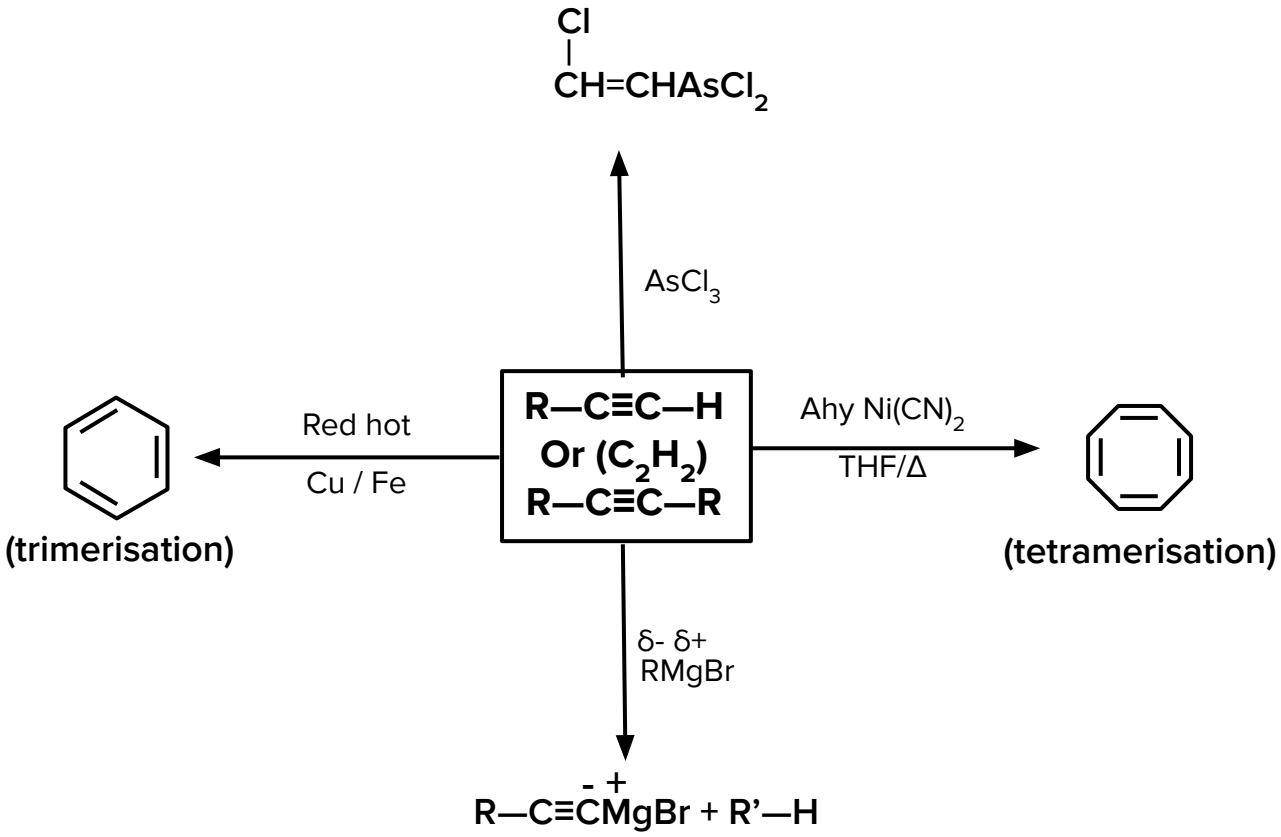
# Preparation of Alkynes



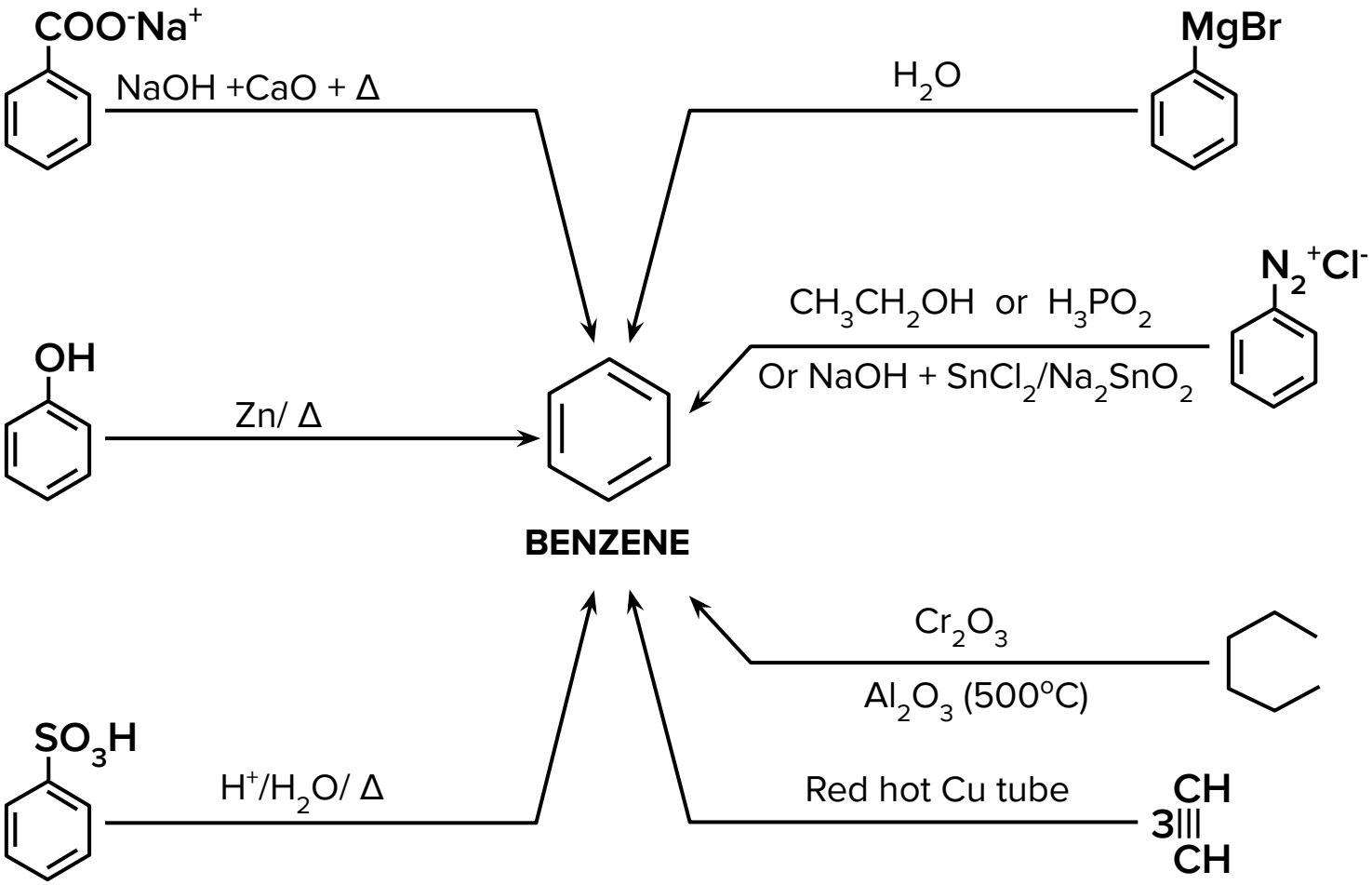
# Properties of Alkynes



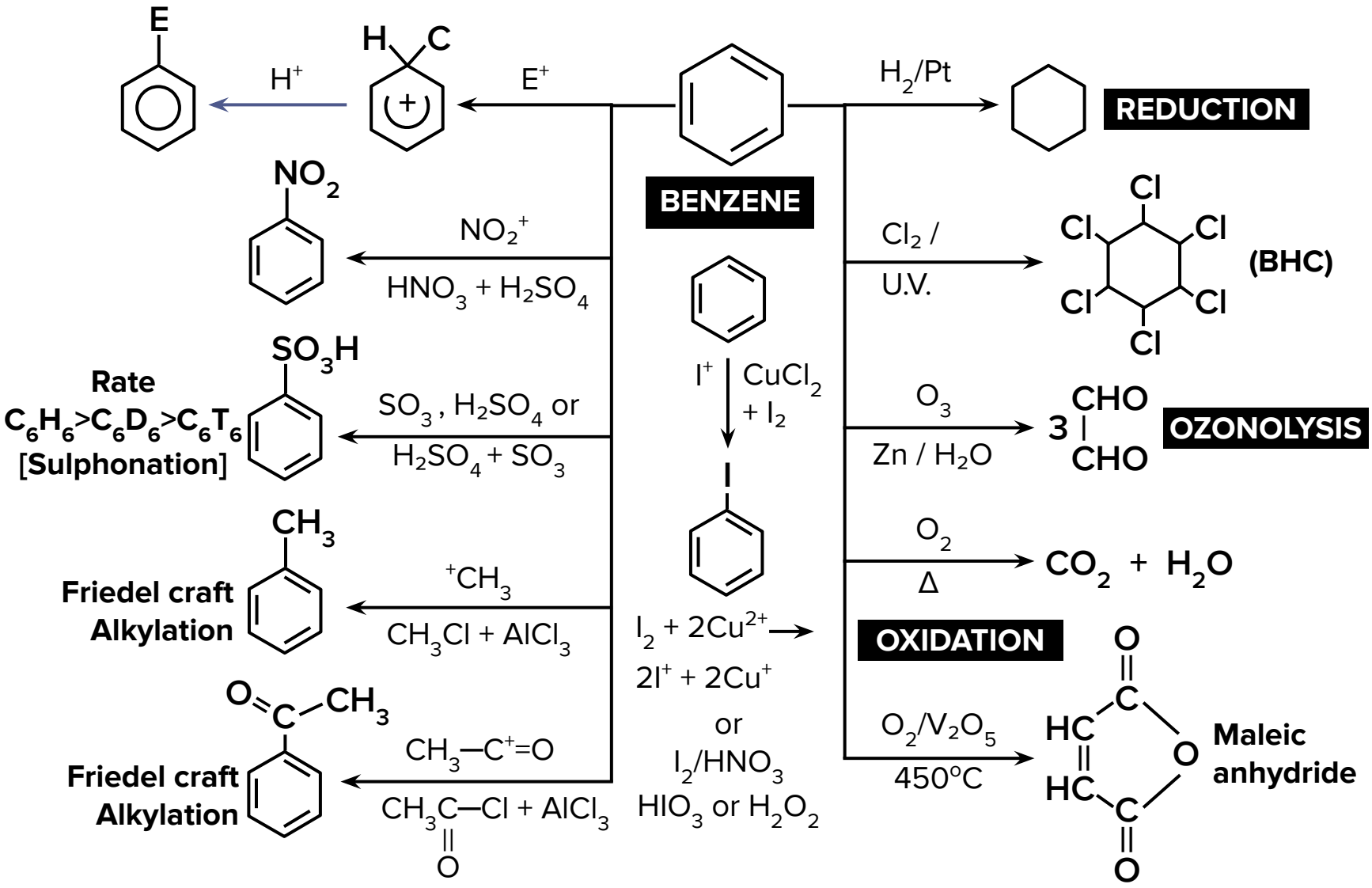
# Properties of Alkynes



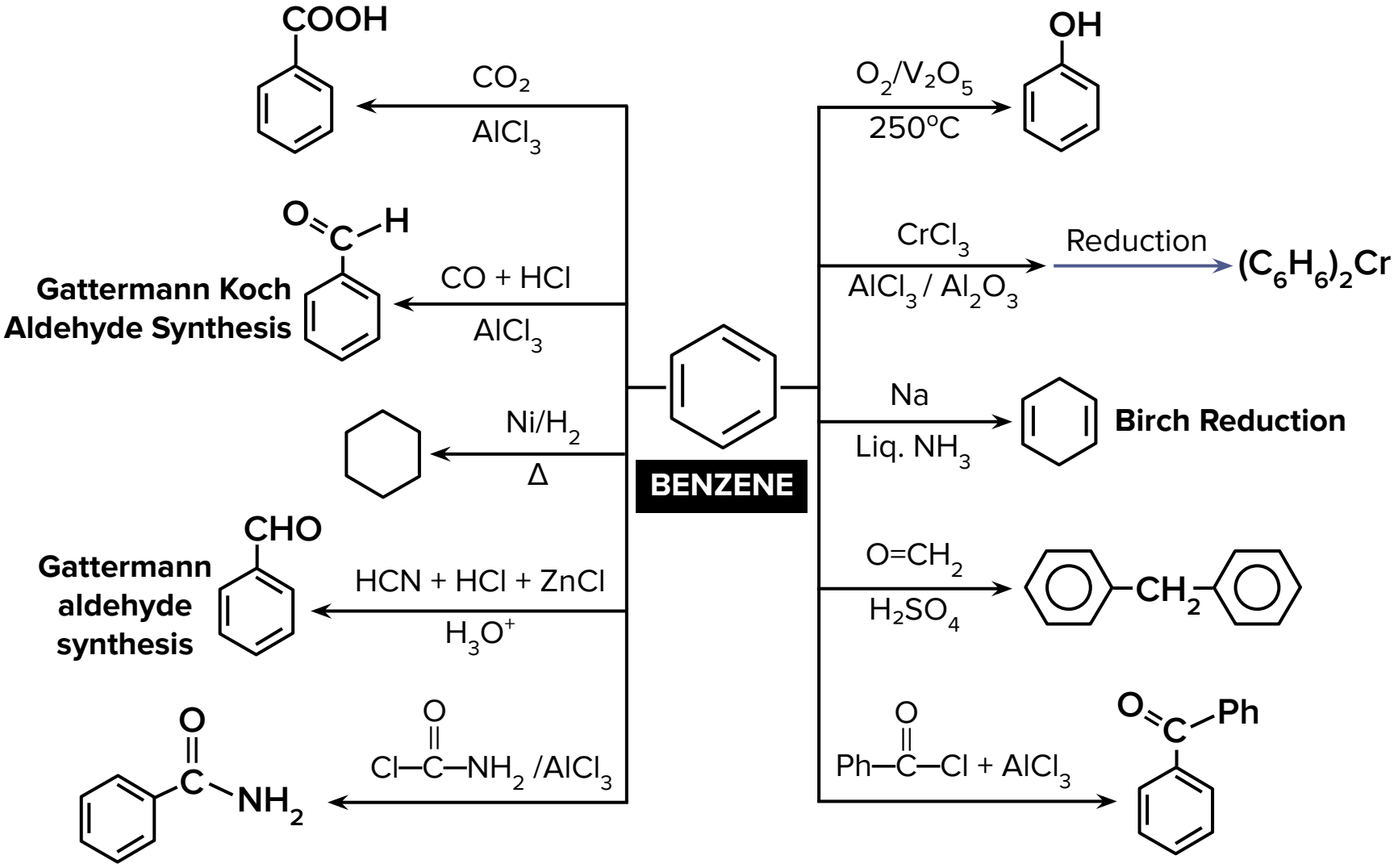
# Preparation of Benzene



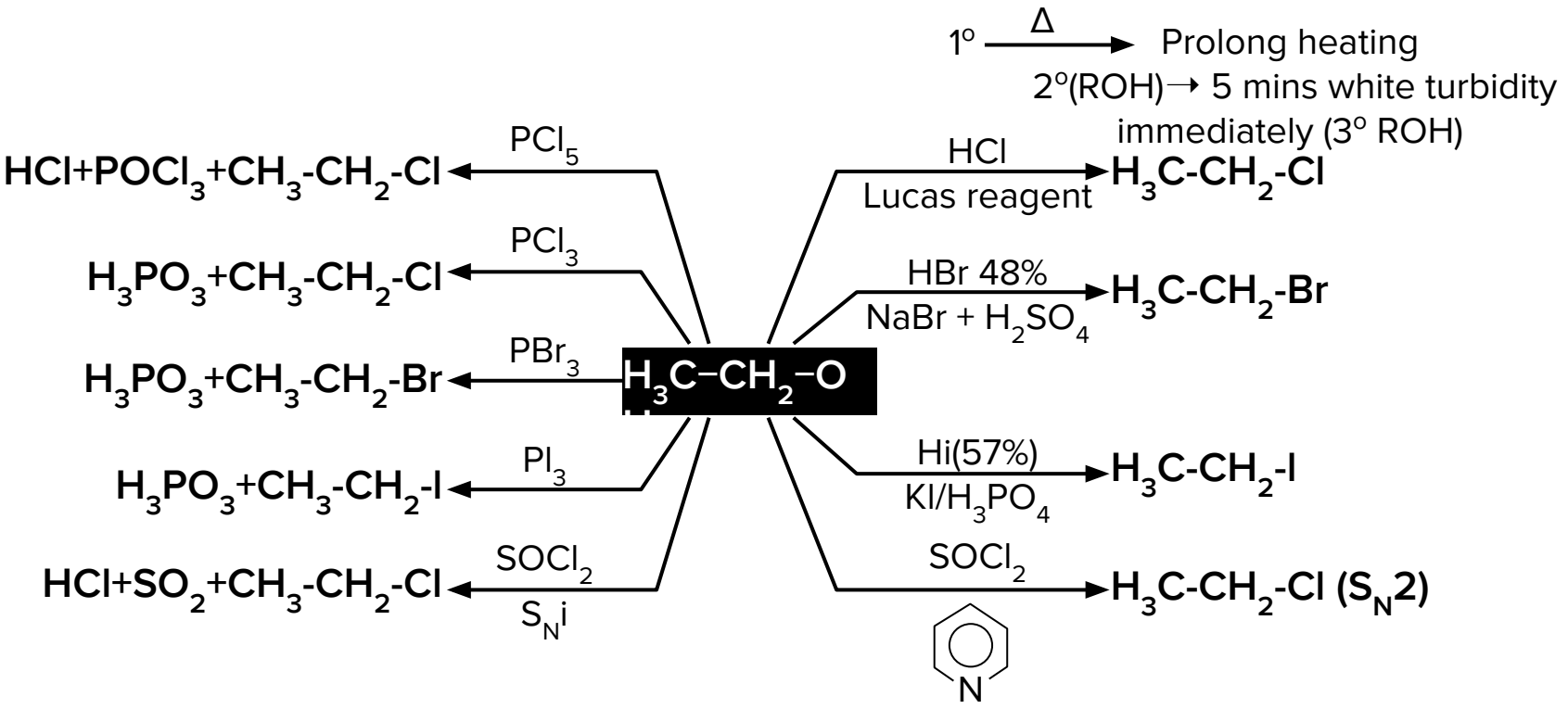
# Properties of Benzene



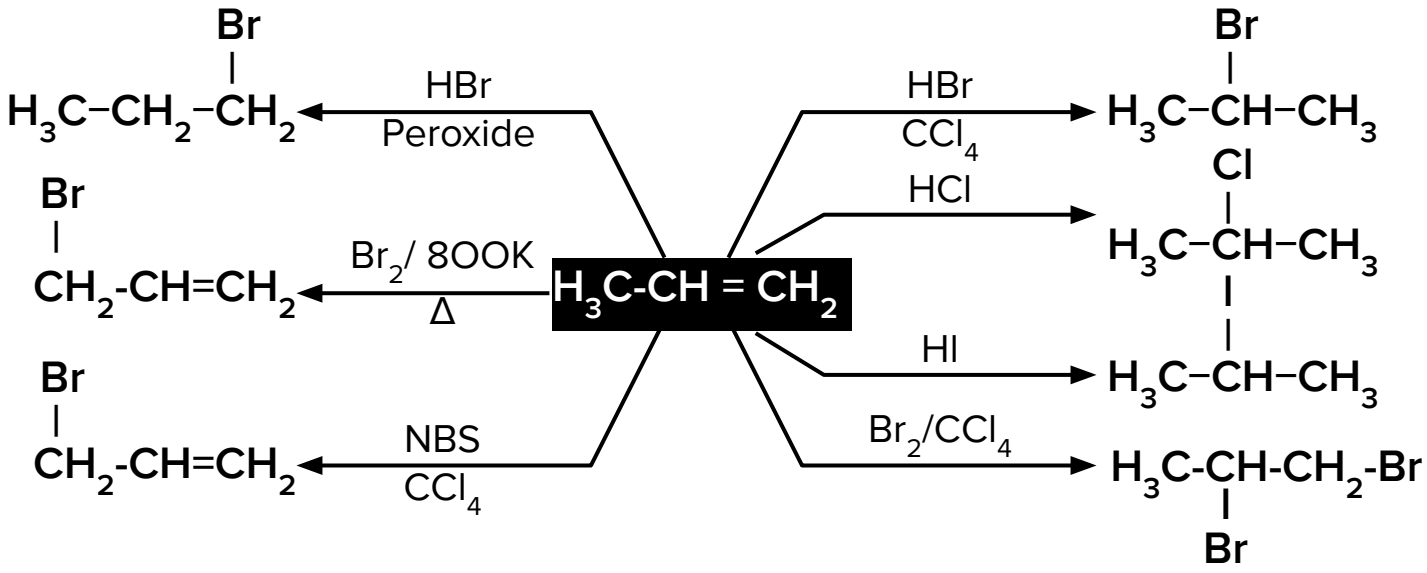
# Properties of Benzene



# Preparation of Haloalkanes



# Preparation of Haloalkanes

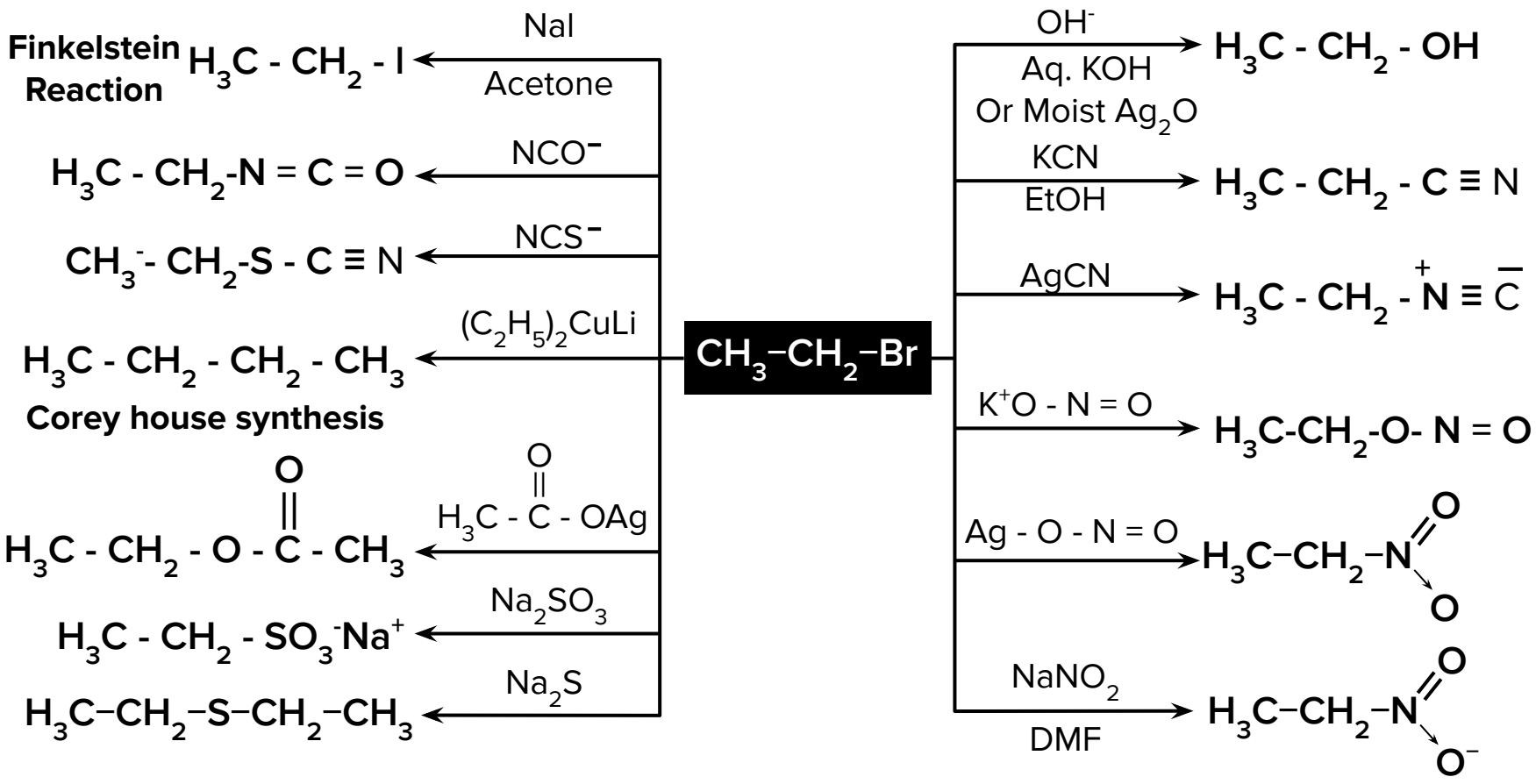



$H_3C–CH_2–H \xrightarrow[h\nu]{Cl_2} H_3C\text{-}CH_2Cl \xrightarrow[Acetone]{NaI} H_3C\text{-}CH_2\text{-}I$ (Finkelstein Reaction)

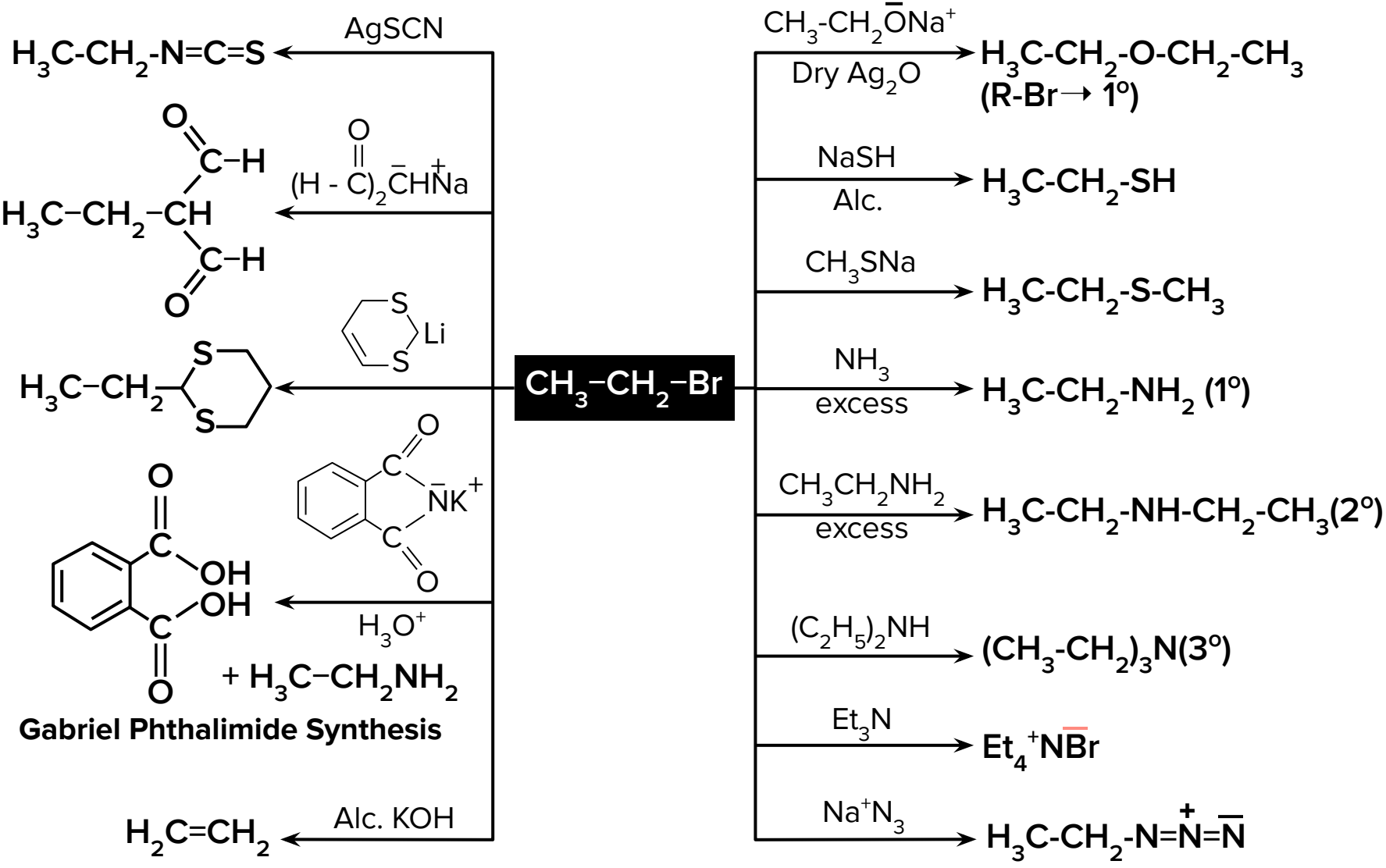
$H_3C–\underset{\underset{O}{\|}}{C}OAg \xrightarrow[CCl_4]{Br_2} H_3C\text{-}Br + CO_2\uparrow + AgBr\downarrow$ (Hunsdiecker Reaction)

$H_3C\text{-}CH_2\text{-}Cl \xrightarrow[\text{or } Hg_2F_2]{AgF} H_3C\text{-}CH_2\text{-}F$ (swarts reaction)

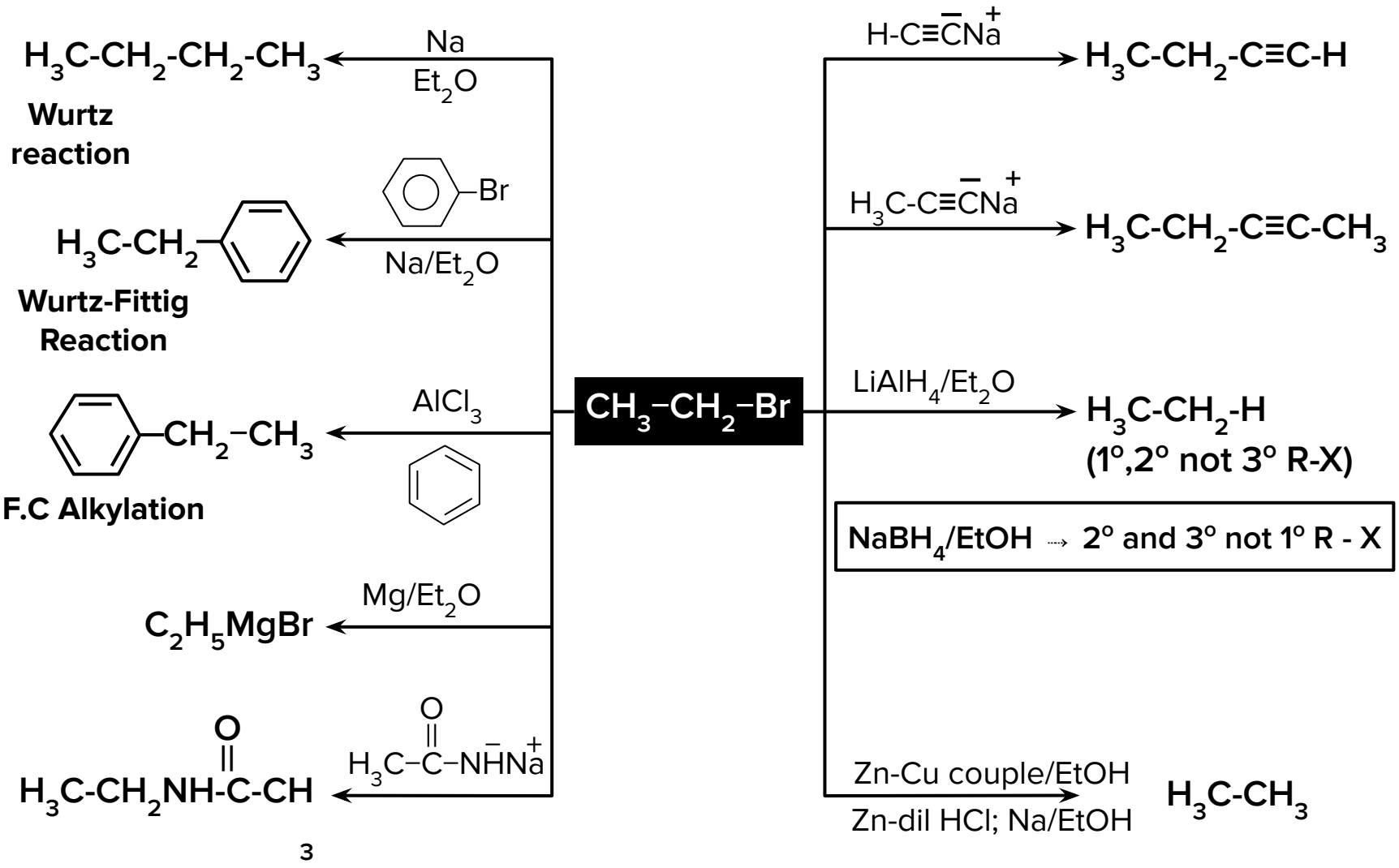
# Properties of Haloalkanes



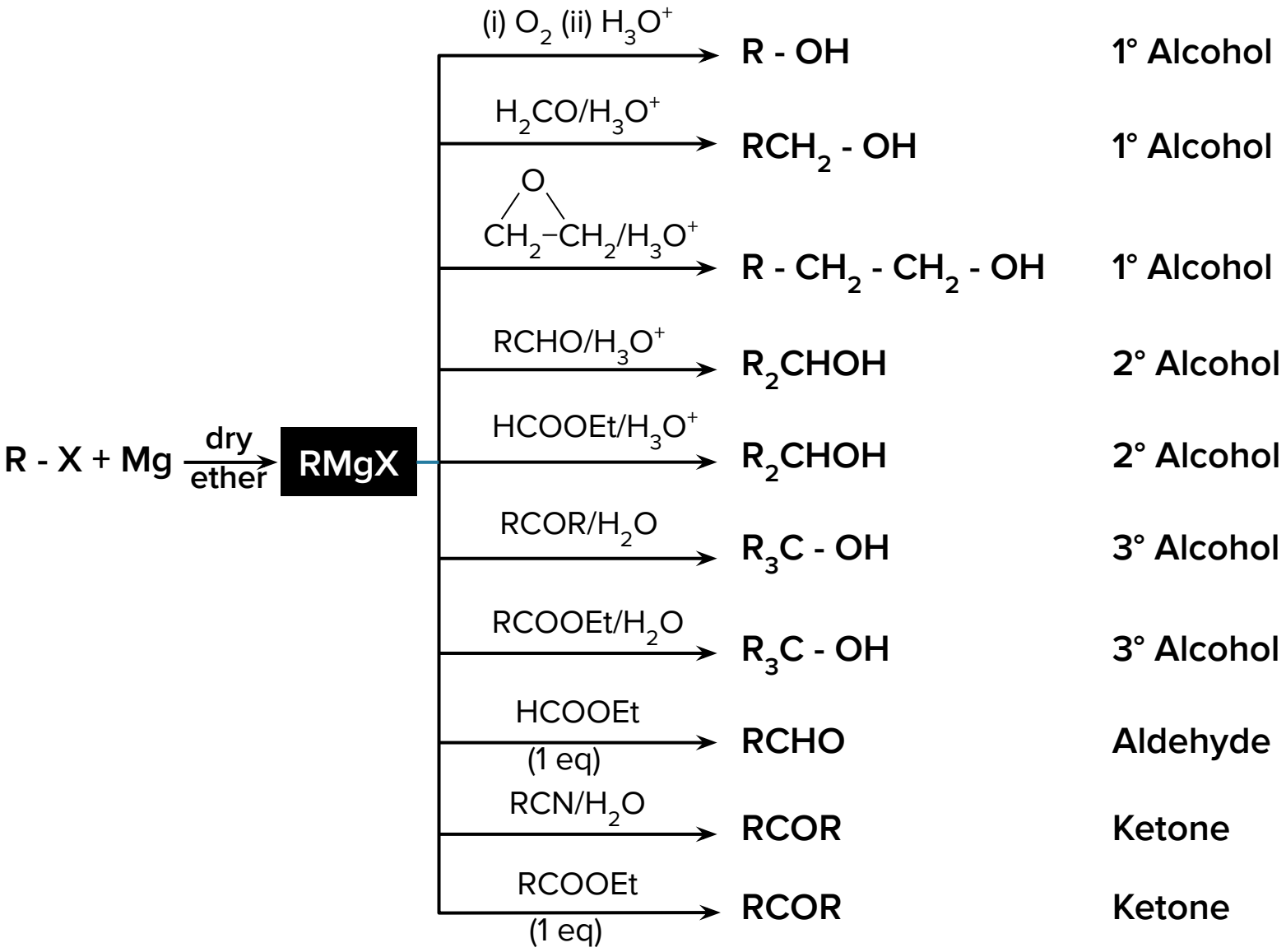
# Properties of Haloalkanes



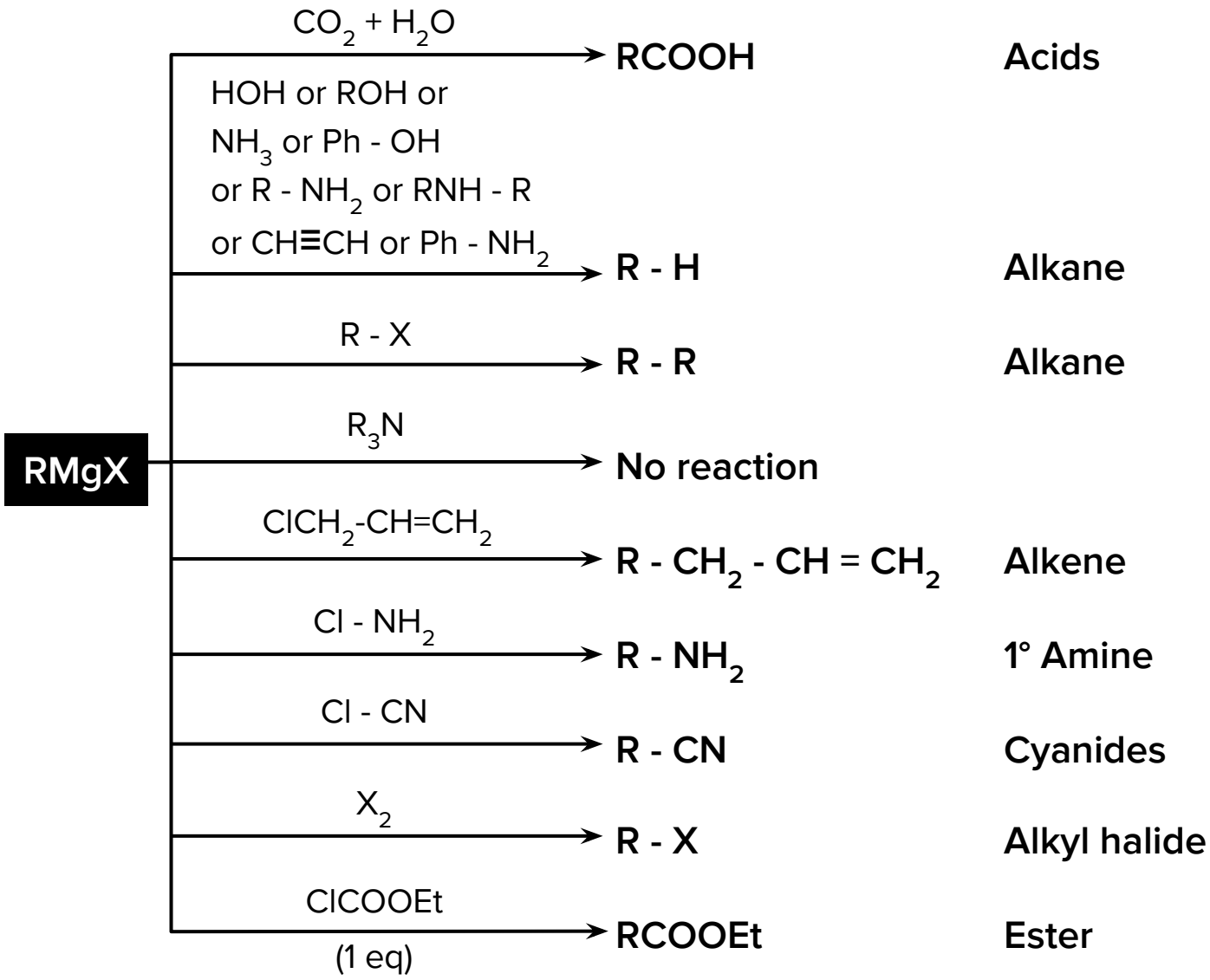
# Properties of Haloalkanes



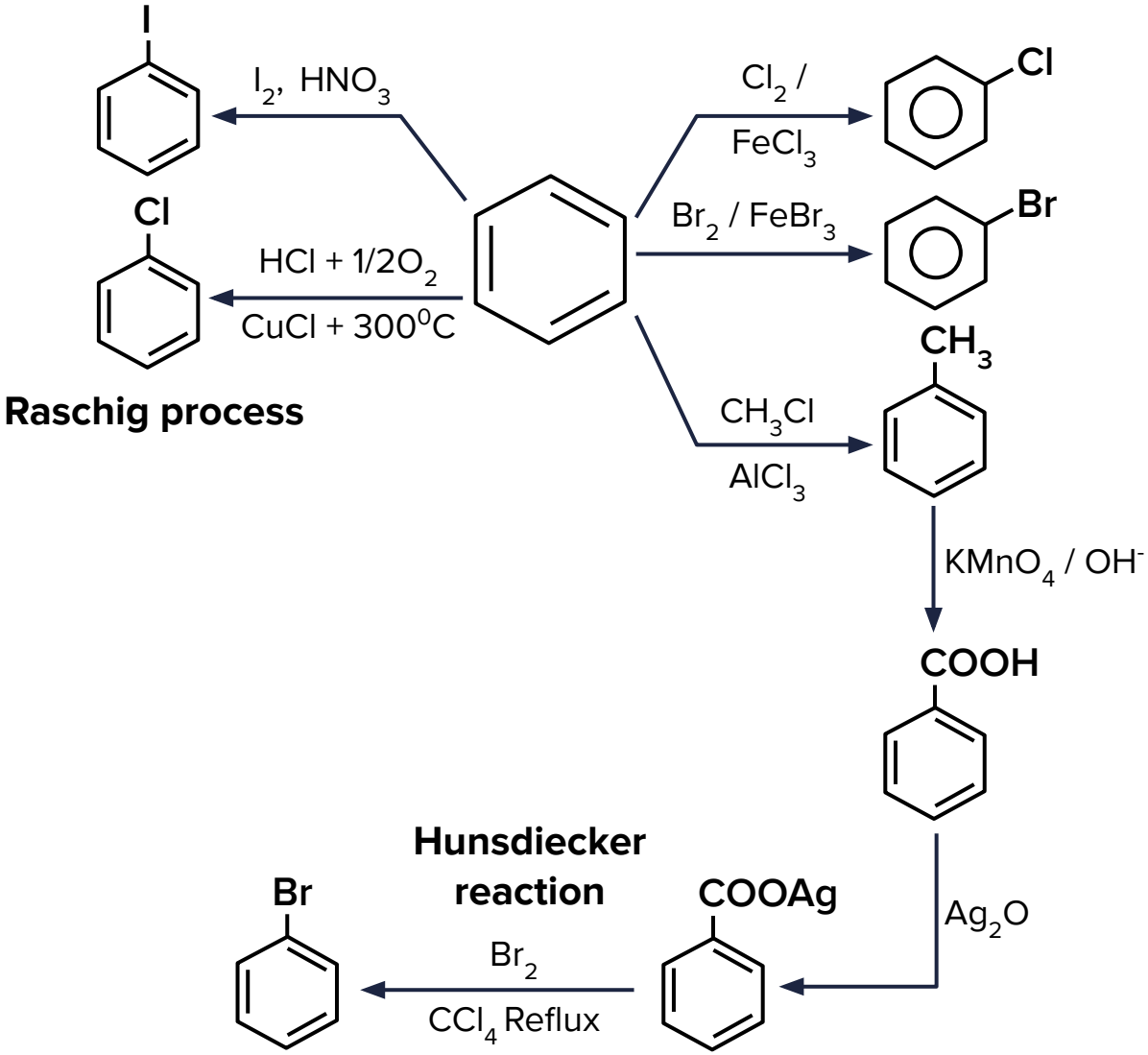
# Preparation & Properties of RMgX (Grignard Reagent)



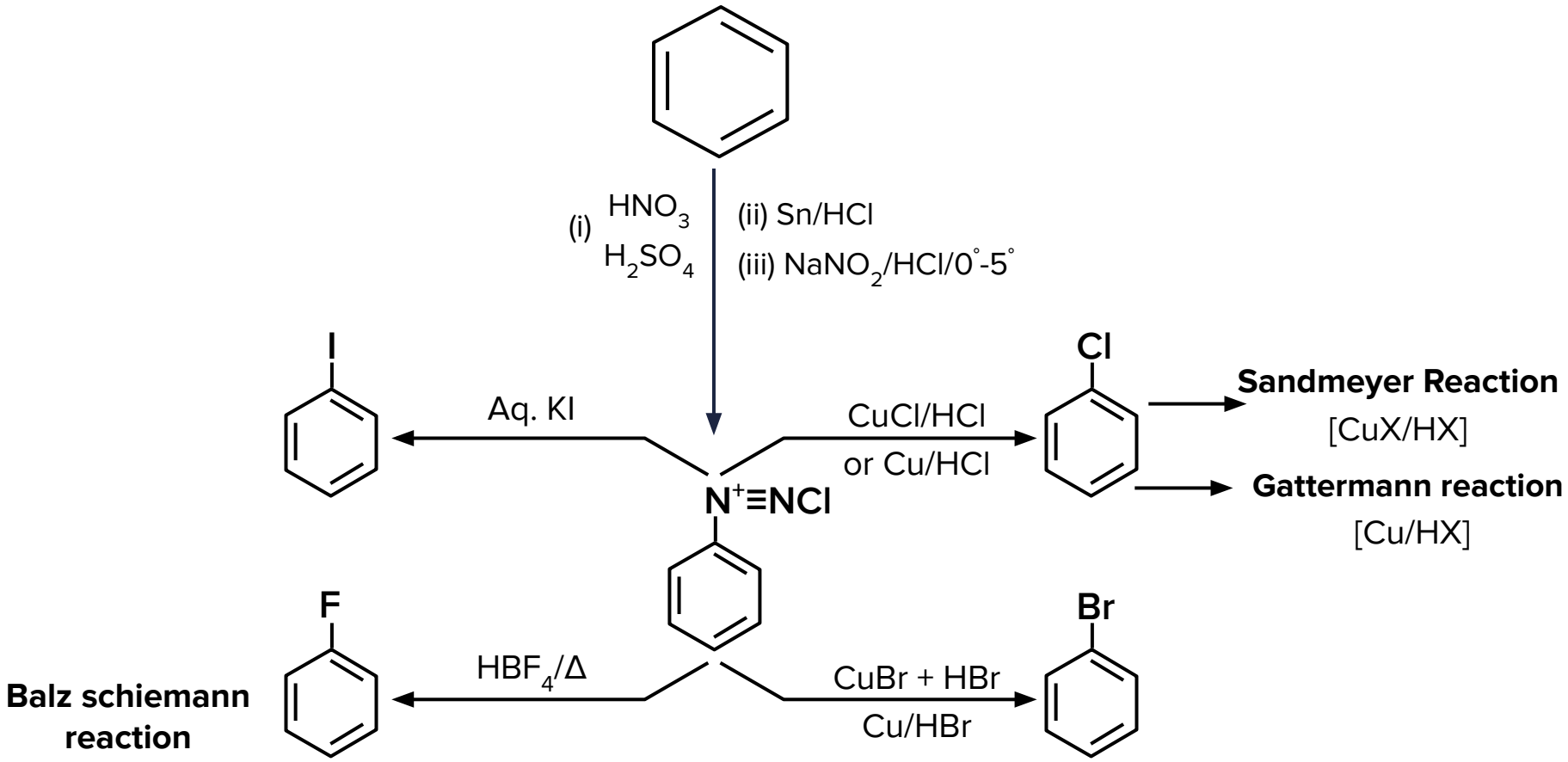
# Preparation & Properties of RMgX (Grignard Reagent)



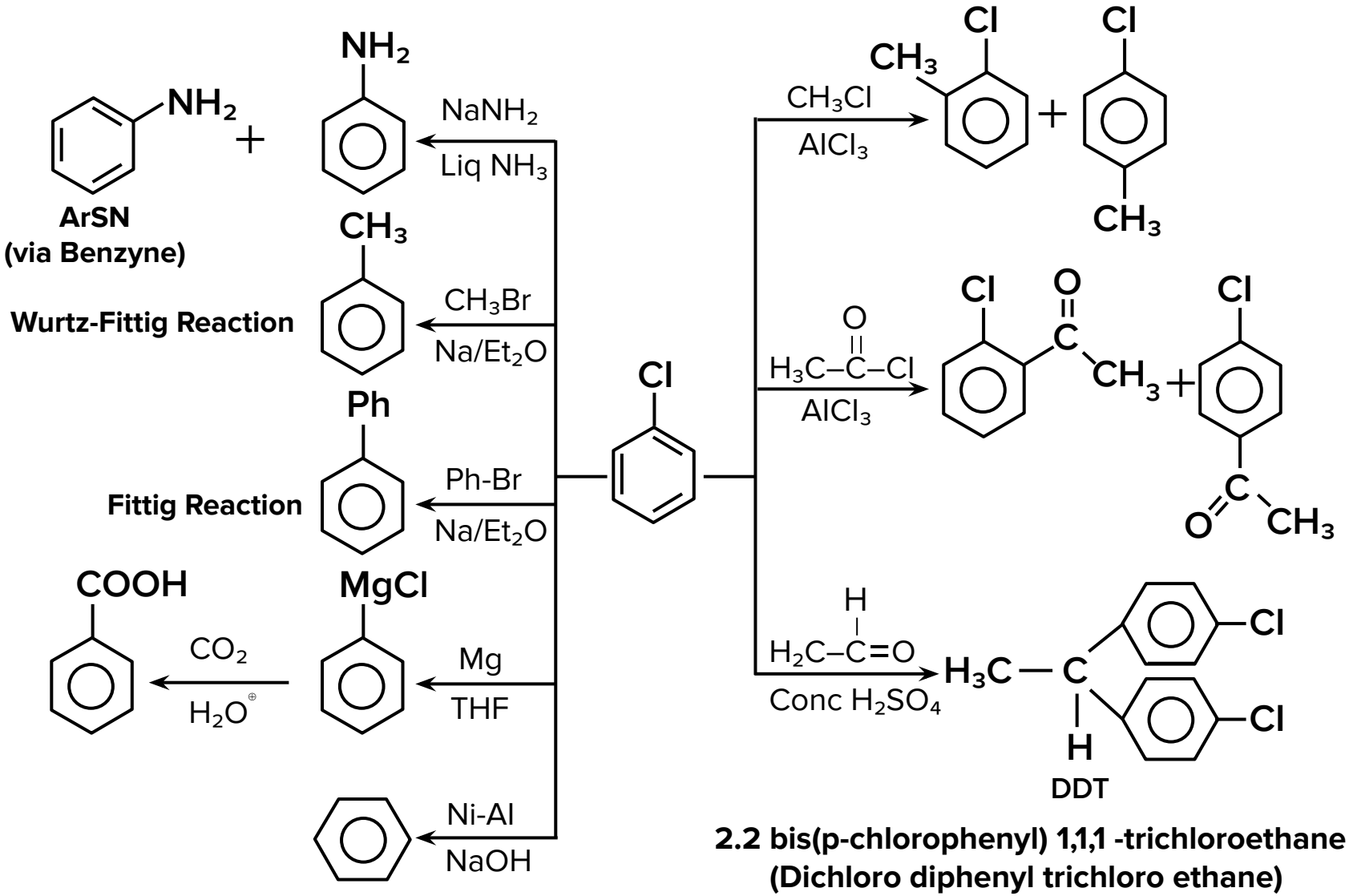
# Preparation of Haloarenes



# Preparation of Haloarenes

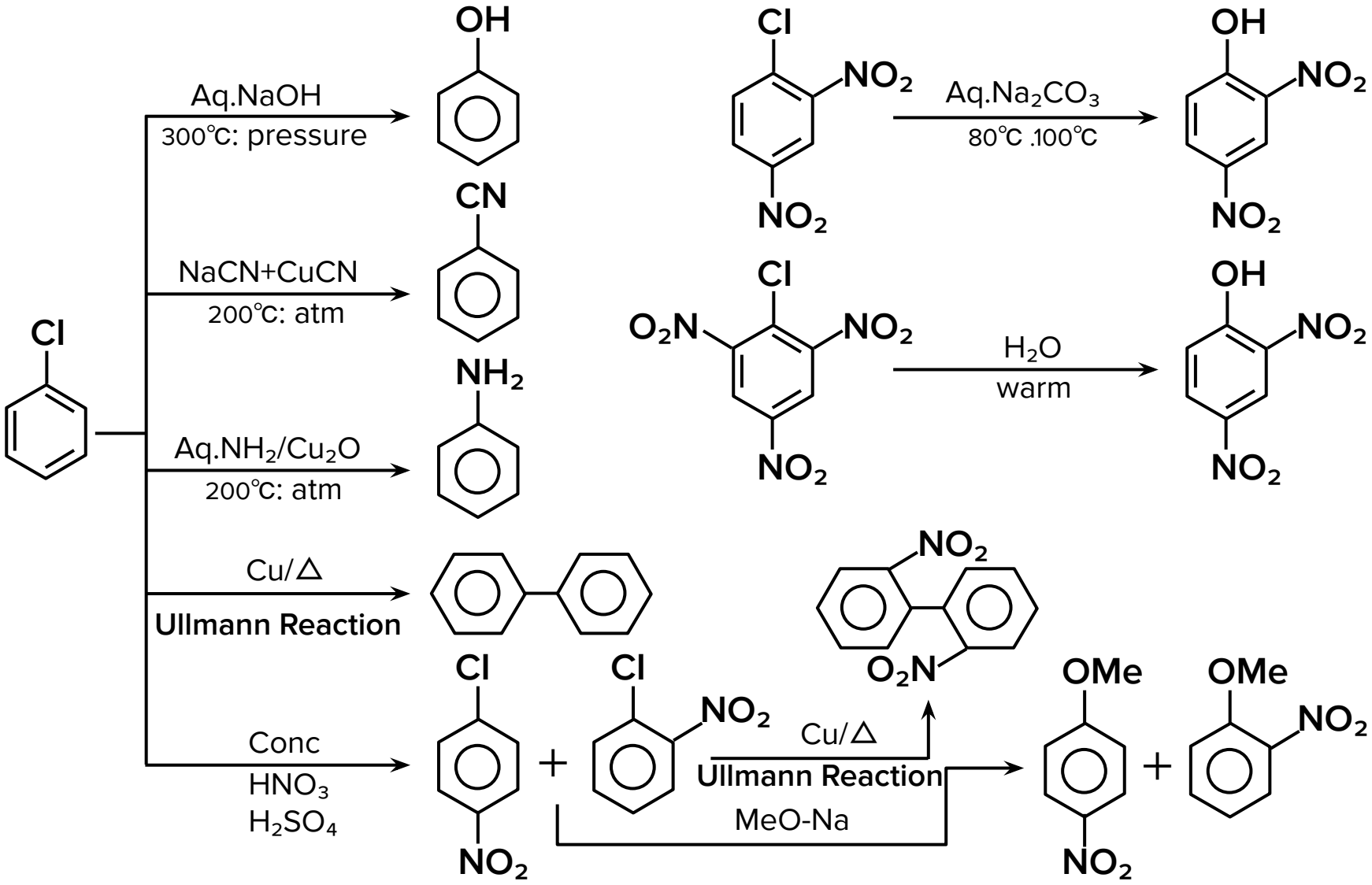


# Properties of Haloarenes

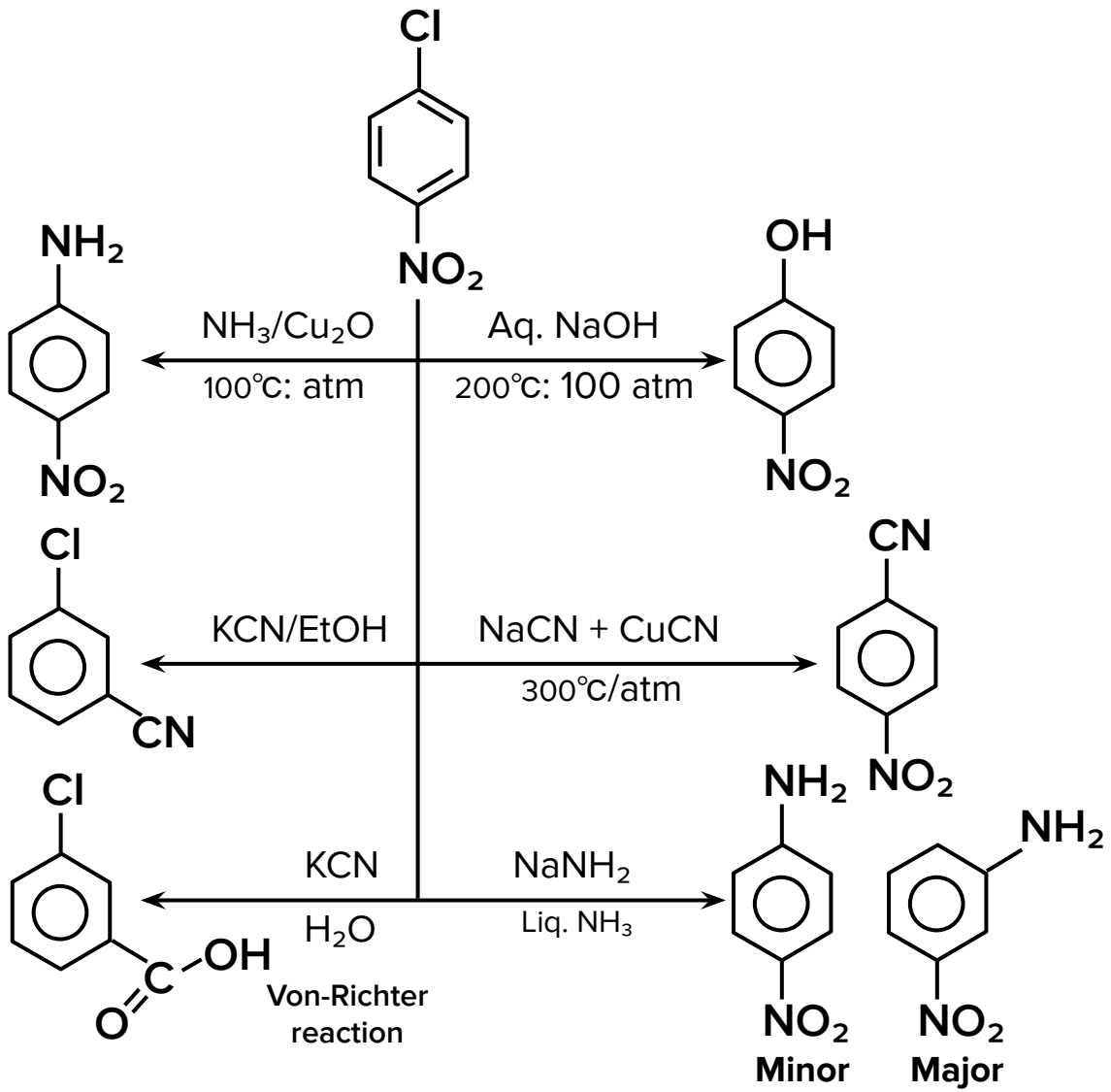



**2.2 bis(p-chlorophenyl) 1,1,1 -trichloroethane**
**(Dichloro diphenyl trichloro ethane)**

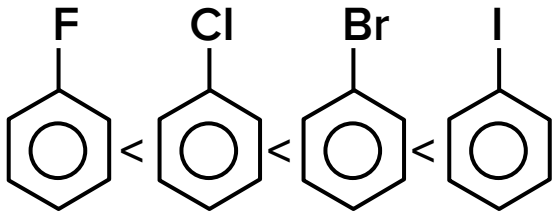
# Properties of Haloarenes

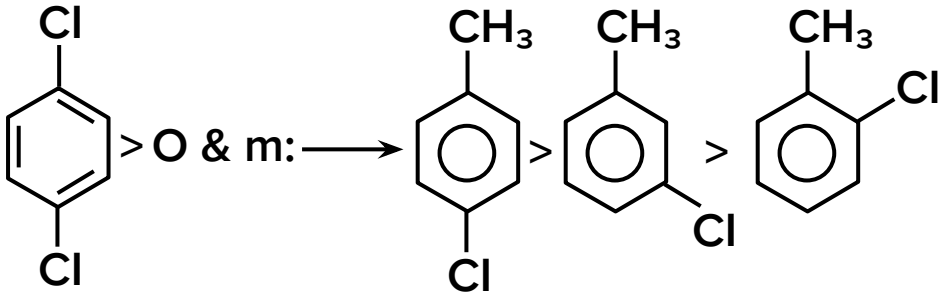


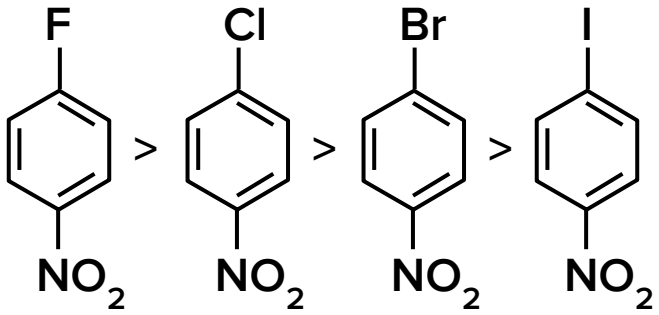
# Properties of Haloarenes



# Properties of Haloarenes

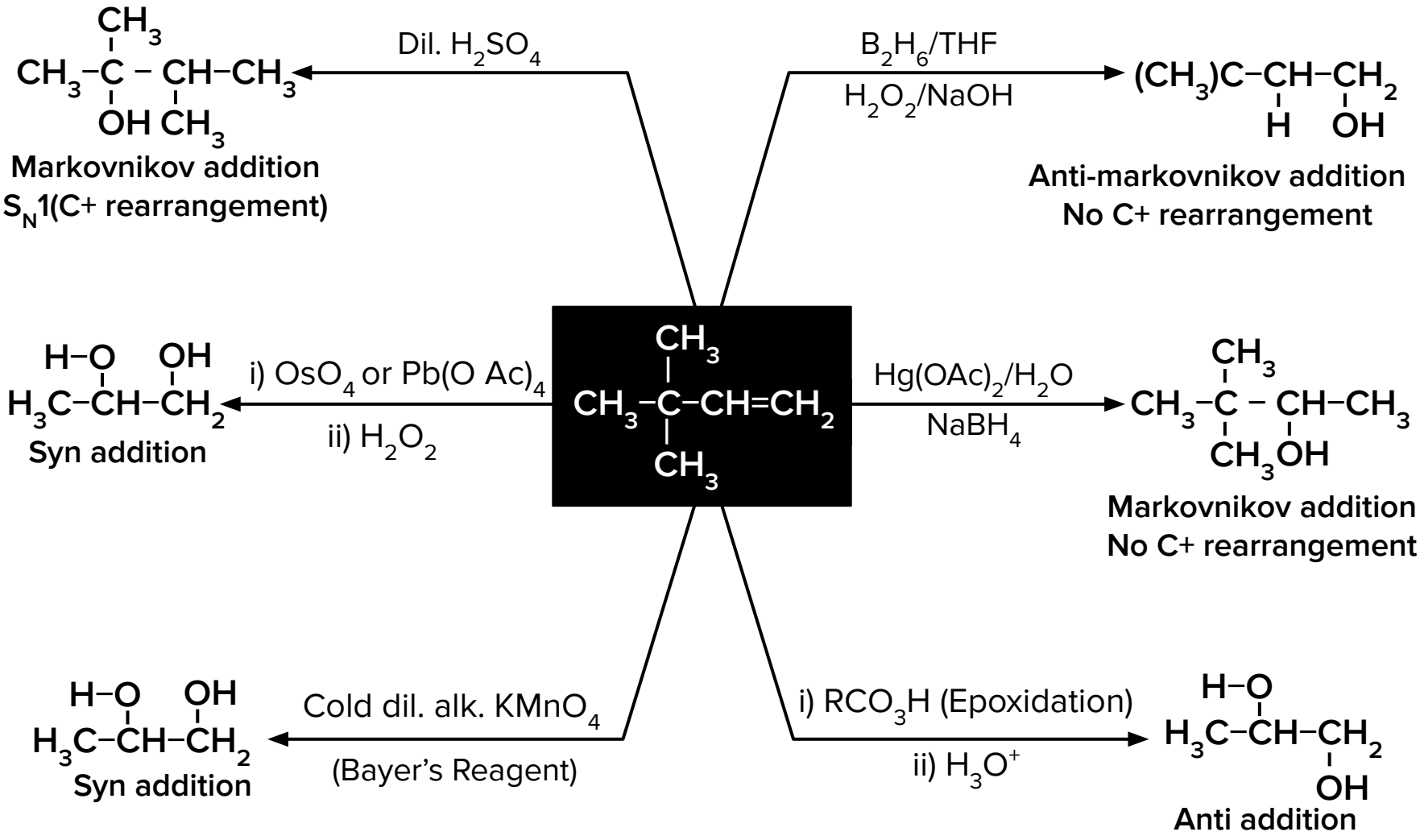
B.p's & Density → 


m.p's →  O & m: → 

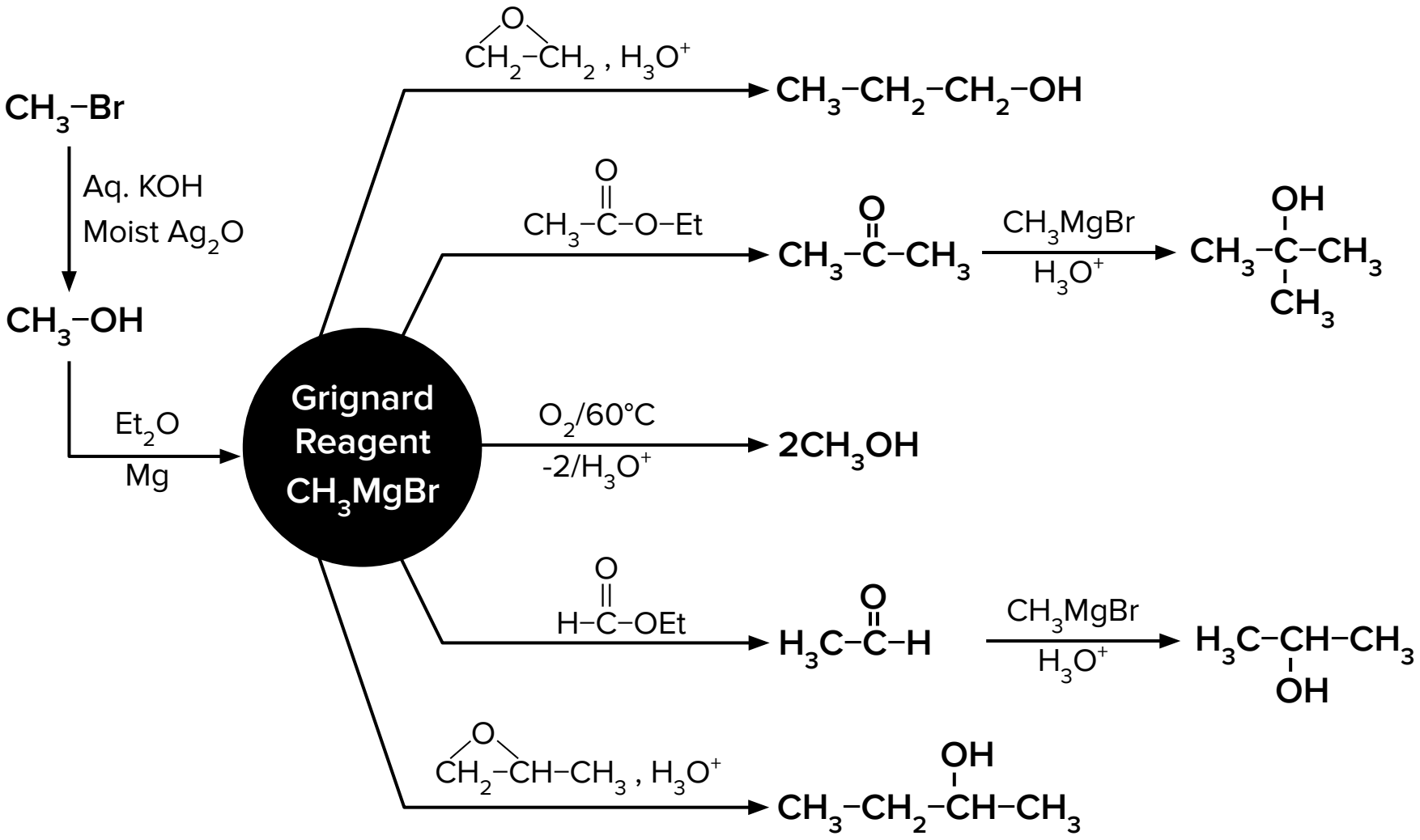




(Reactivity toward Nucleophile)

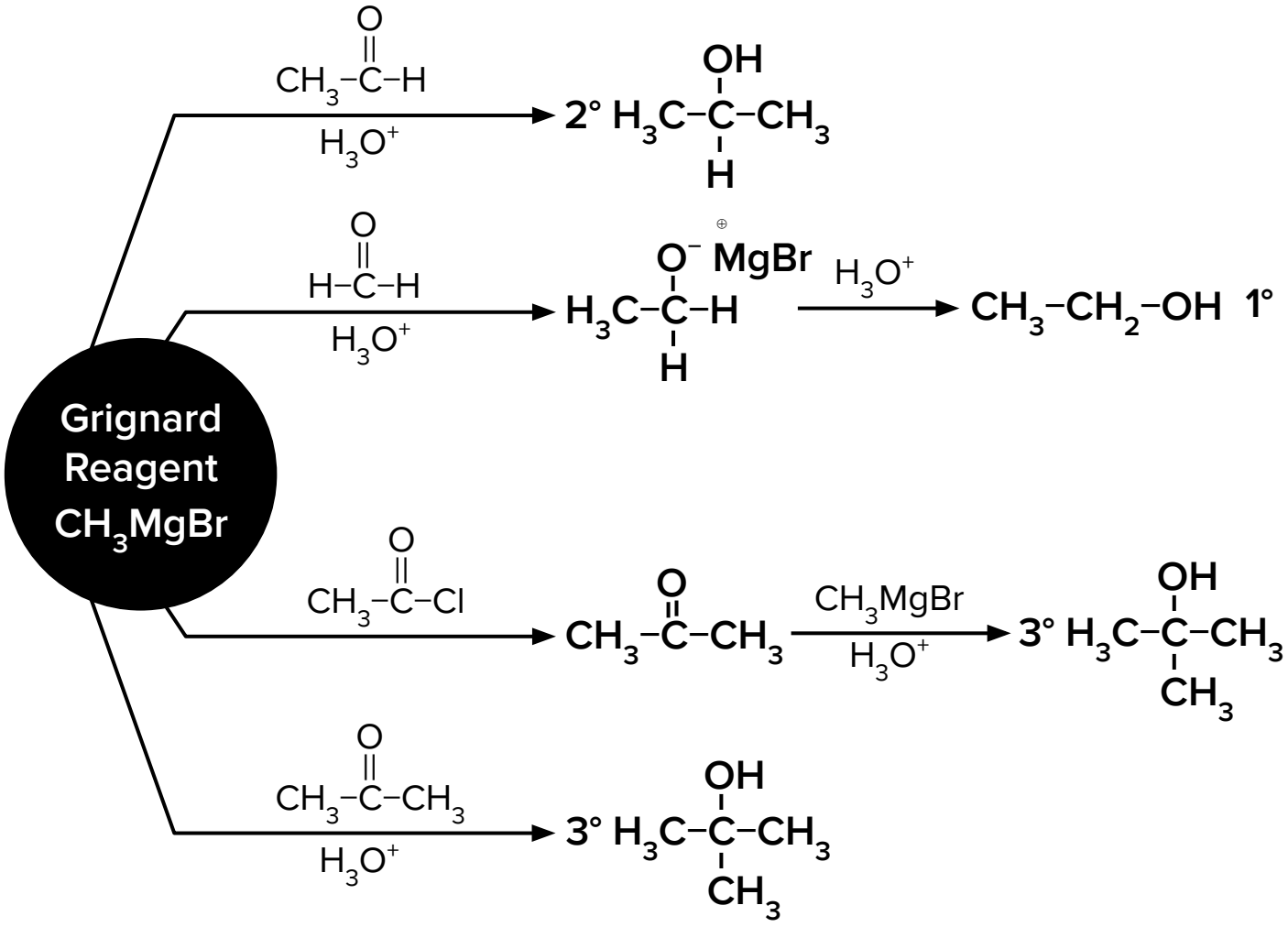
# Preparation of Alcohols



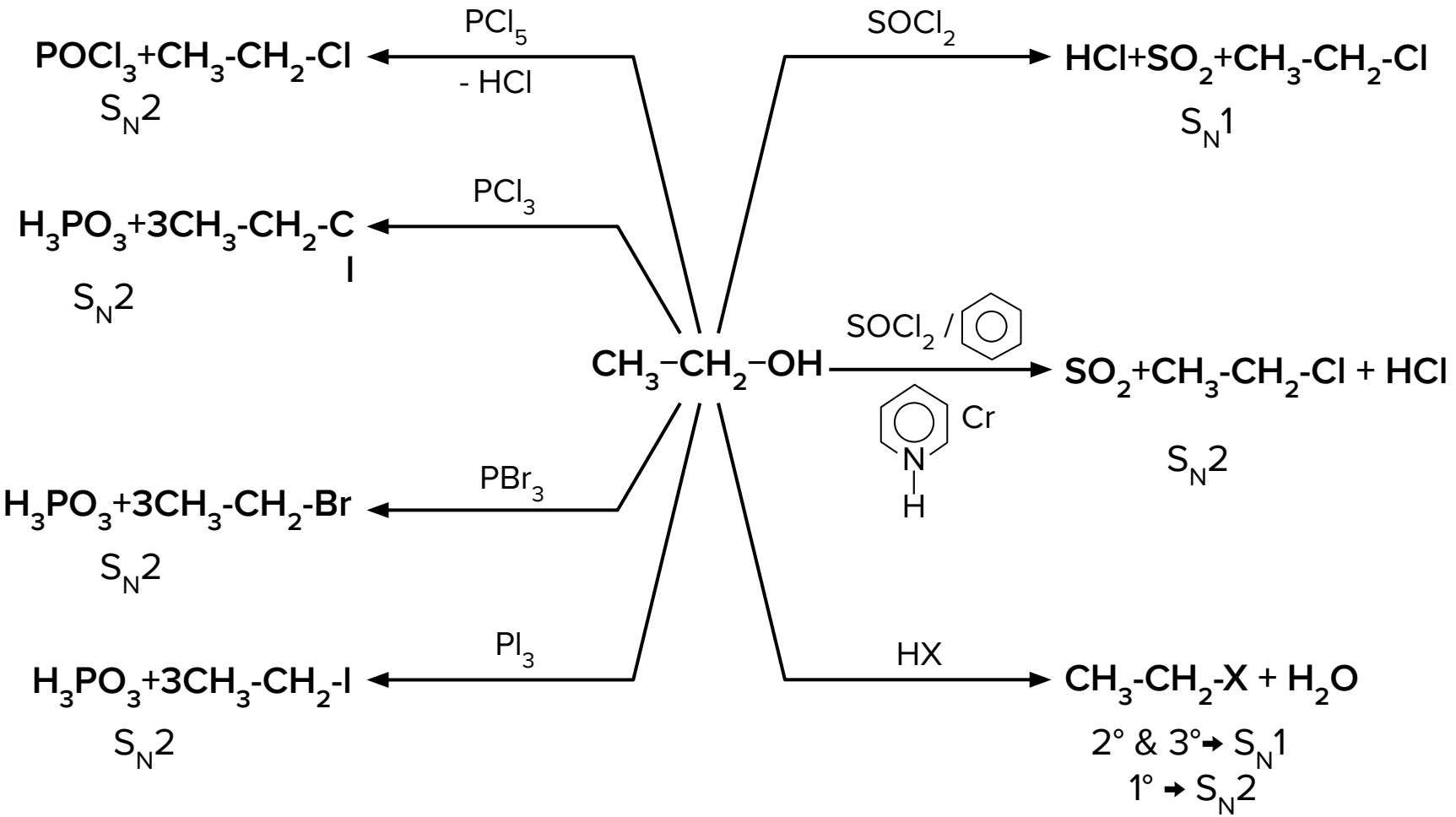
# Preparation of Alcohols



# Preparation of Alcohols

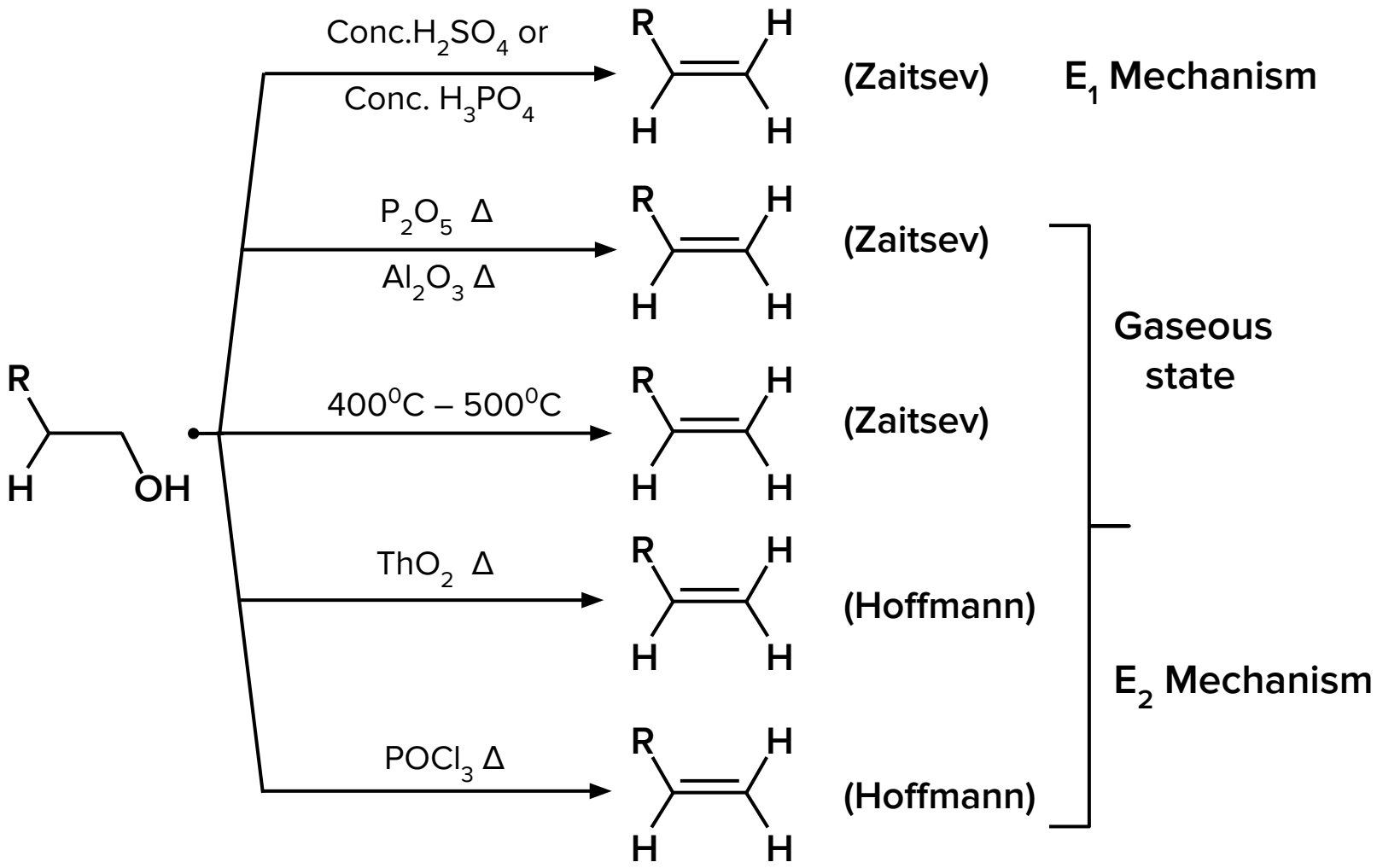


# Properties of Alcohols

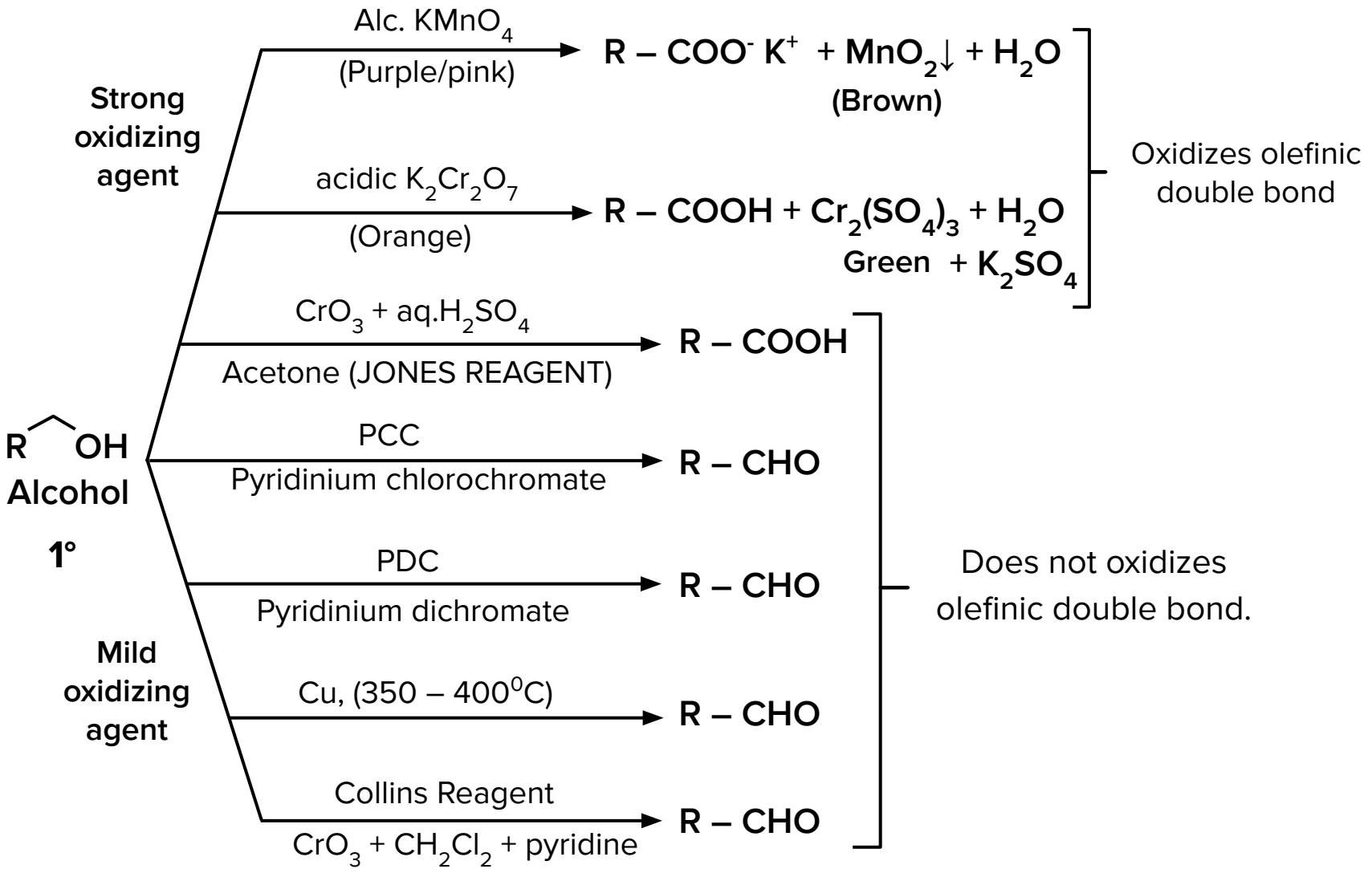


# Properties of Alcohols

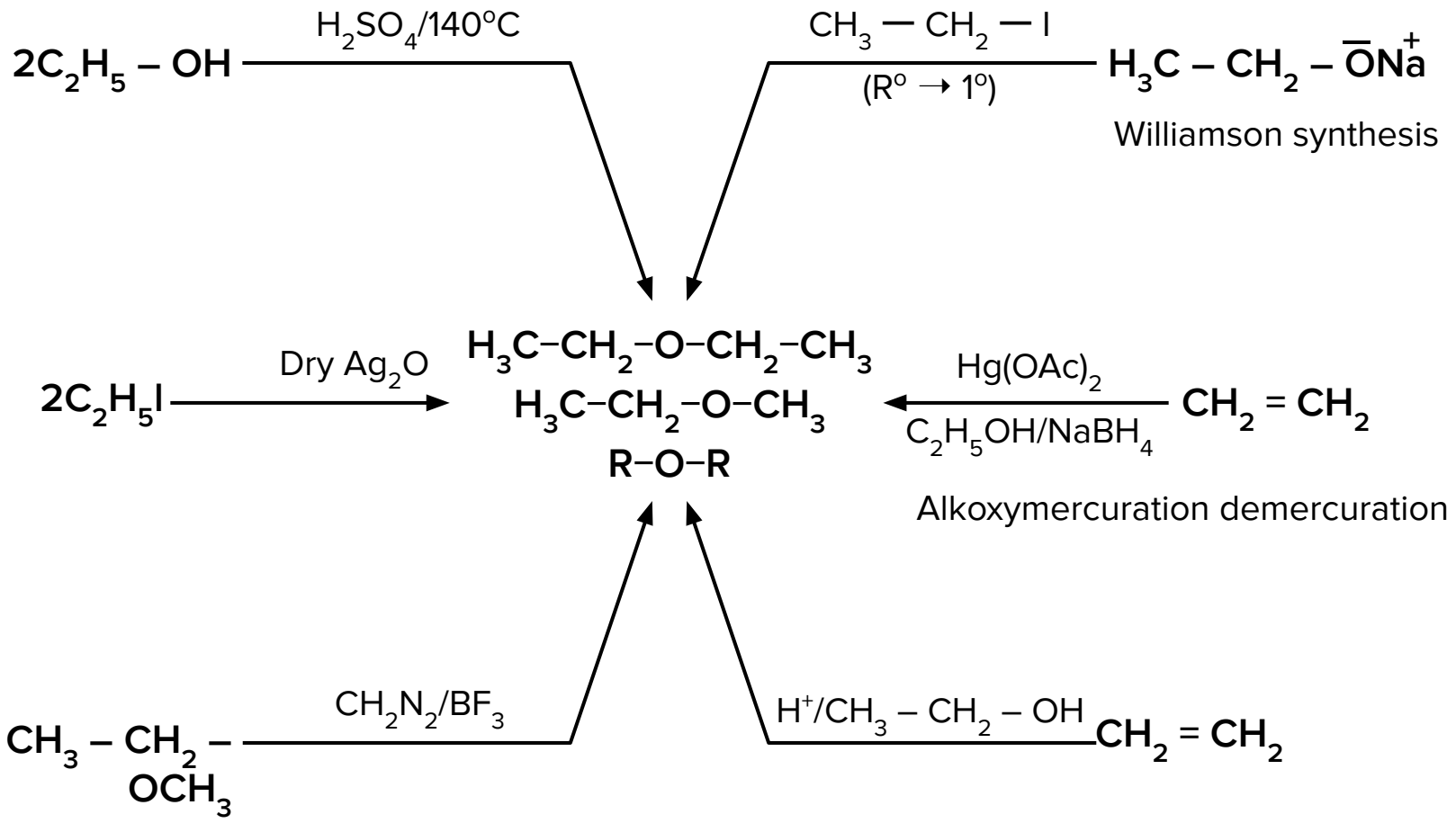
## Dehydration reaction



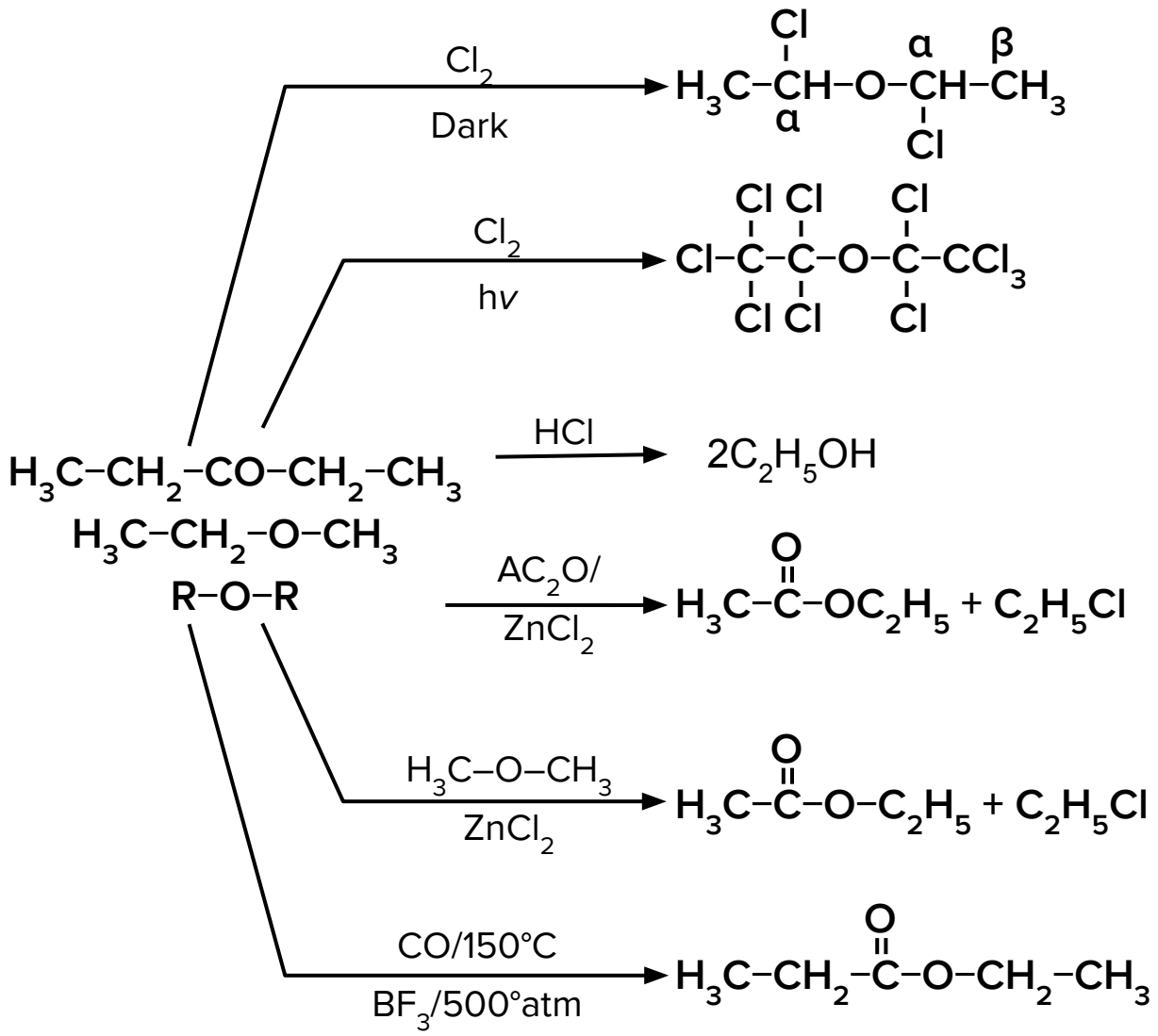
# Properties of Alcohols



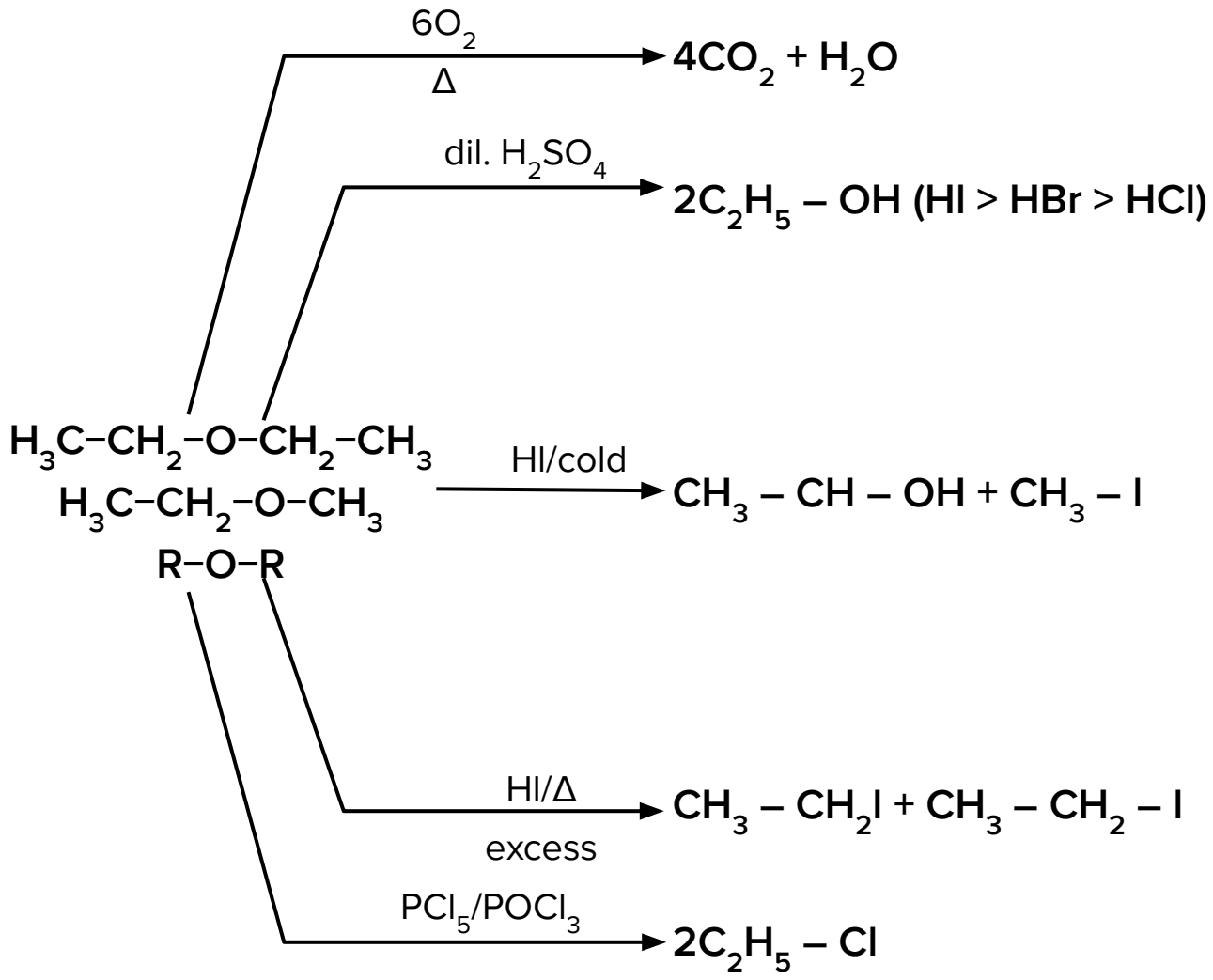
# Preparation of Ethers



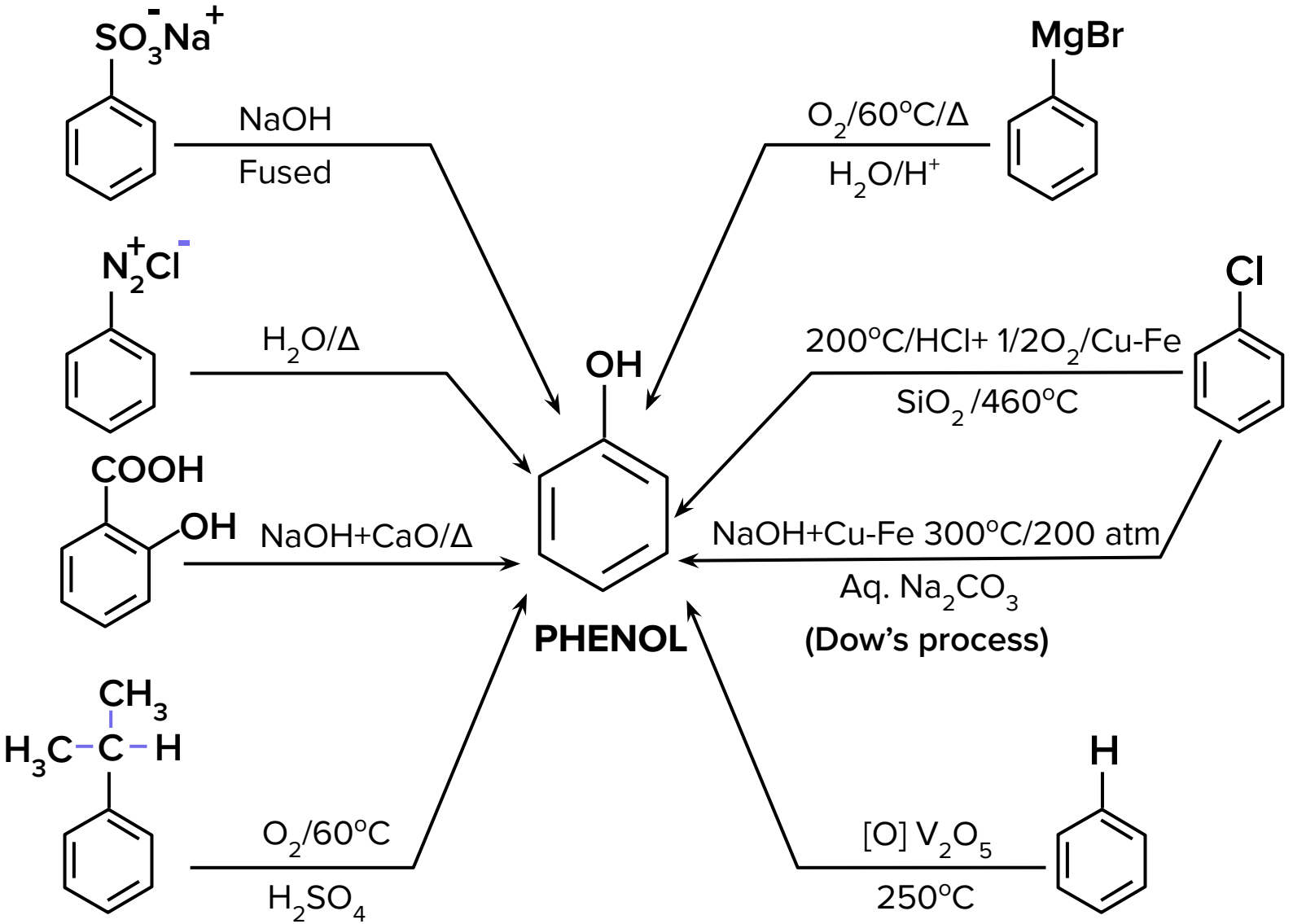
# Properties of Ethers



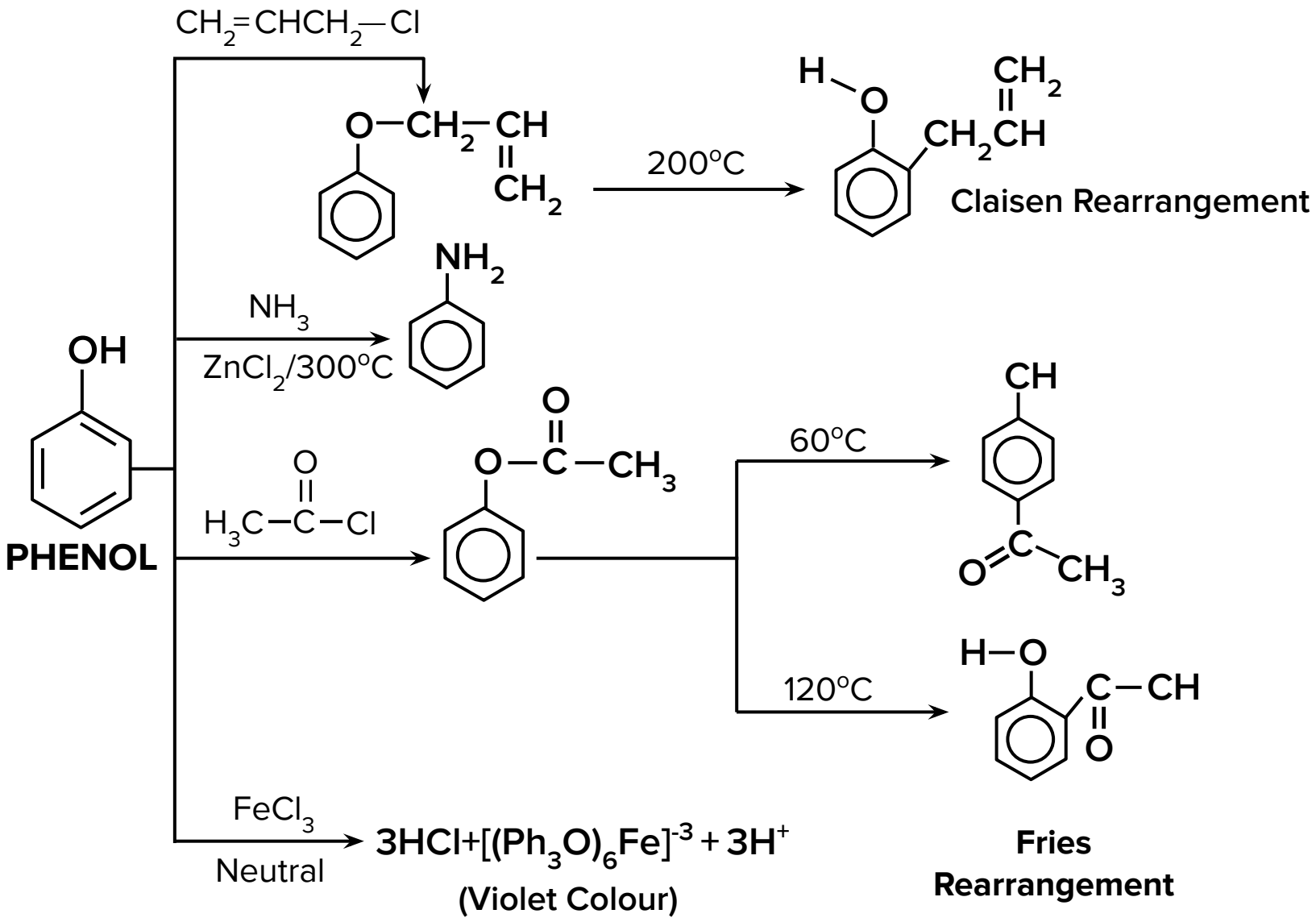
# Properties of Ethers



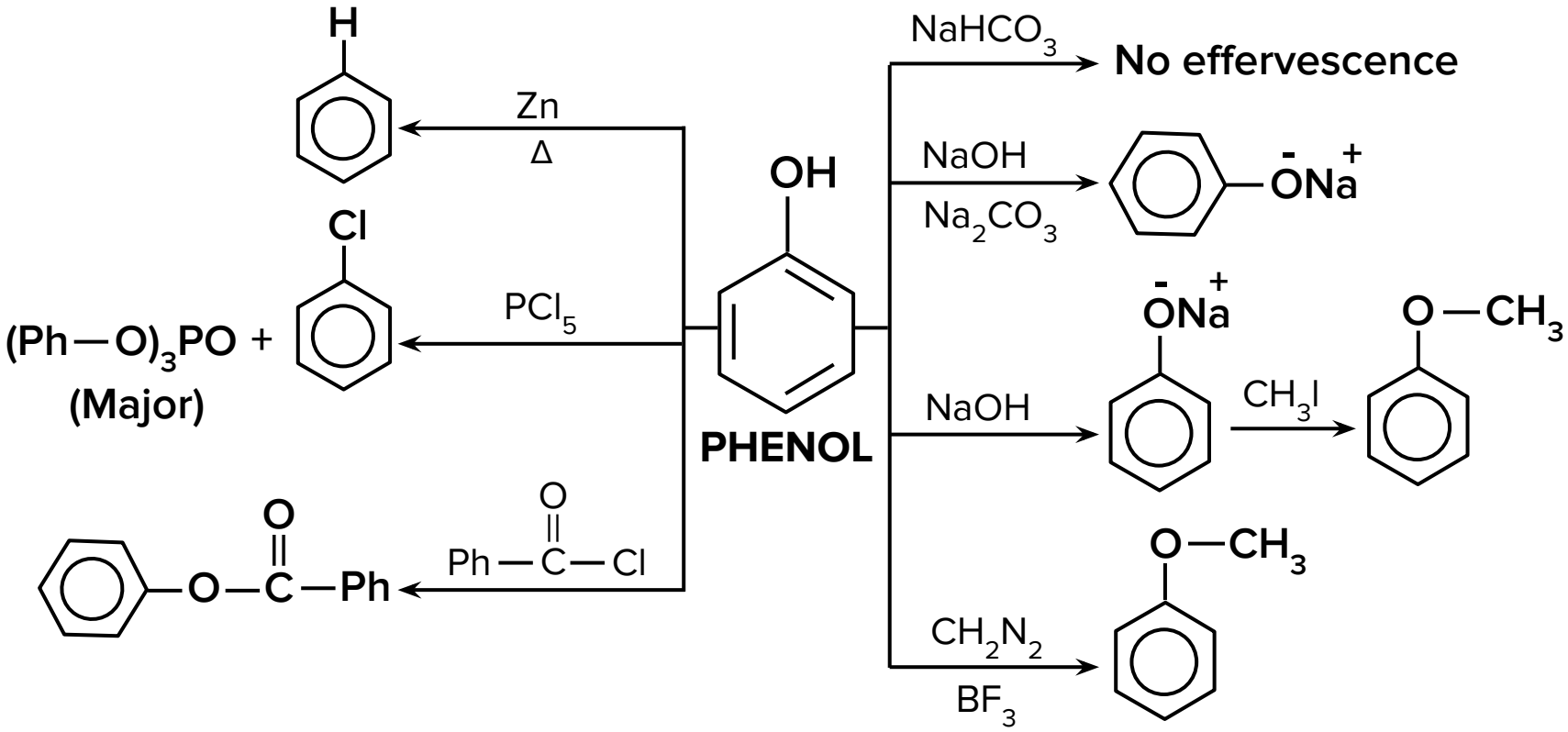
# Preparation of Phenol



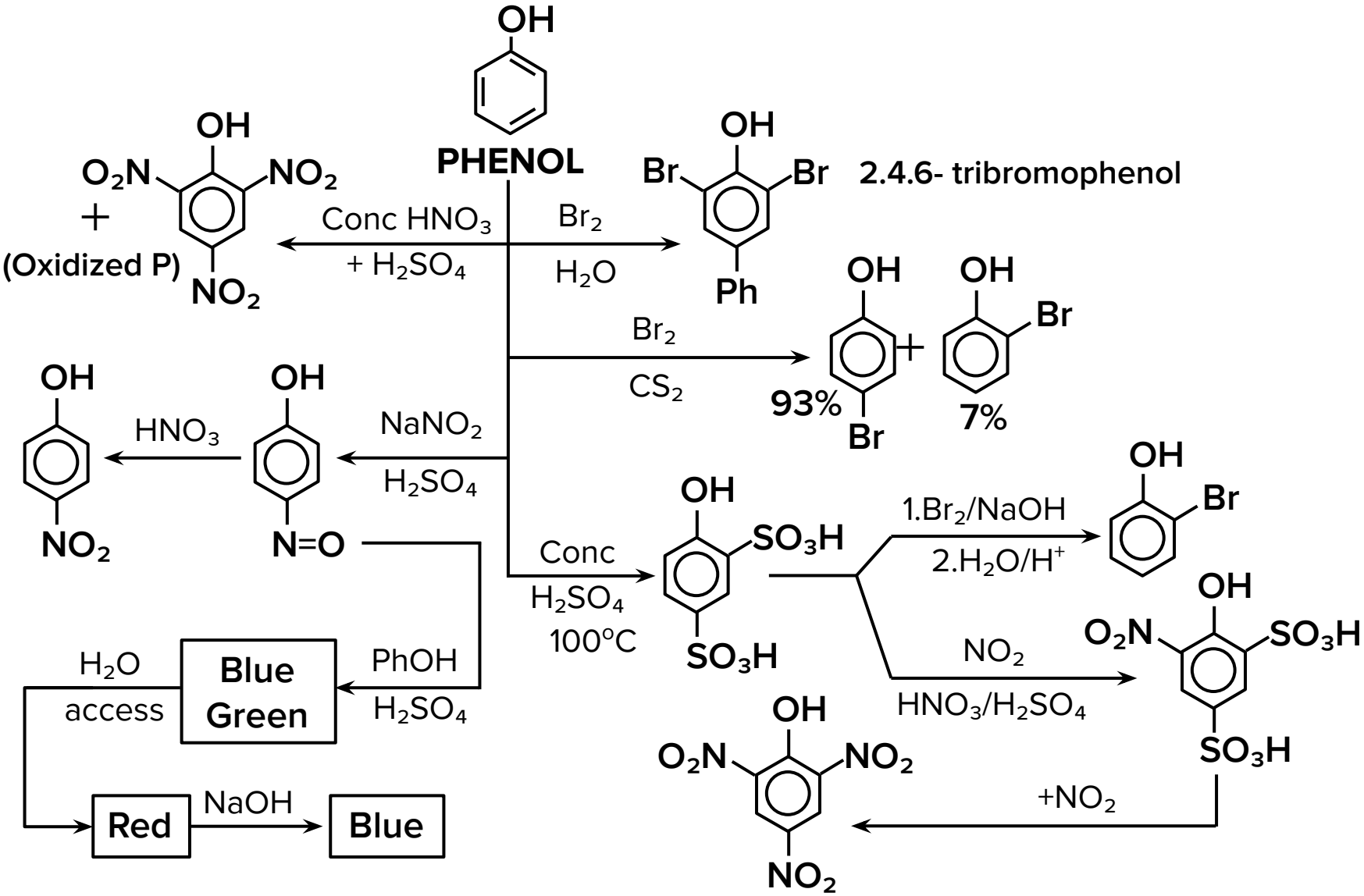
# Properties of Phenol



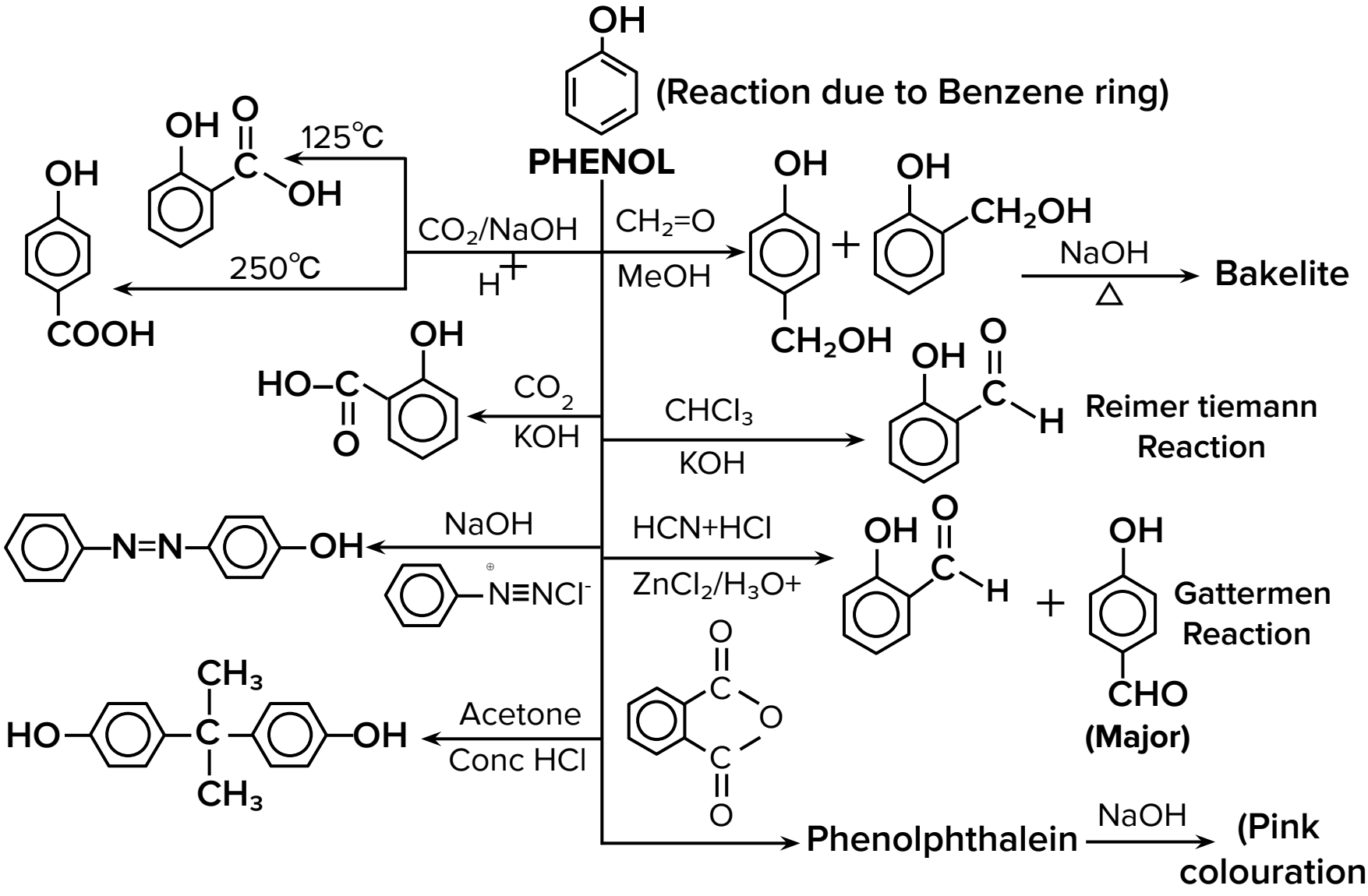
# Properties of Phenol



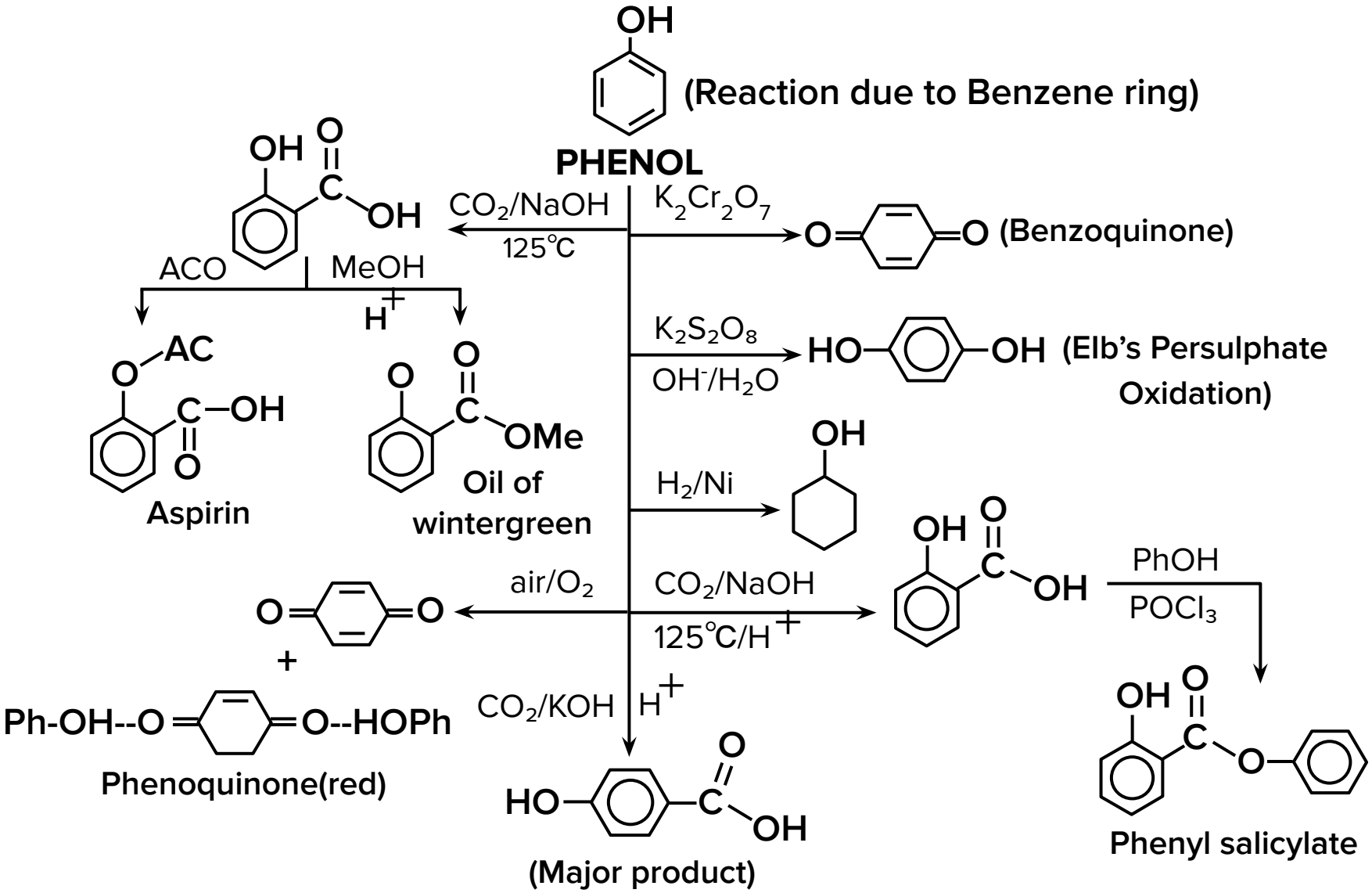
# Properties of Phenol



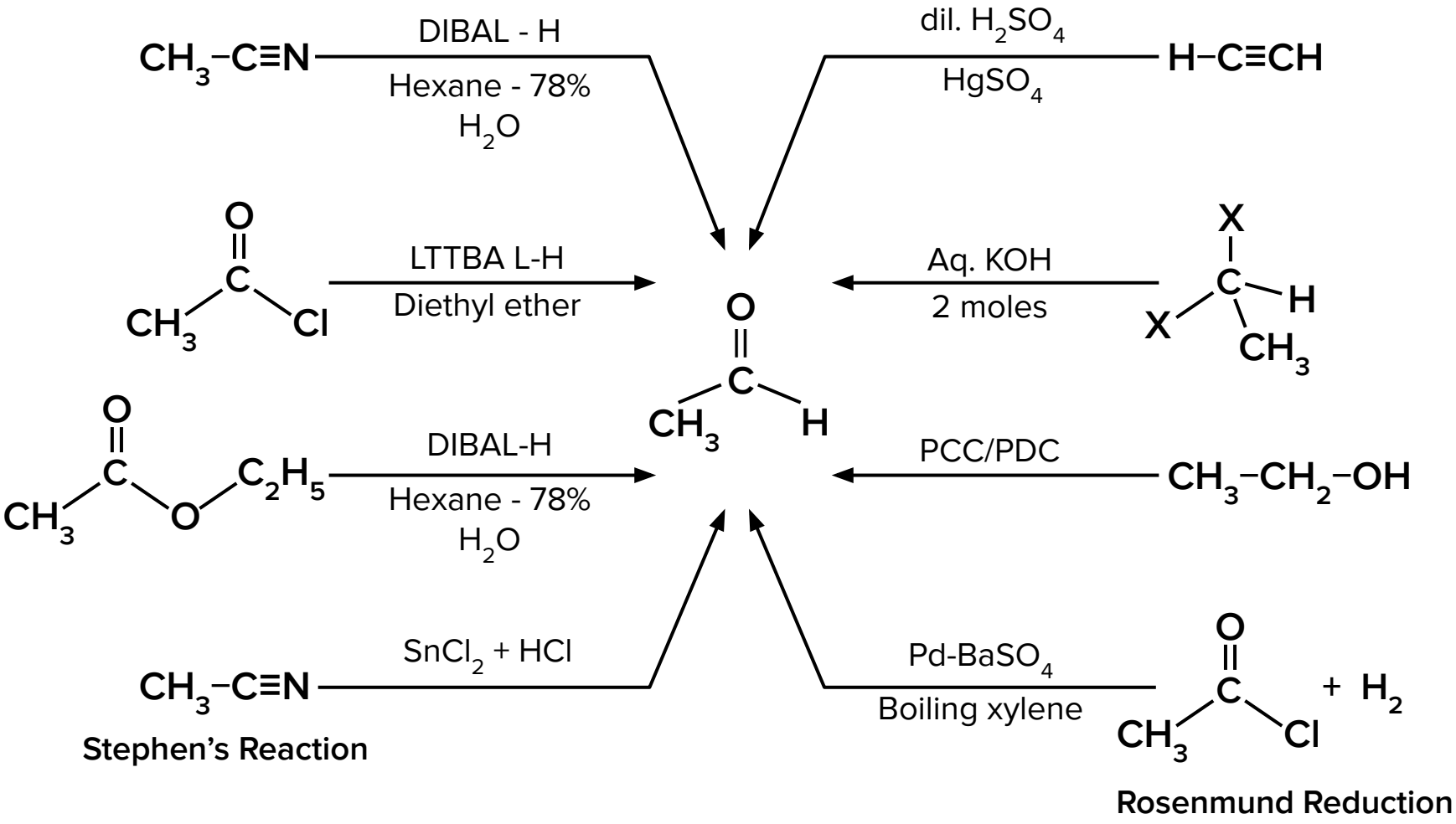
# Properties of Phenol



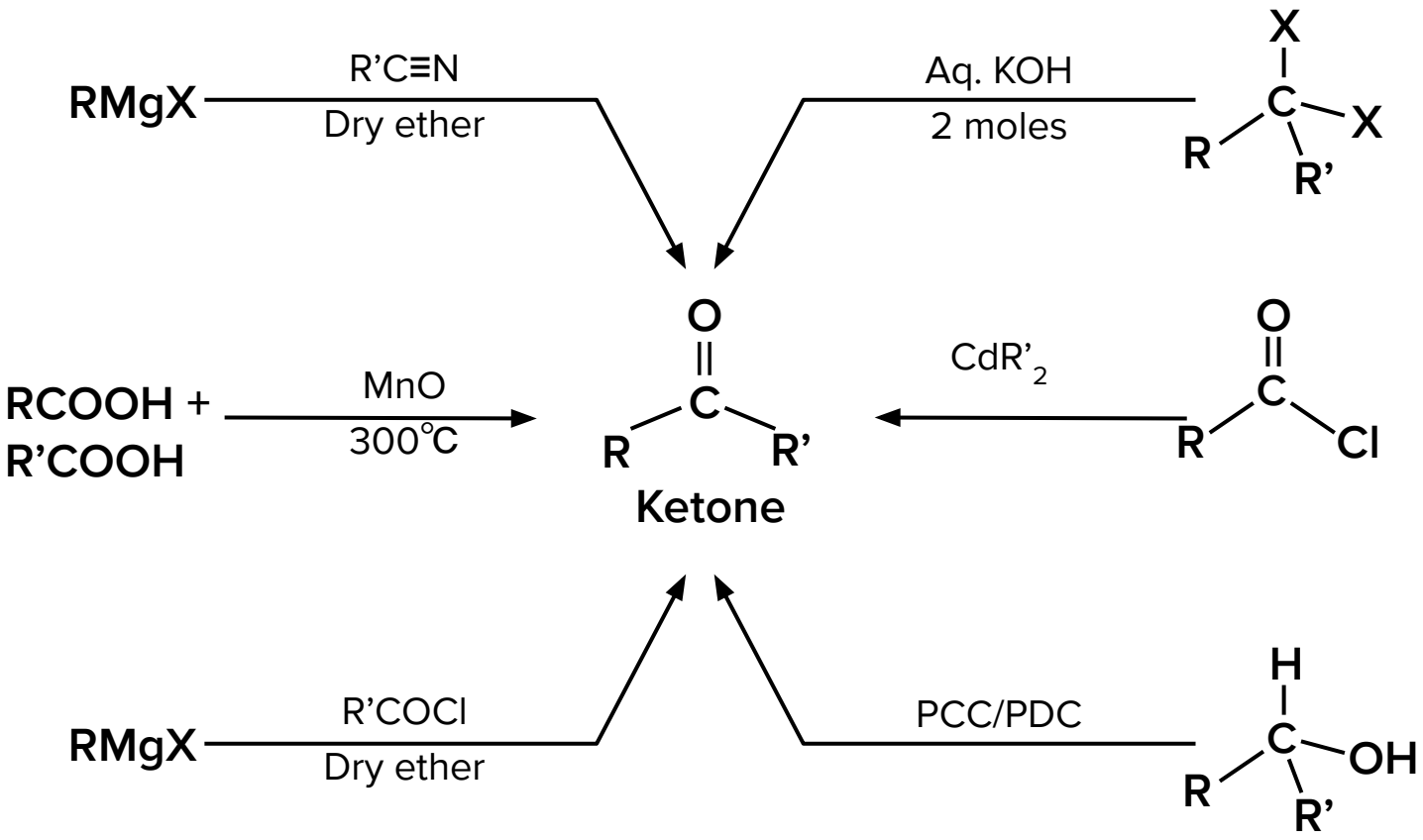
# Properties of Phenol



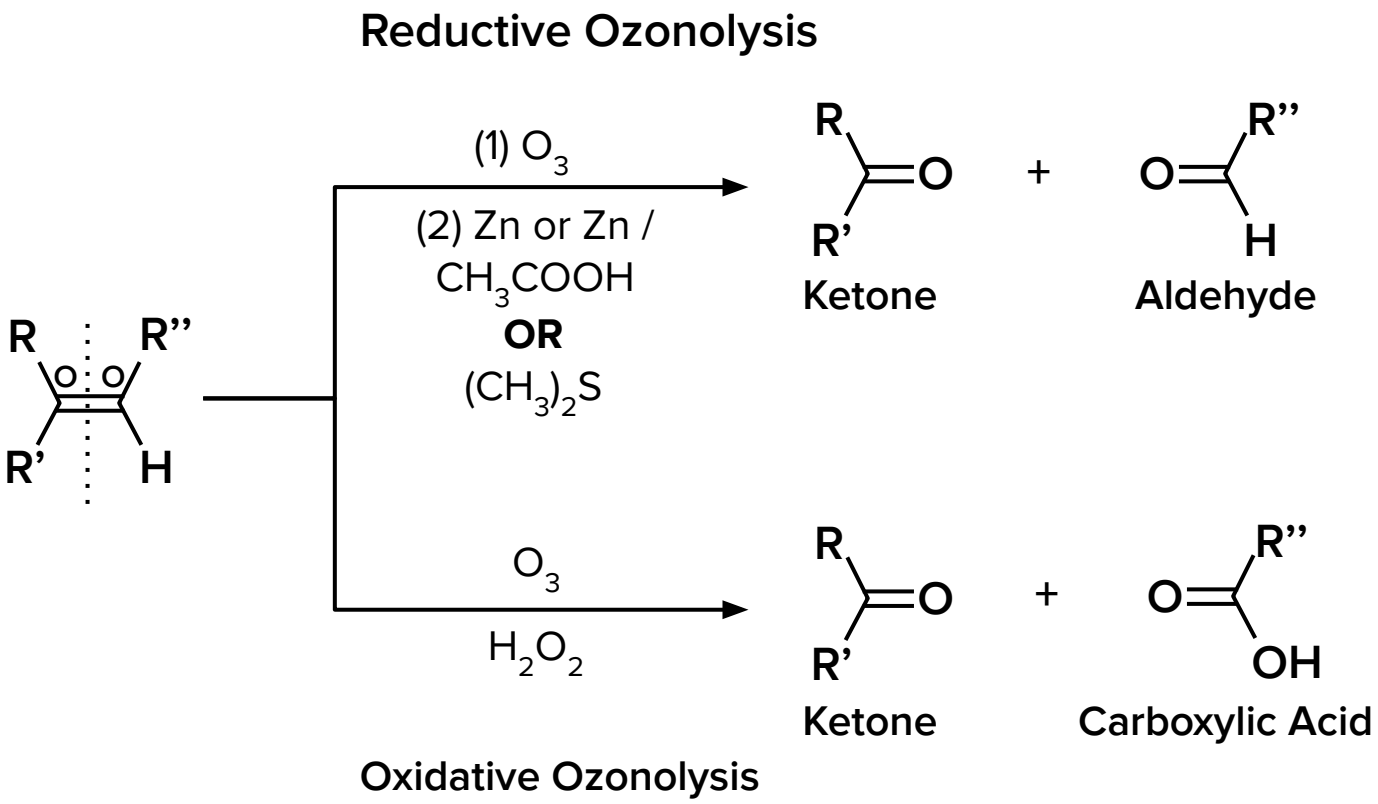
# Preparation of Aldehydes



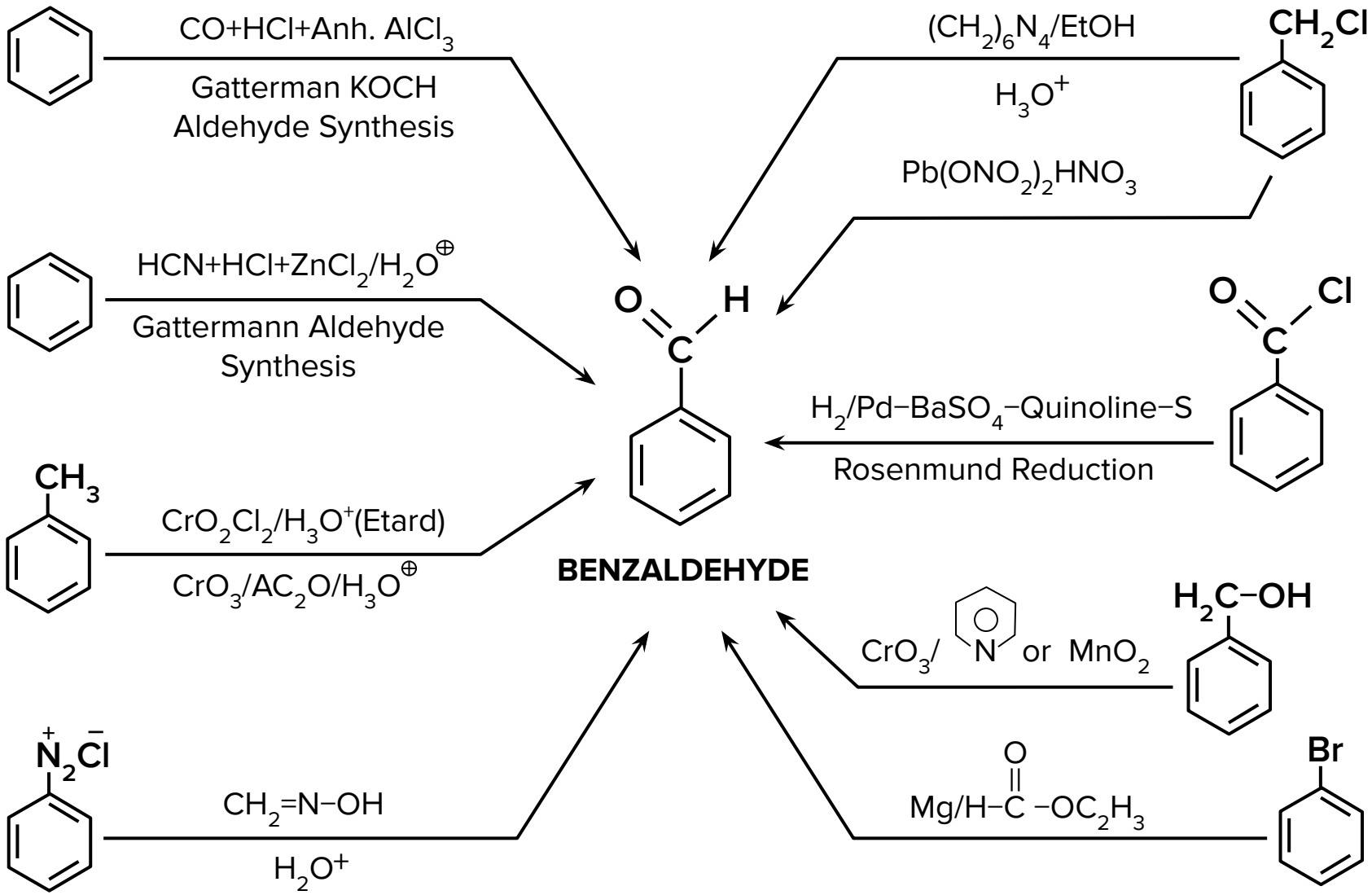
# Preparation of Ketones



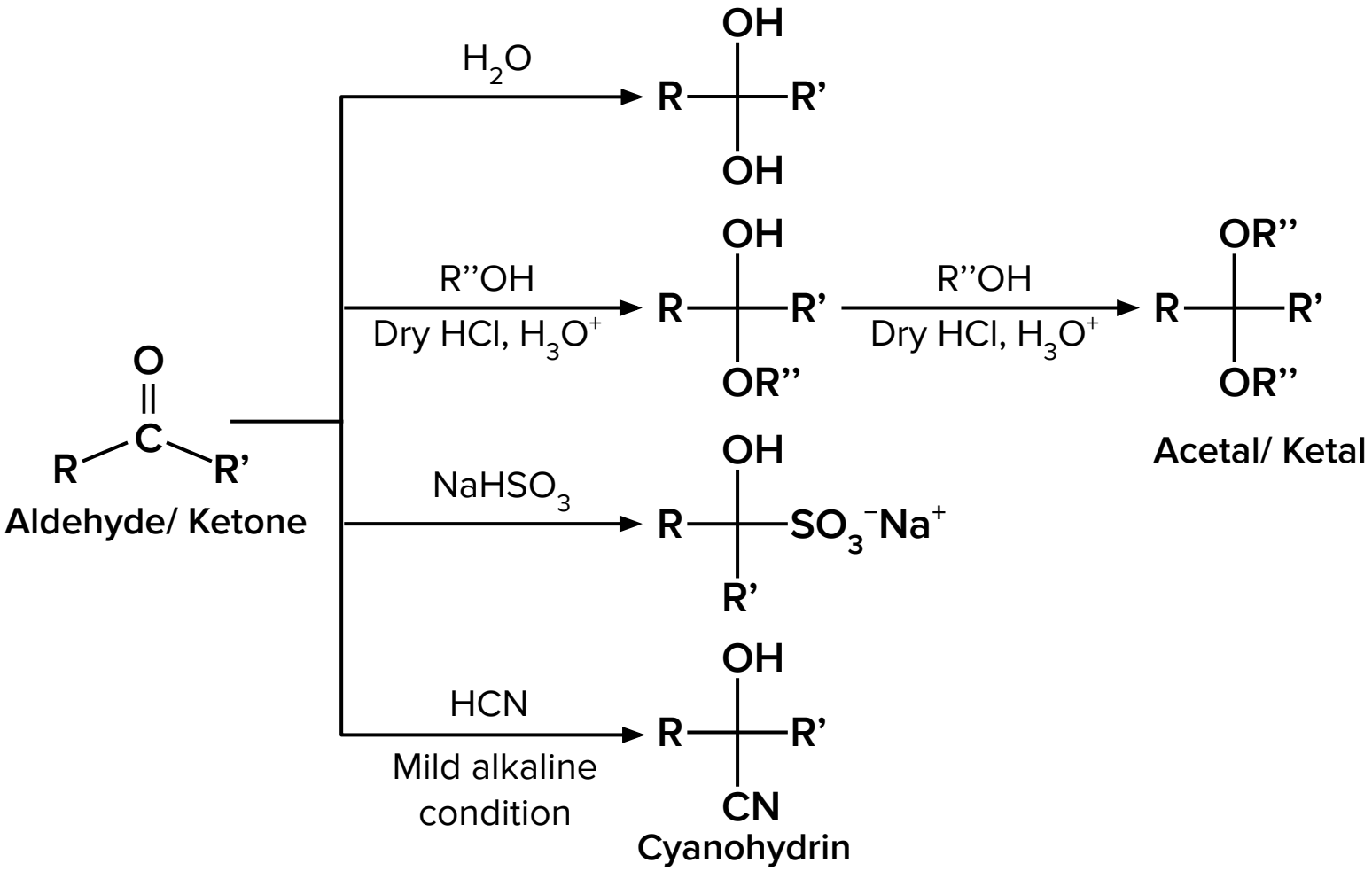
# Preparation of Aldehyde & Ketones



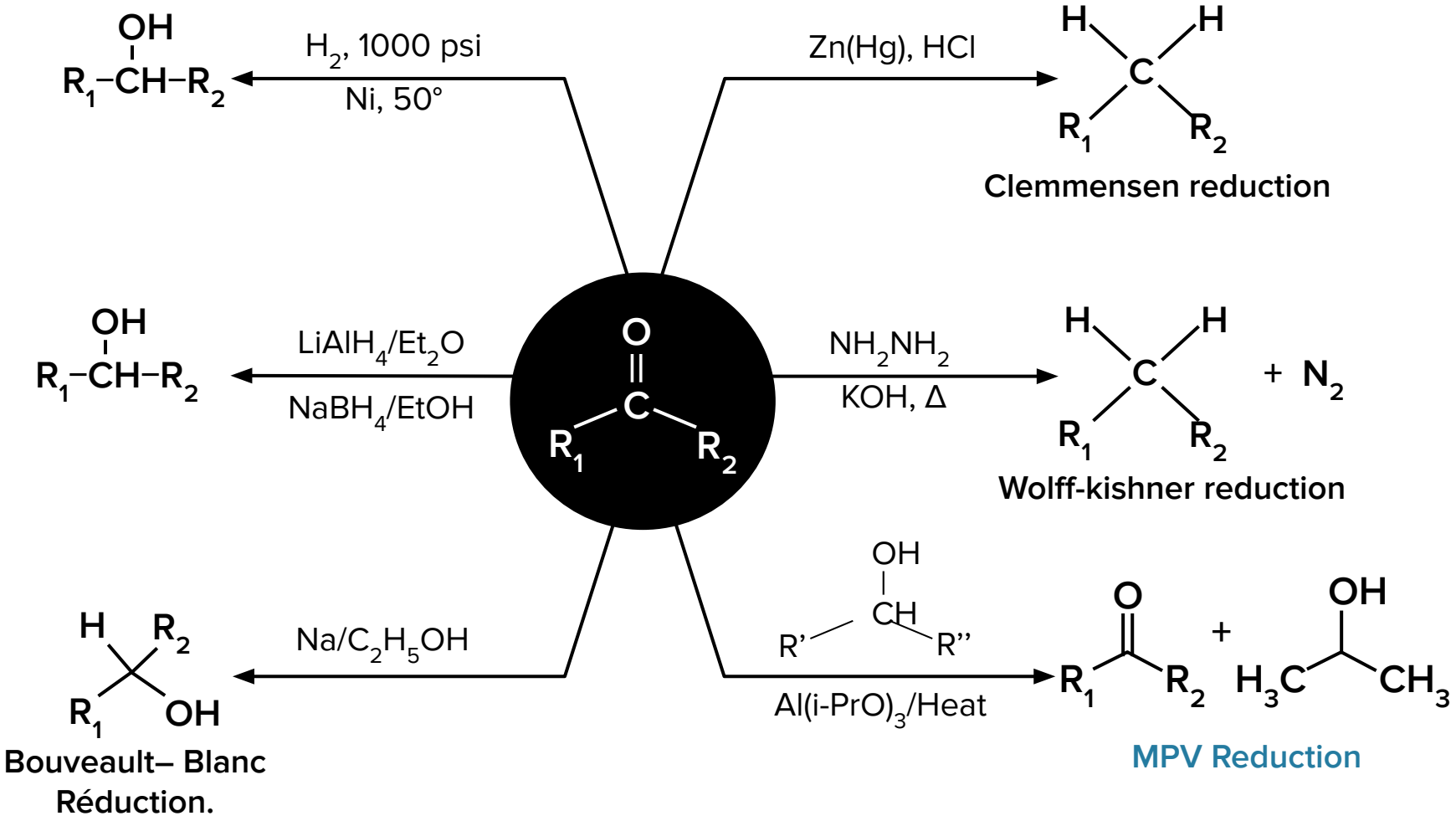
# Preparation of Benzaldehyde



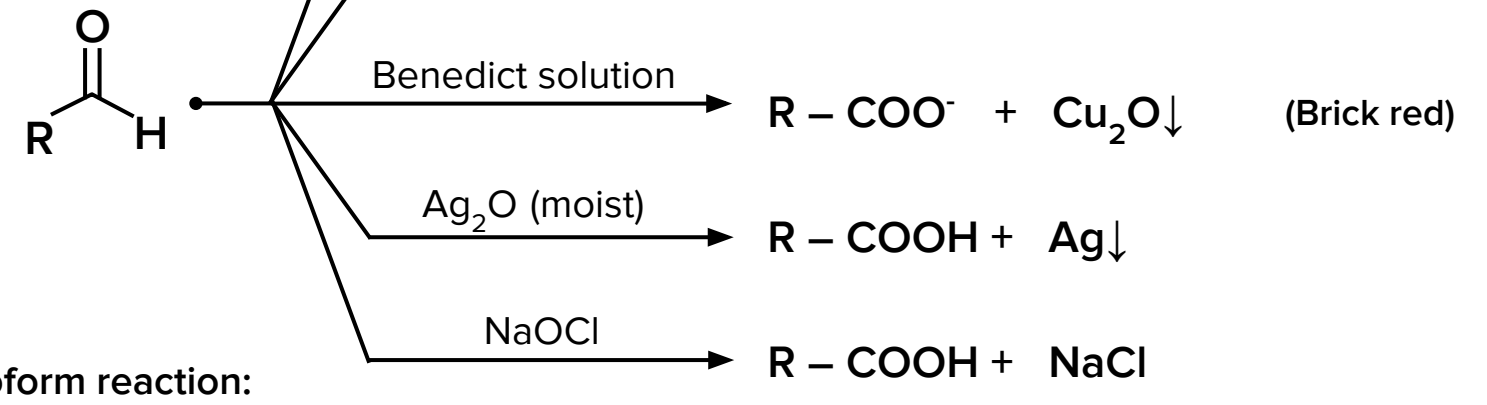
# Properties of Aldehydes and Ketones



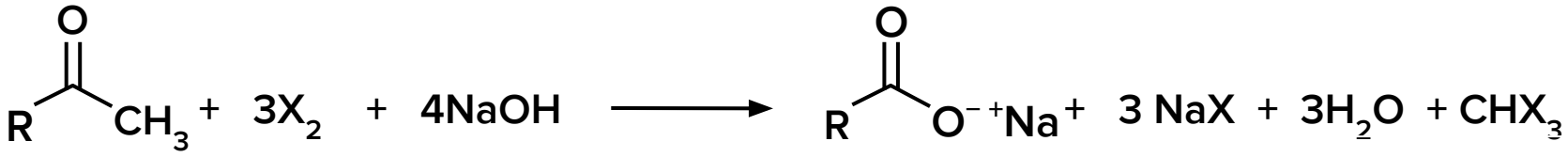
# Properties of Aldehydes and Ketones



# Properties of Aldehydes and Ketones

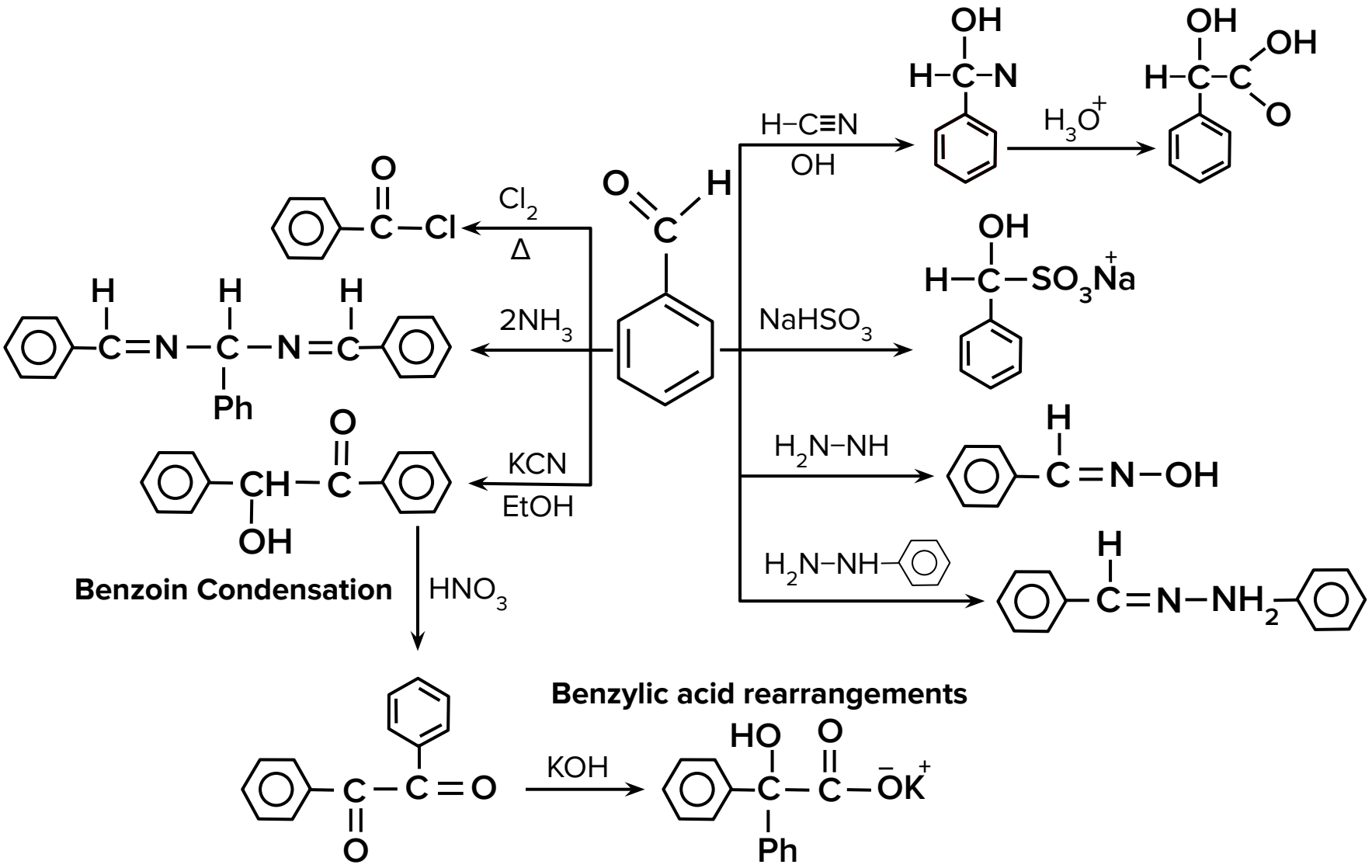



**Haloform reaction:**

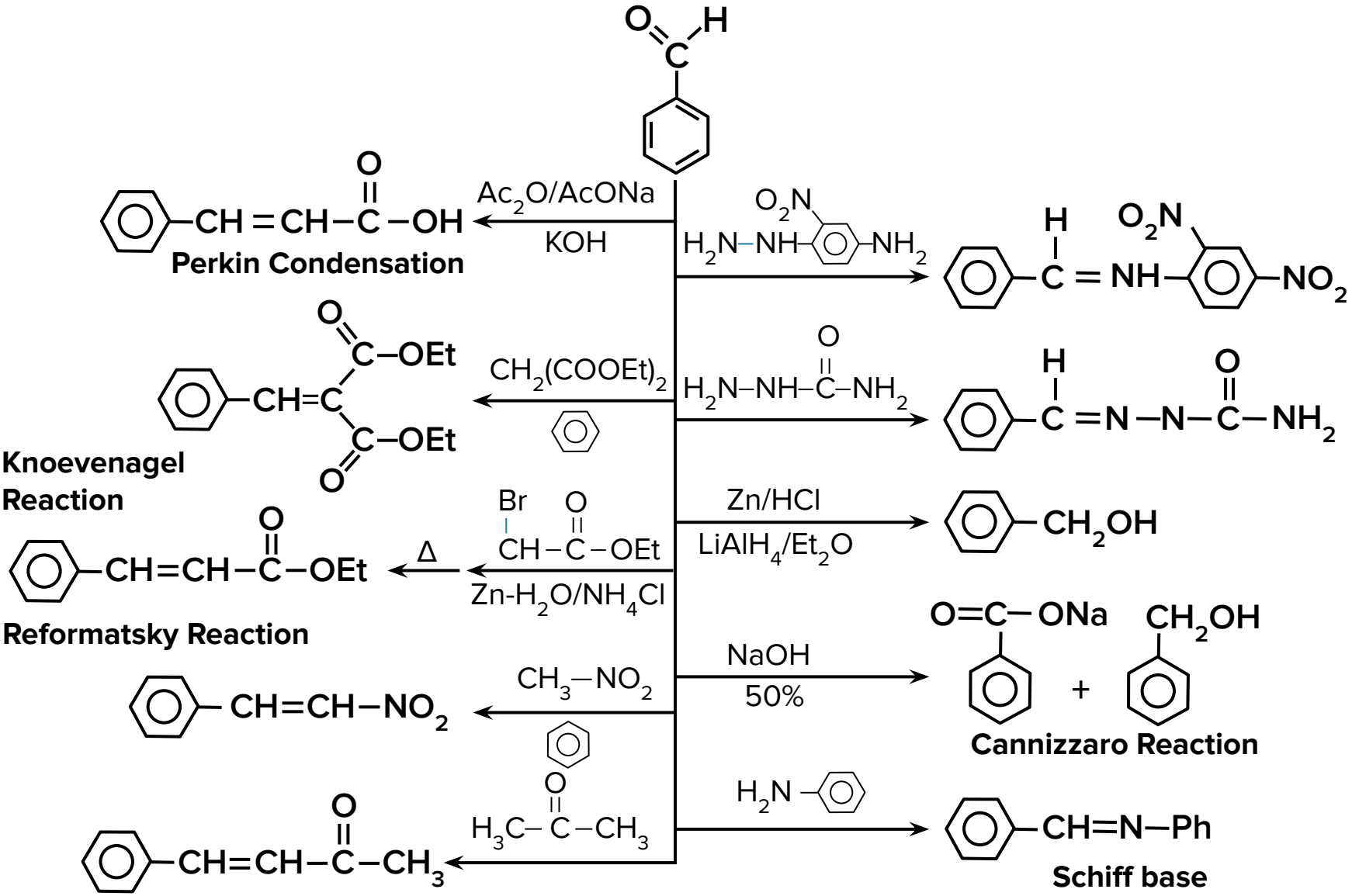



Alternative reagent : NaOX

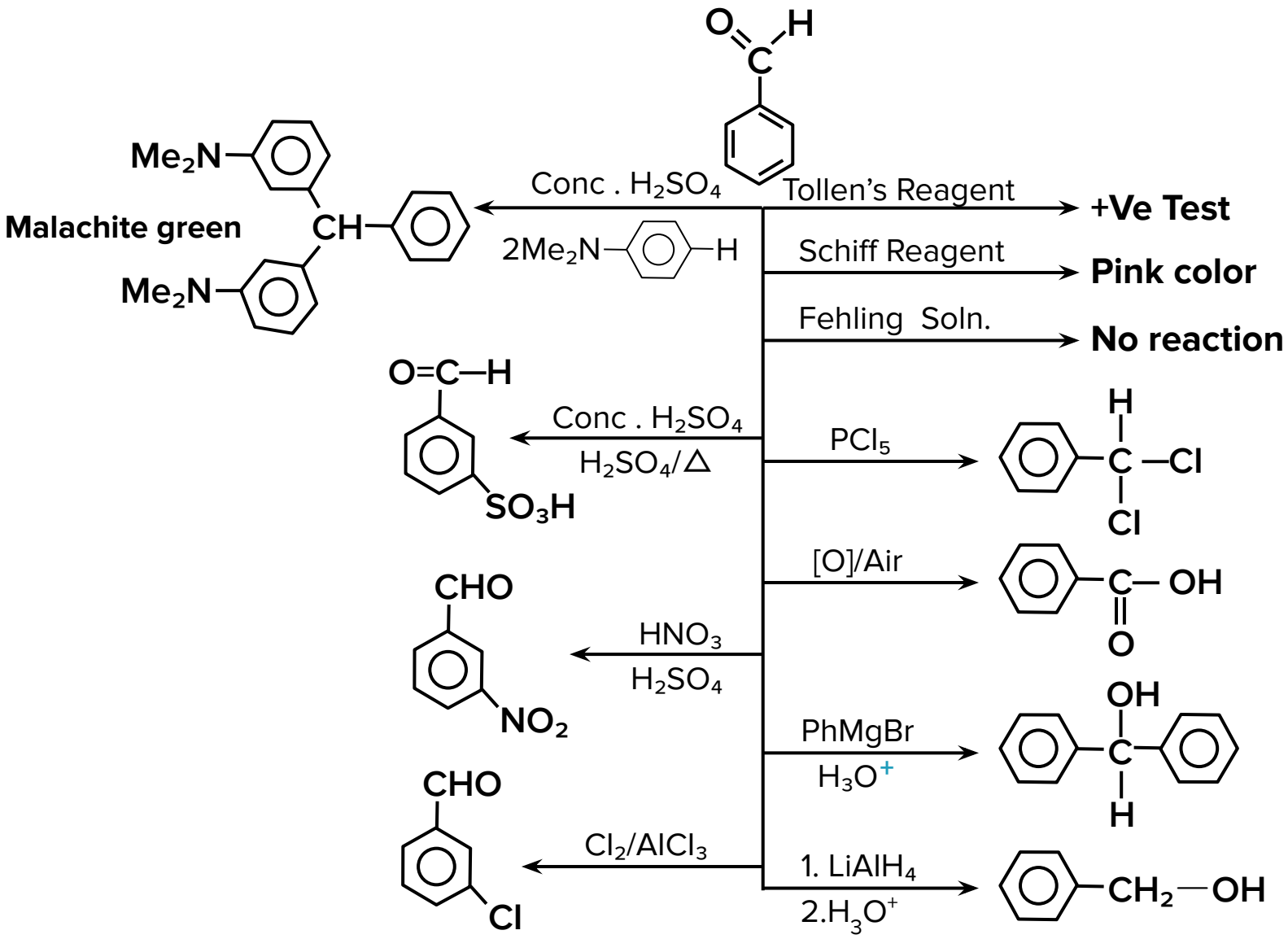
# Properties of Benzaldehyde



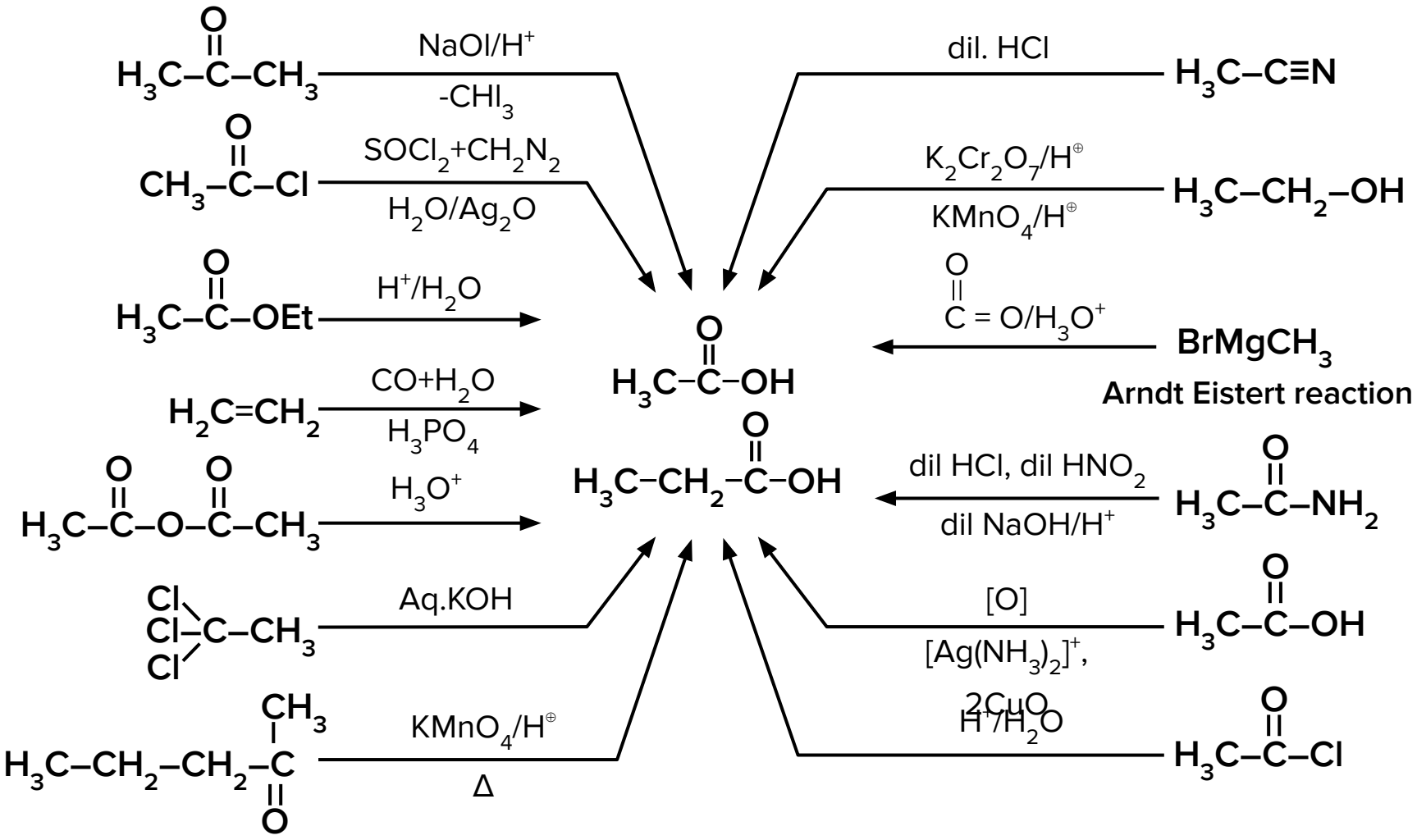
# Properties of Benzaldehyde



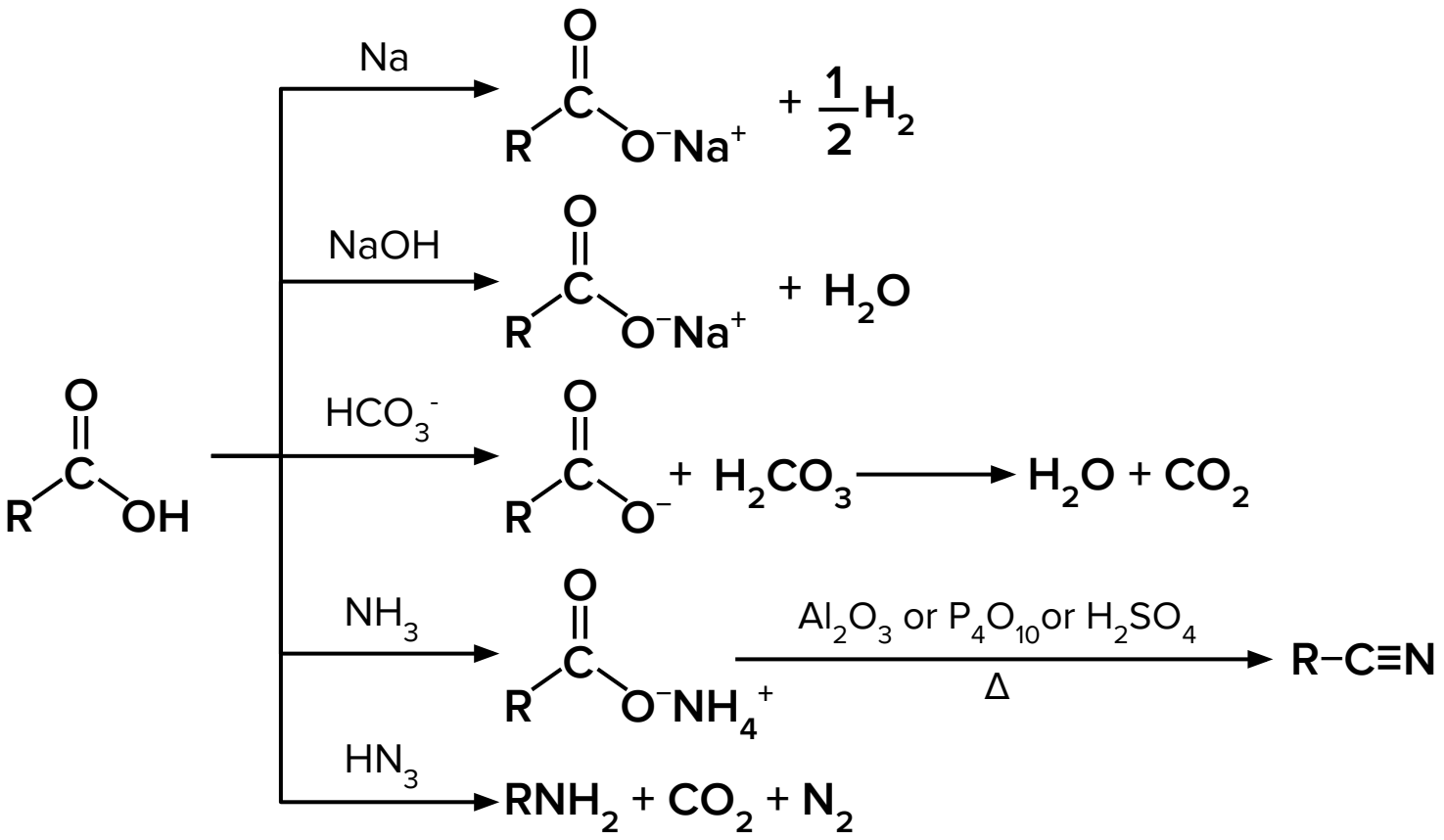
# Properties of Benzaldehyde



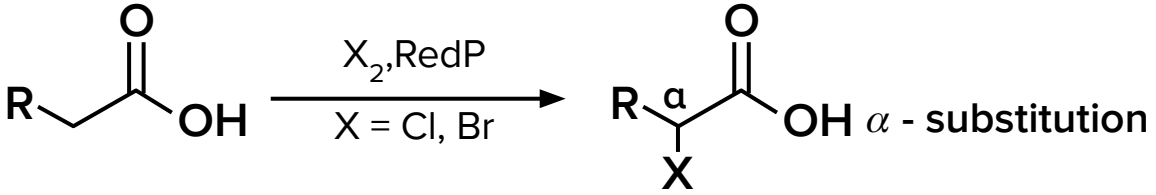
# Preparation of Carboxylic acid



# Properties of Carboxylic acid

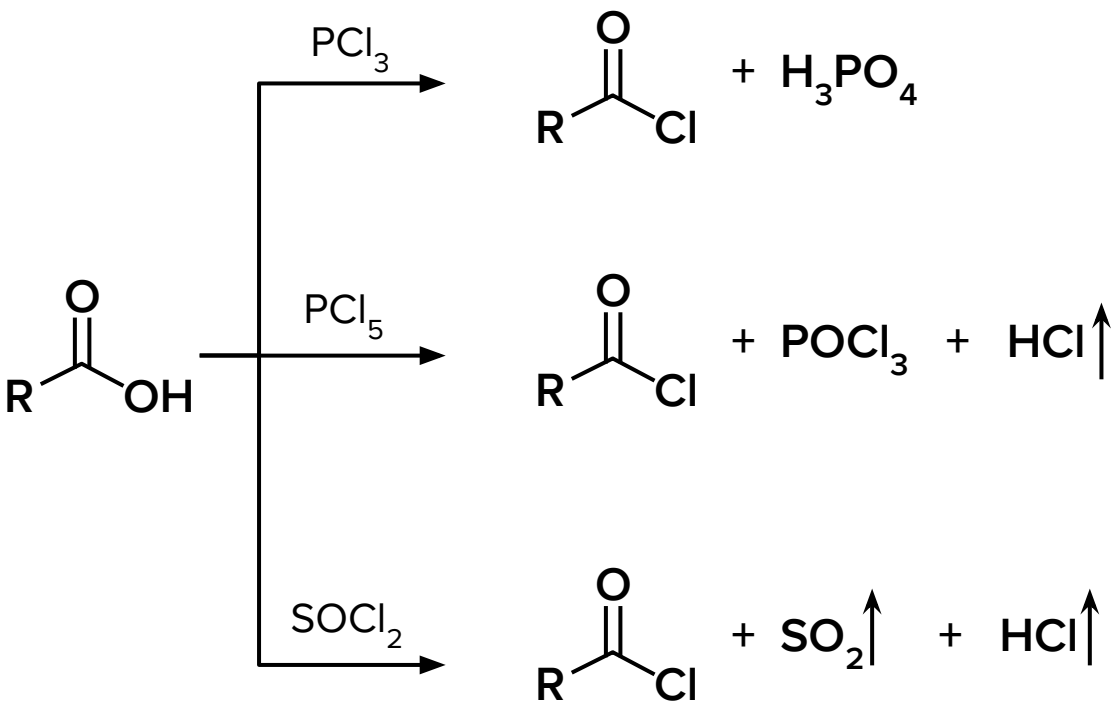



**Hell volhard zelinsky reaction**



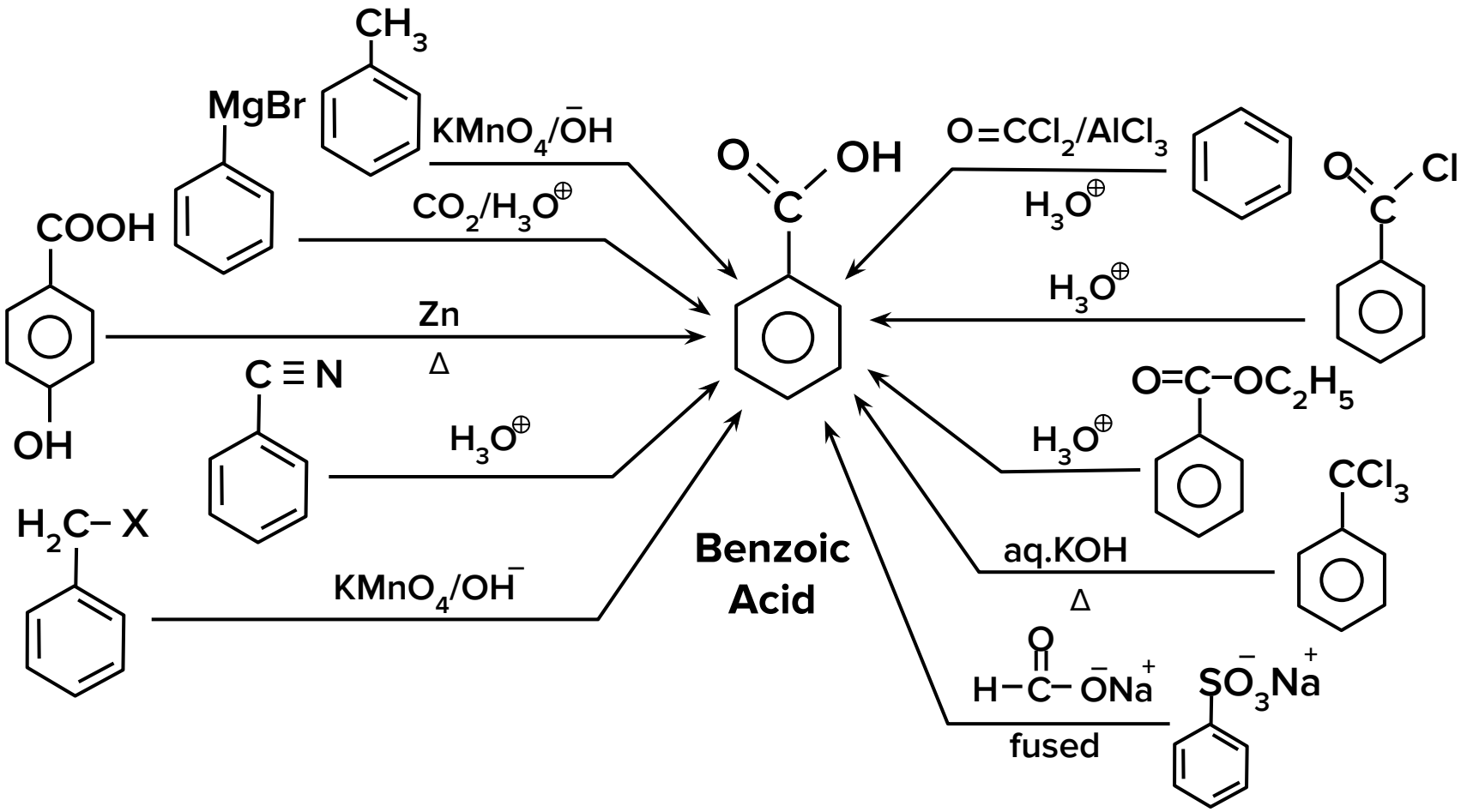
# Properties of Carboxylic acid

**Conversion to carboxylic acid derivative :**

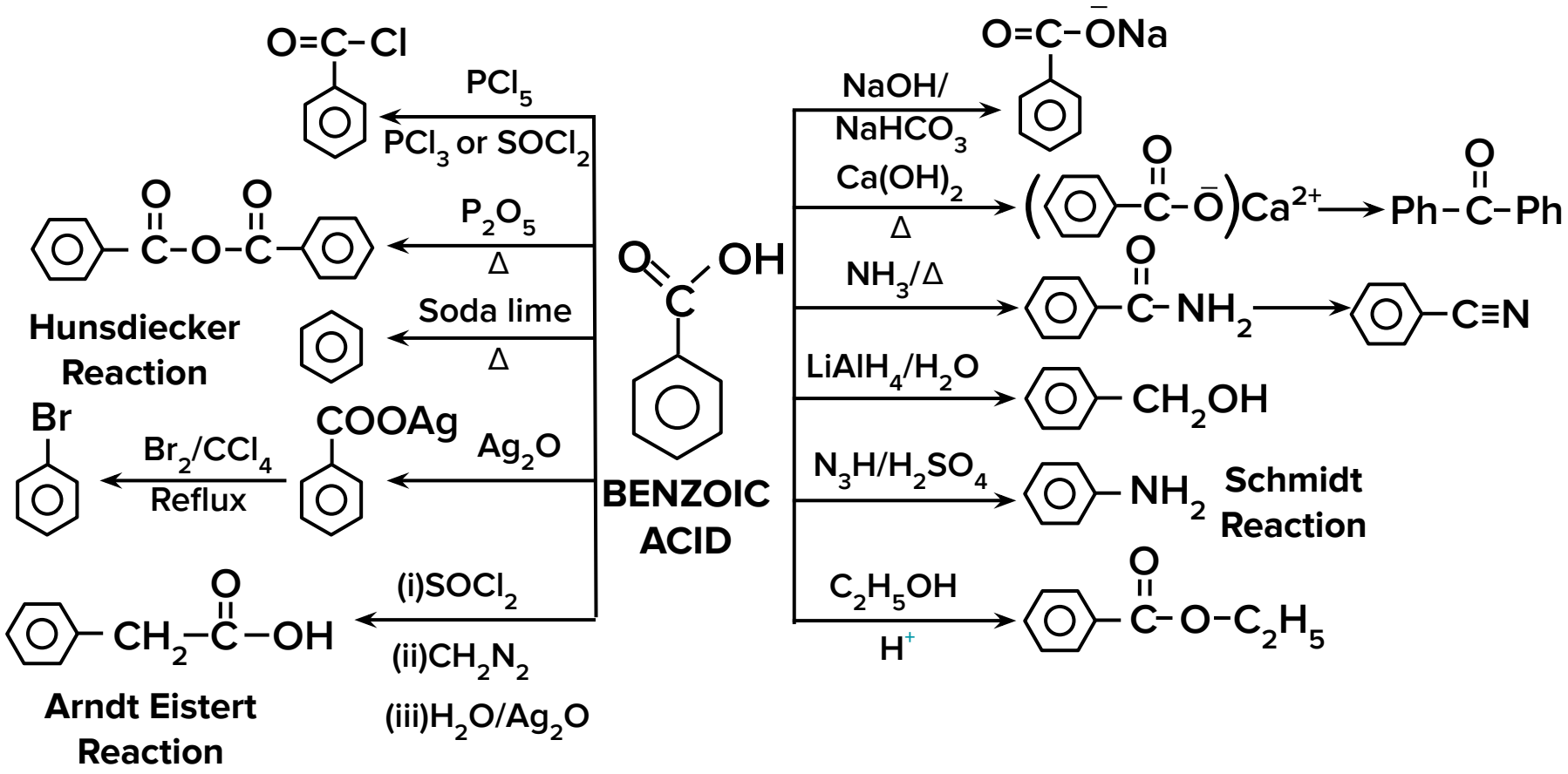



**Acyl chloride**

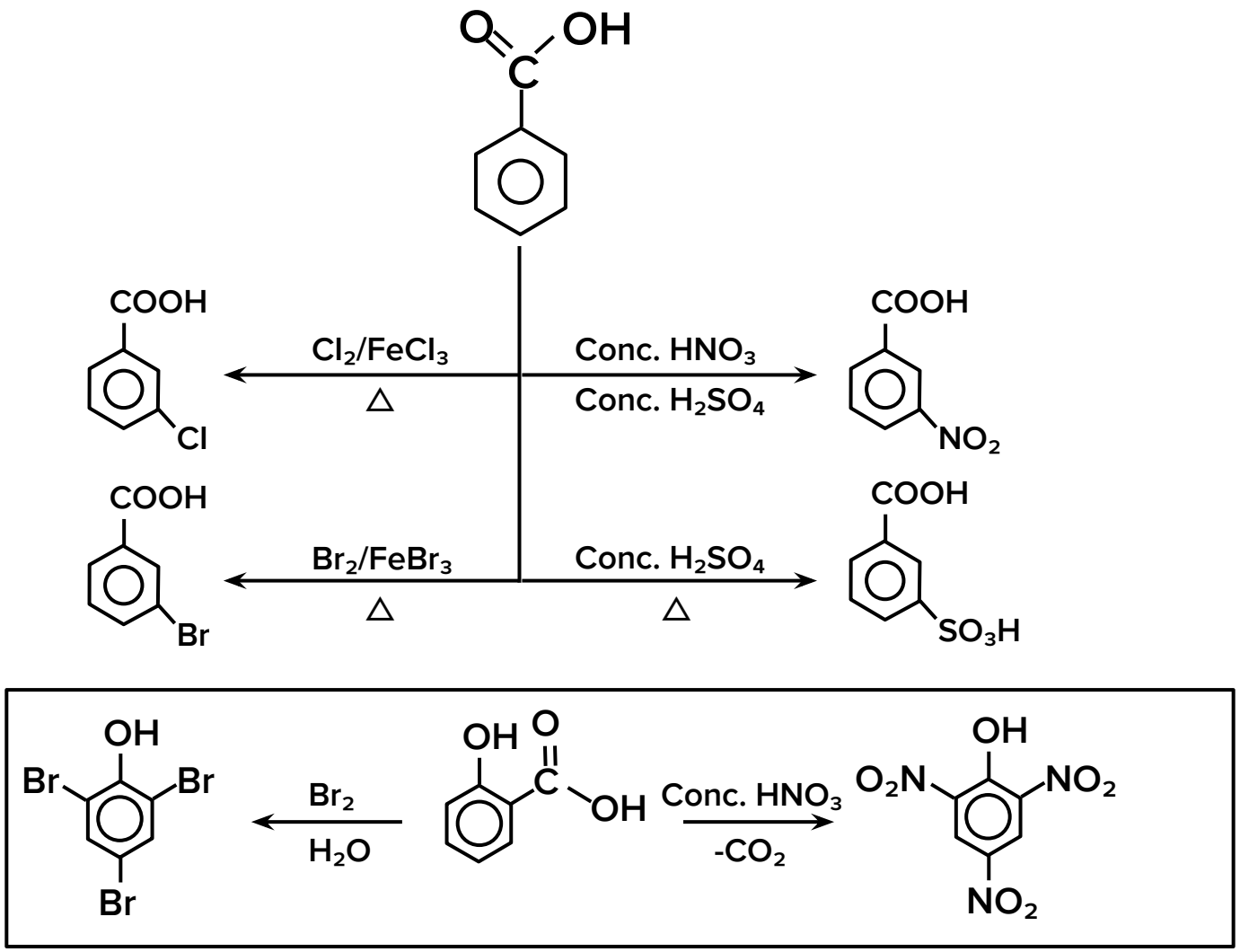
# Preparation of Benzoic Acid



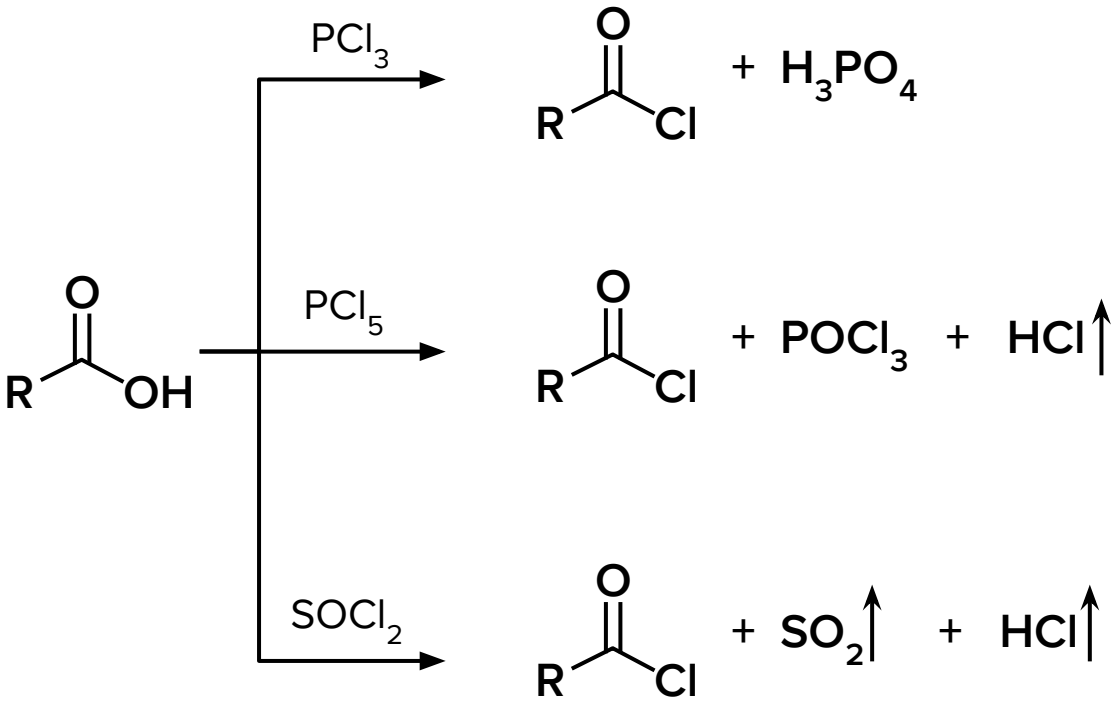
# Properties of Benzoic Acids



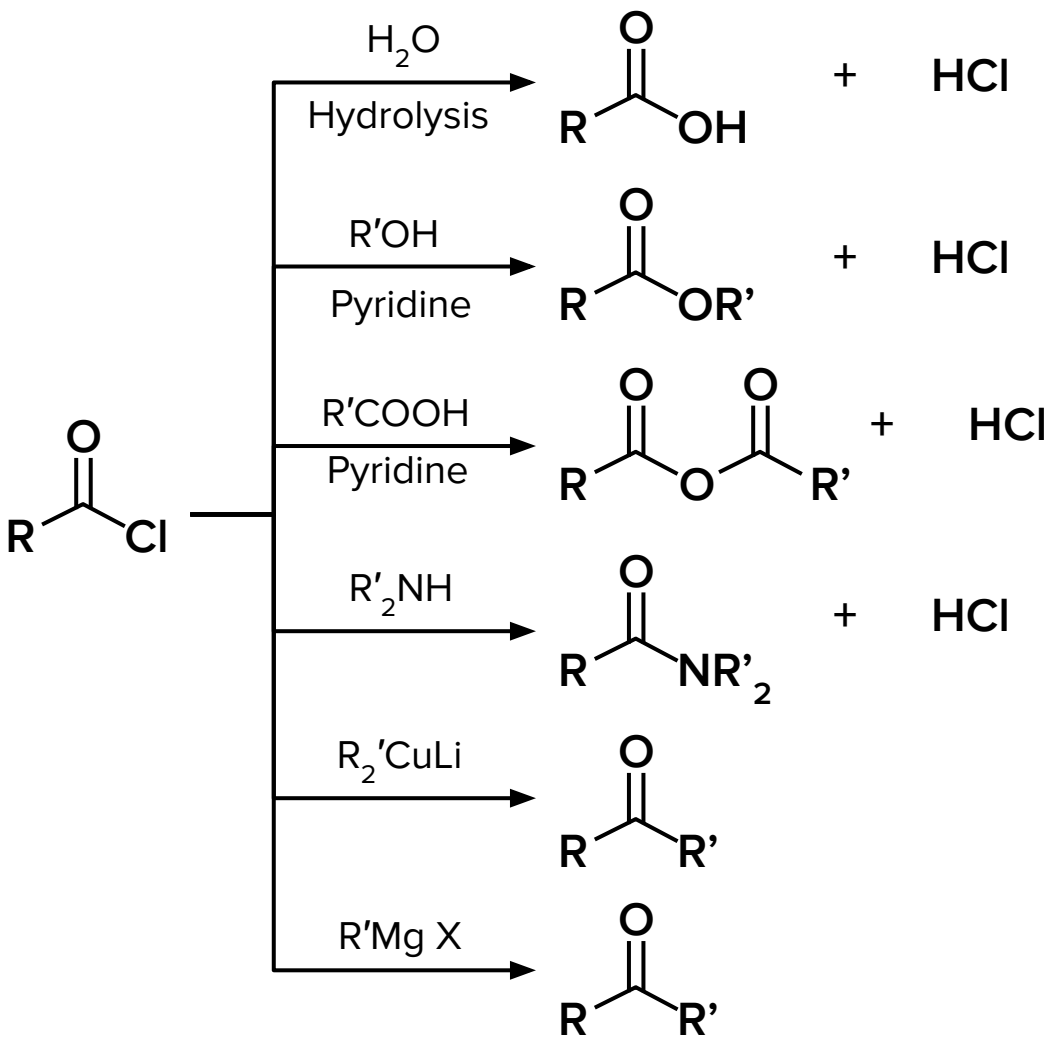
# Properties of Benzoic Acids



# Preparation of Acid Chloride

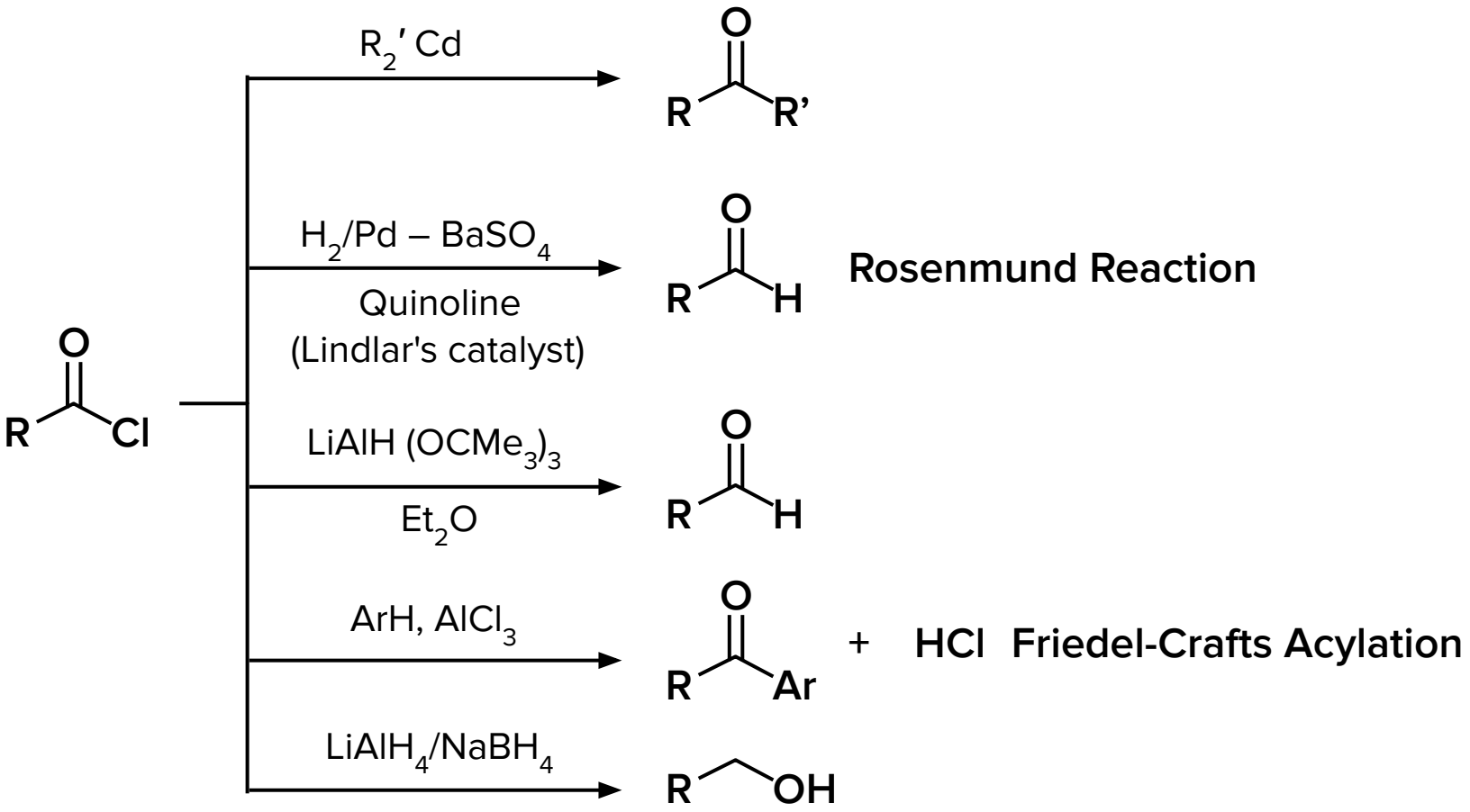


# Properties of Acid Chloride

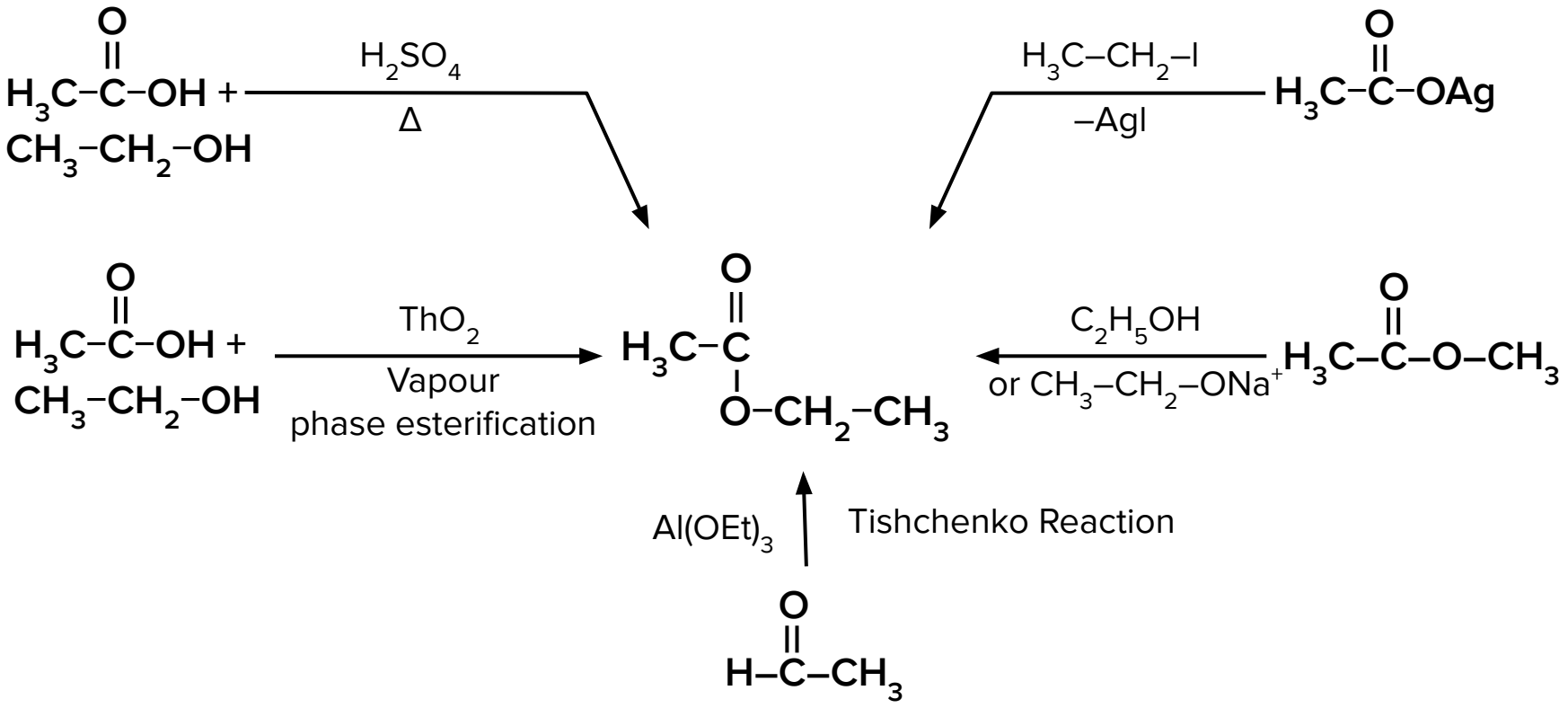


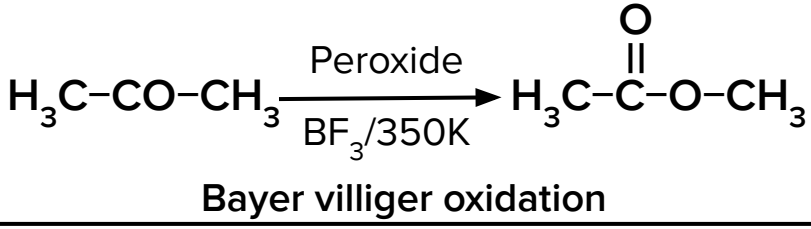

Pyridine is used to absorb HCl because reactivity of ester & anhydride is fairly high

# Properties of Acid Chloride

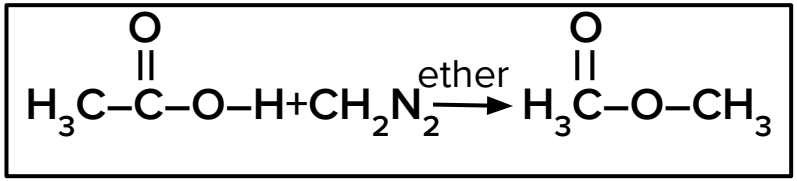


# Preparation of Esters

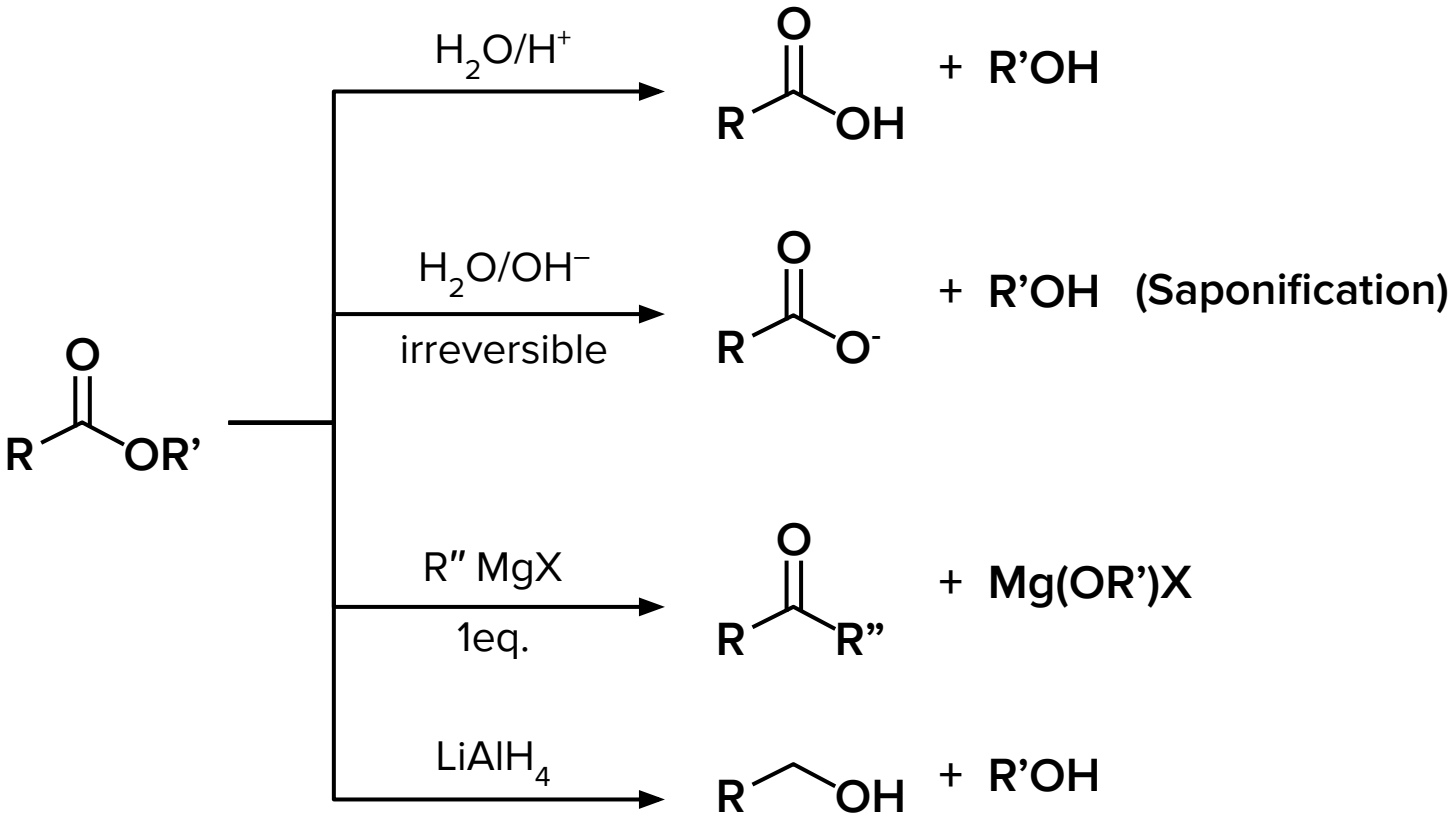


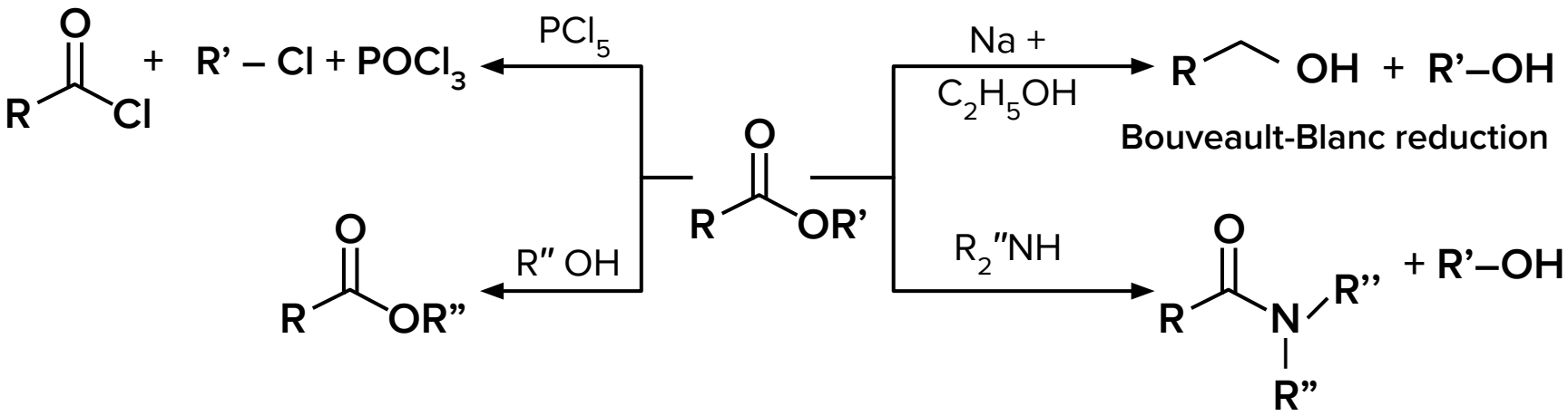

**Bayer villiger oxidation**



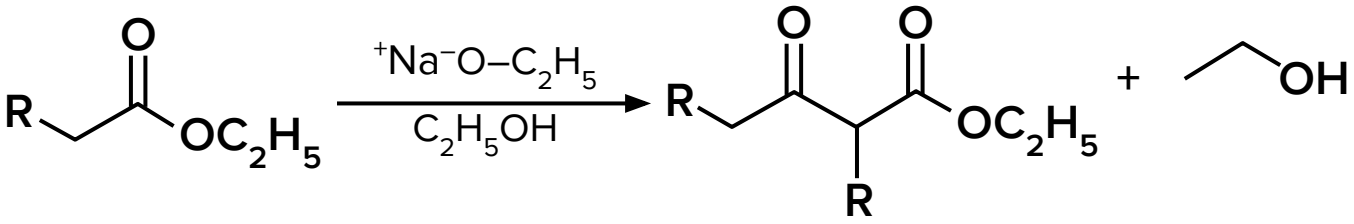
# Properties of Esters



# Properties of Esters

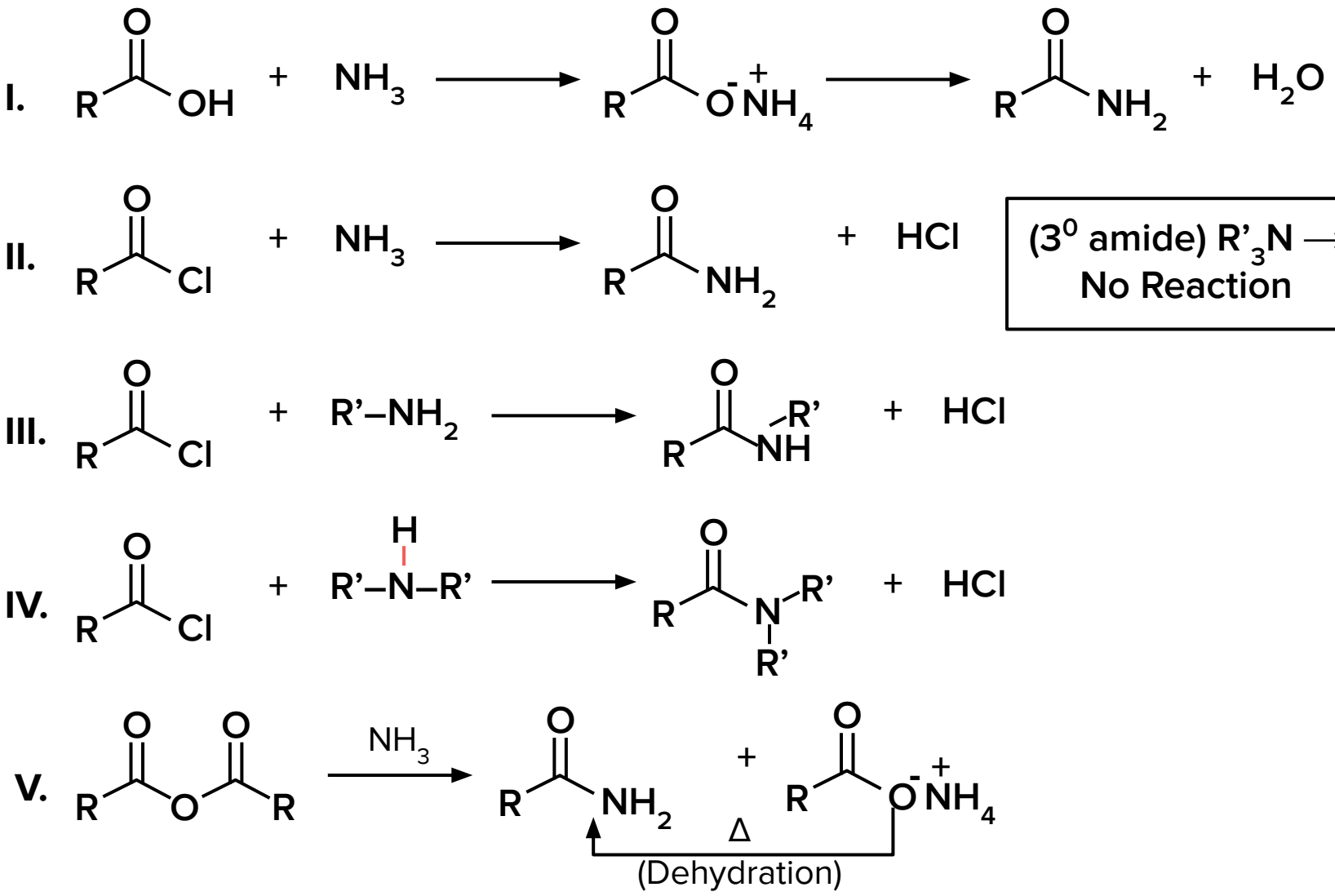



Claisen condensation :

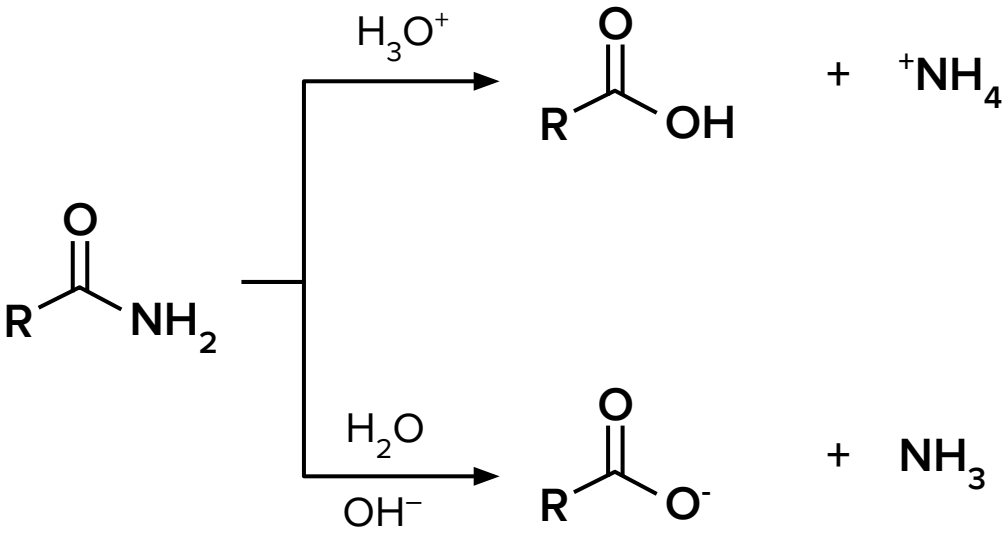


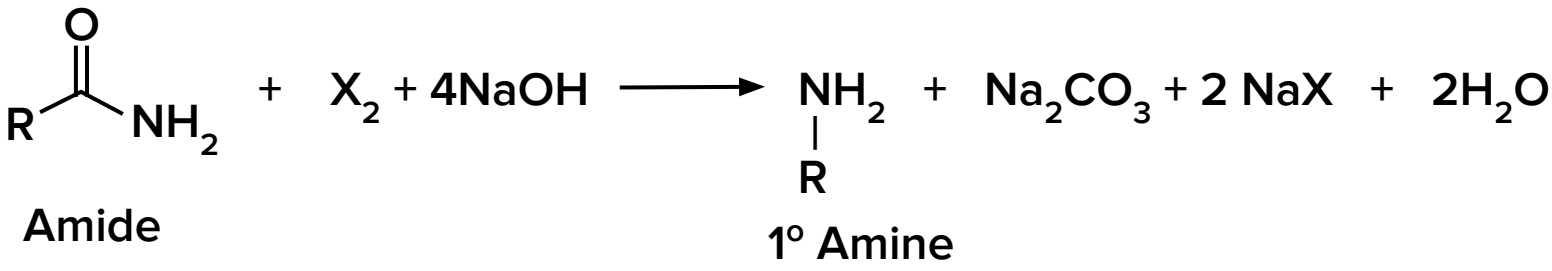

TRANSESTERIFICATION

# Preparation of Amides



# Properties of Amides

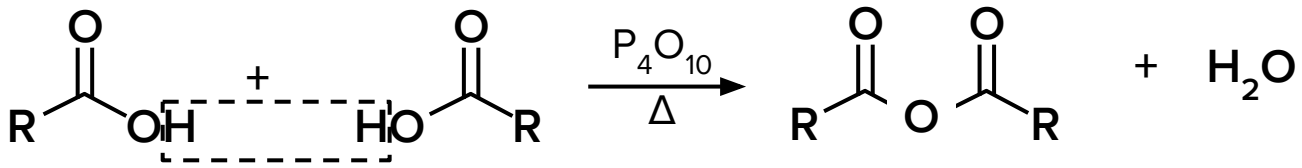


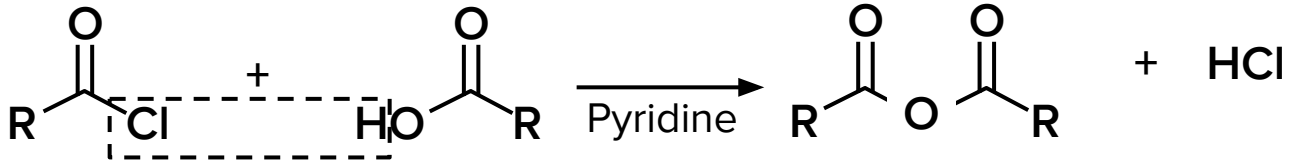

Amide

1° Amine

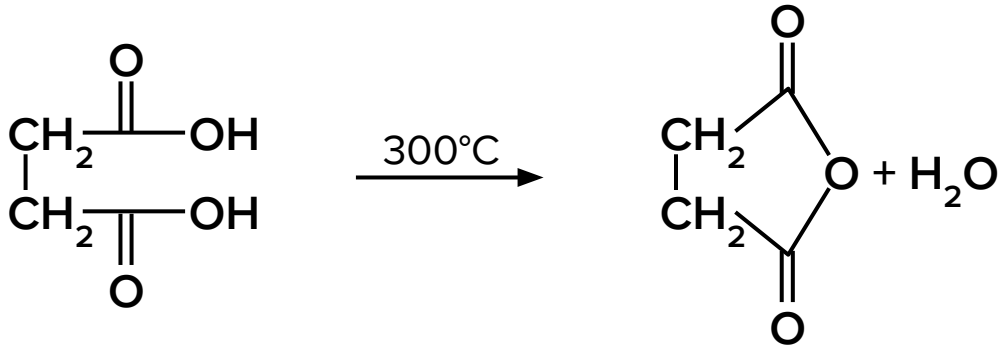
# Preparation of Acid anhydride




**Carboxylic acid**

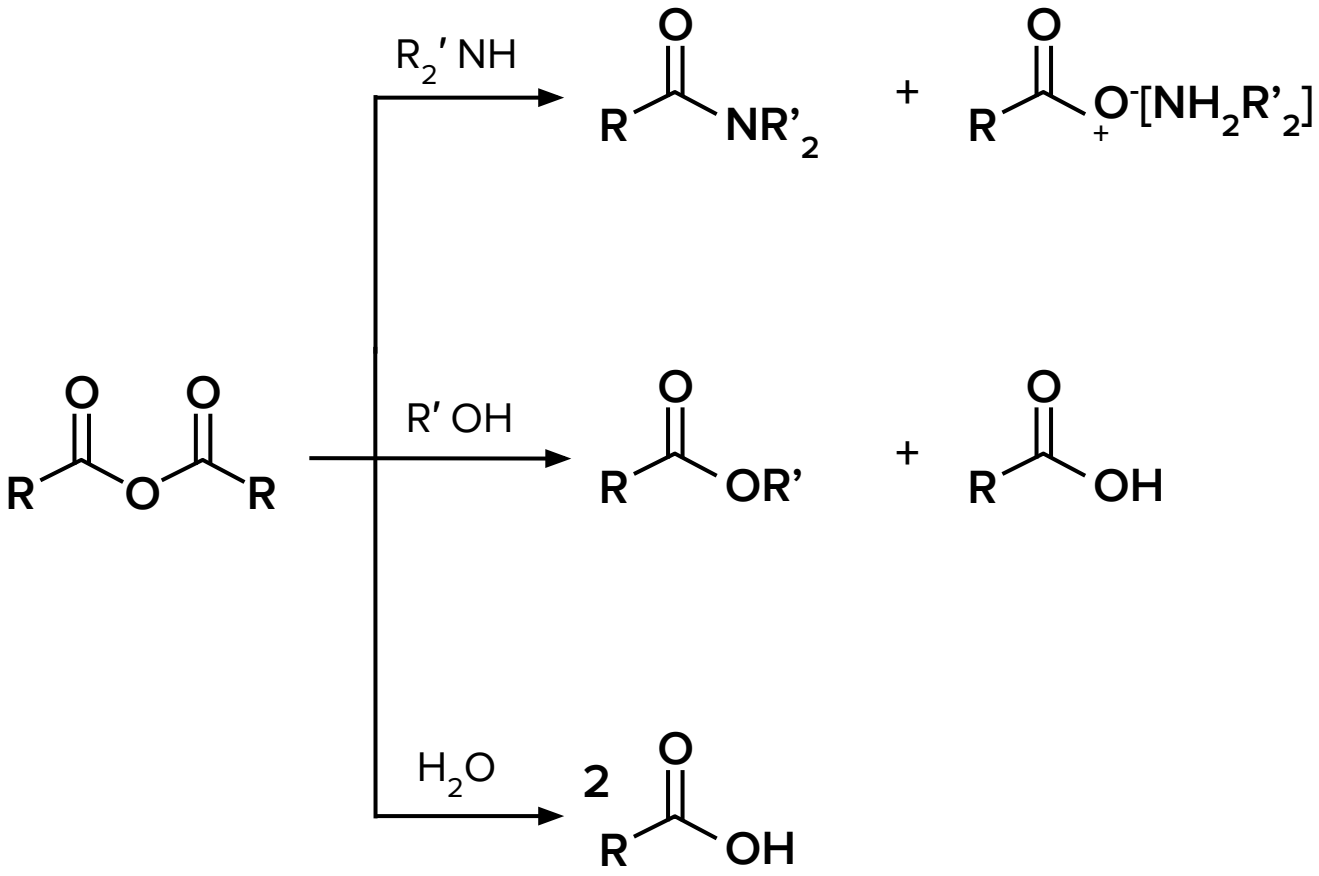



**Acid Chloride**

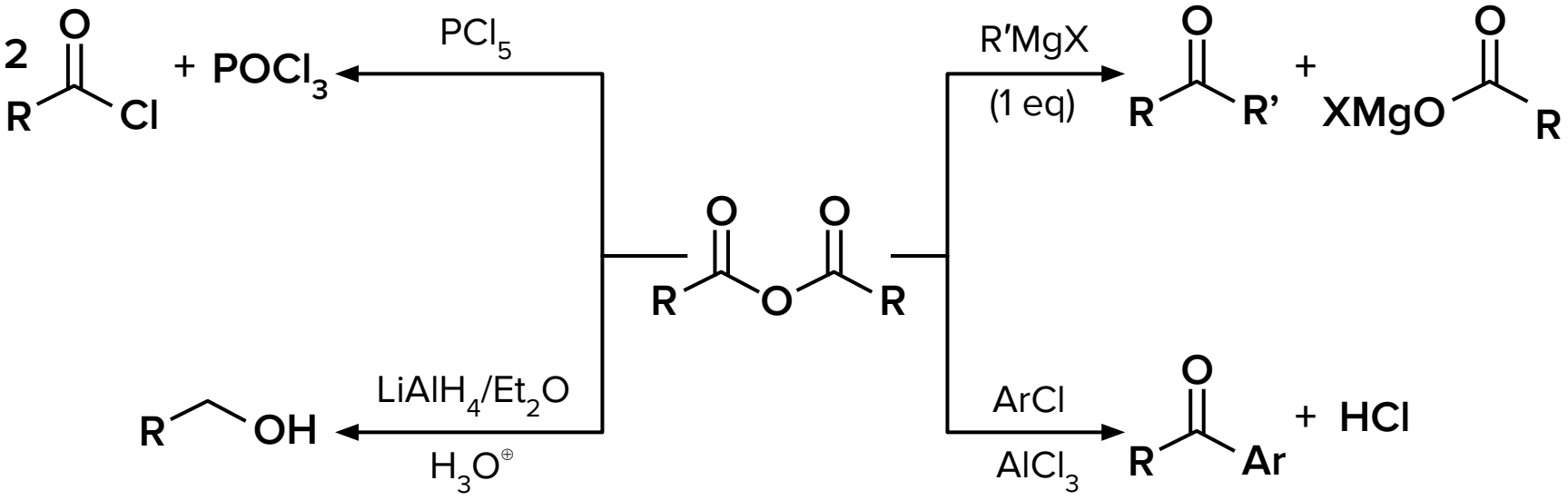



**Succinic Acid** **Cyclic anhydride**

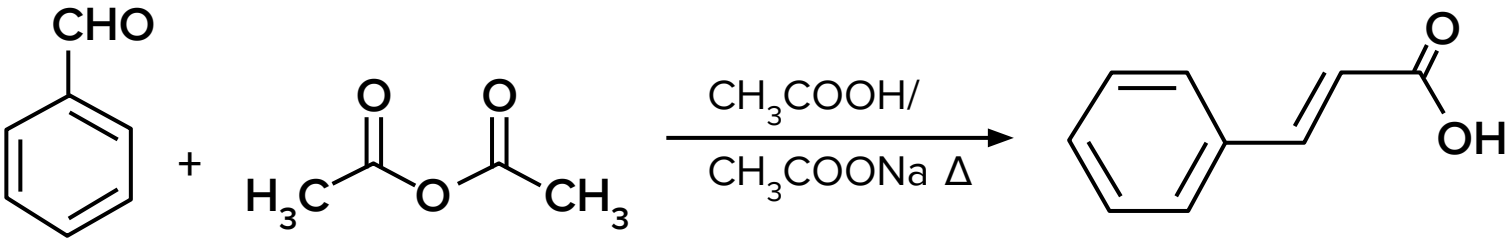
# Properties Acid anhydride



# Properties Acid anhydride




## Perkin Reaction :

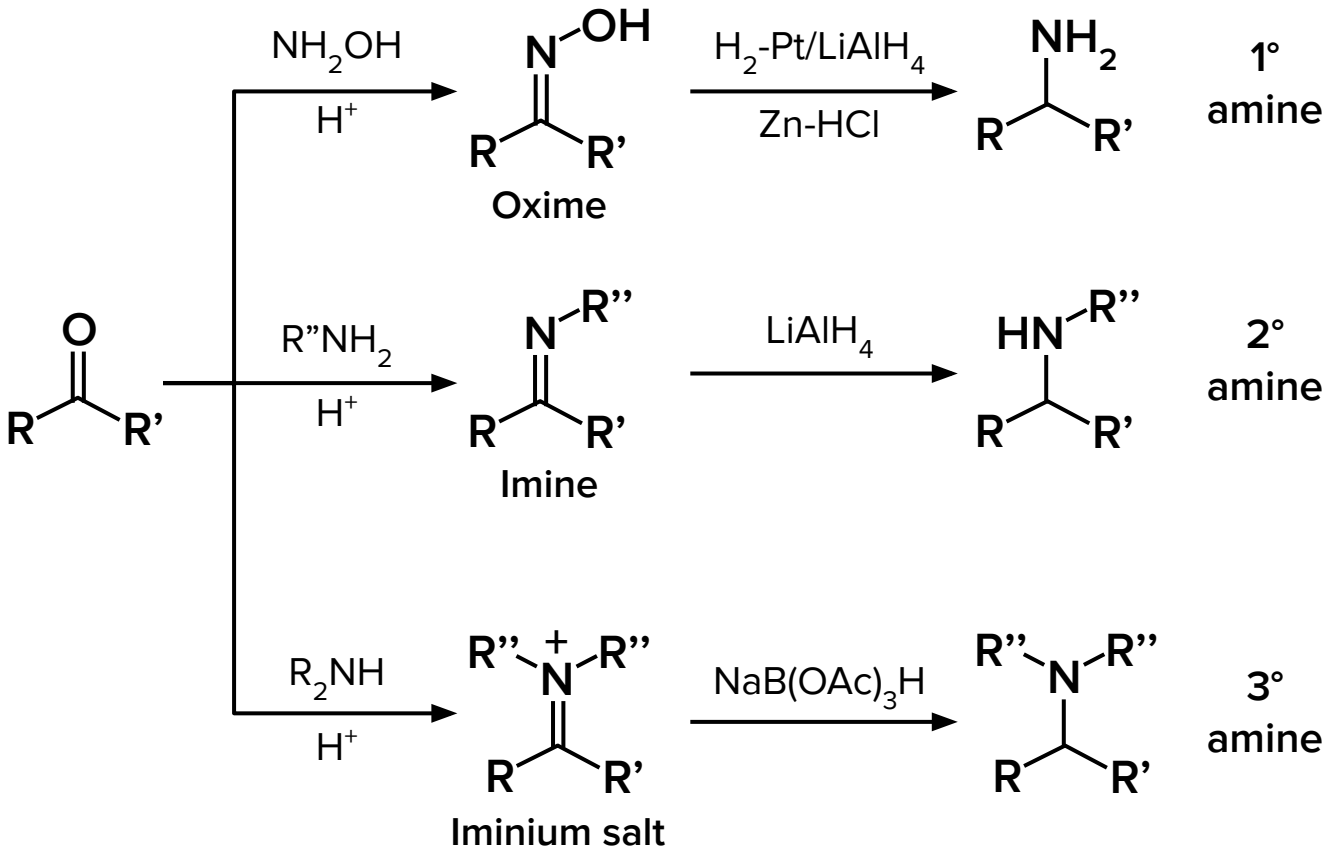



Cinnamic Acid

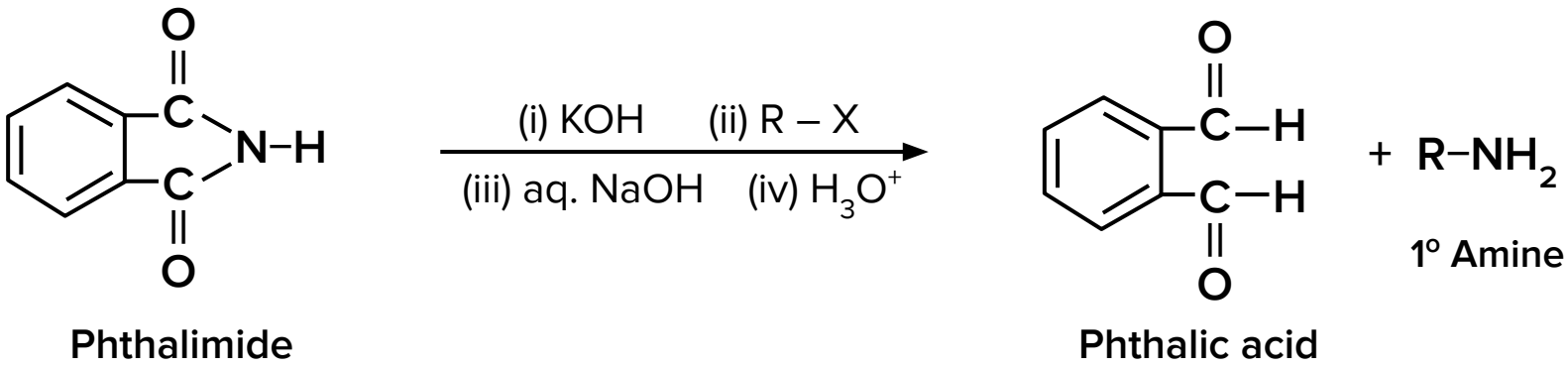
# Preparation of Amines

| | |
|---|---|
| $R-NO_2$ (Nitroalkane) $\xrightarrow[HCl]{Sn / Zn / Fe}$ $R-NH_2$ (1° amine) | $R-N_3$ (Alkyl azide) $\xrightarrow[\text{ii) } H_3O^+]{\text{i) LAH, } Et_2O}$ $R-NH_2$ (1° amine) |
| $R-C\equiv N$ (Cyanide) $\xrightarrow[\text{ii) } H_3O^{+},]{\text{i) LAH,} Et_2O}$ $R-CH_2-NH_2$ (1° amine) | $R-\overset{+}{N}\equiv C^-$ (Isocyanide) $\xrightarrow[\text{ii) } H_3O^+]{\text{i) LAH,} Et_2O}$ $R-NH-CH_3$ (2° Amine) |
| $R-C\equiv N$ (cyanide) $\xrightarrow[C_2H_5OH]{Na/C_2H_5OH}$ $R-CH_2-NH_2$ (1° Amine Mendius) | 1,3-dinitrobenzene $\xrightarrow[\text{or } NH_4HS]{(NH_4)_2S}$ 1,3-diaminobenzene |
| $R-Mg-Cl + Cl-NH_2 \longrightarrow R-NH_2 + MgCl_2$ | |

# Preparation of Amines

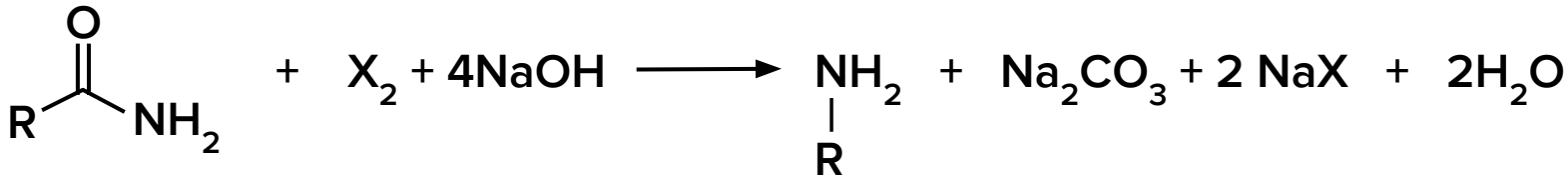


# Preparation of Amines



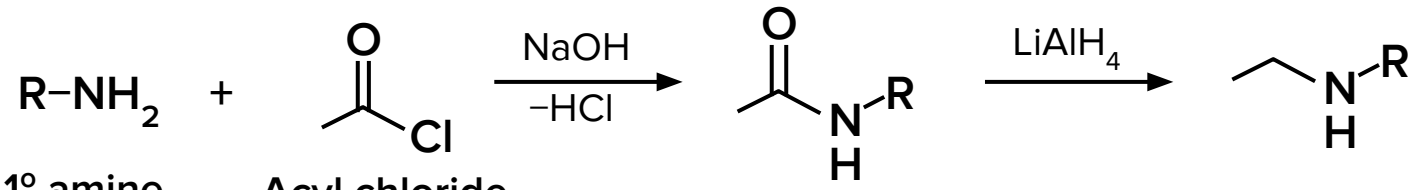

Phthalimide

Phthalic acid




Amide

1° Amine




1° amine

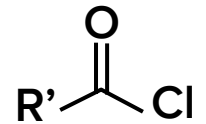
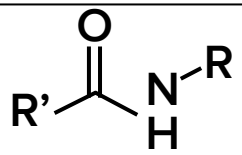
Acyl chloride

# Properties of Amines

$R - NH_2$ + $R' - X$ ⟶ $R - NH - R'$ + $HX$

1° Amine — 1° Alkyl halide

---

$R - NH_2$ +  ⟶  + $HCl$

1° Amine — Acyl Chloride — N-sub. Amide

---

$R - NH_2 + HNO_2 \longrightarrow R - N_2^+ + H_2O$

---

$R - NH_2$ + $CHCl_3$ + $3KOH$ ⟶ $R - NC$ + $3KCl$ + $3H_2O$

1° Amine — Chloroform — Carbylamine

---

$RCH_2NH_2 \xrightarrow[KMnO_4]{[O]} R - CH = NH \xrightarrow{H_2O} R - CHO + NH_3$

Aldimine — Aldehyde

---

$R_2CHNH_2 \xrightarrow[KMnO_4]{[O]} R_2C = NH \xrightarrow{H_2O} R_2C = O + NH_3$

Ketimine — Ketone

---

$2R_2NH \xrightarrow[KMnO_4]{[O]} R_2N - NR_2$

(Tetra-alkyl hydrazine)

---

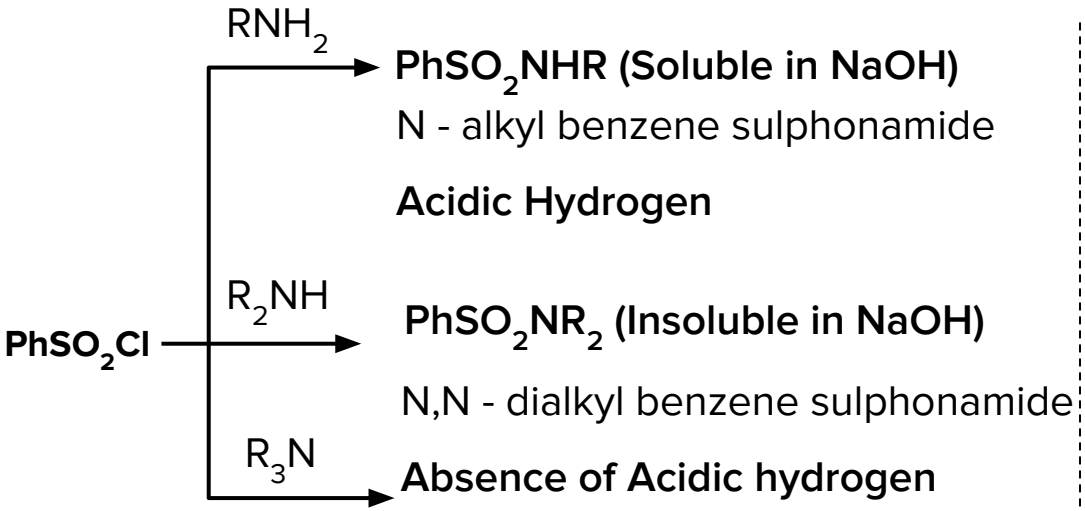
$R_2NH \xrightarrow[acid]{Caro's} R_2N\text{-}OH$

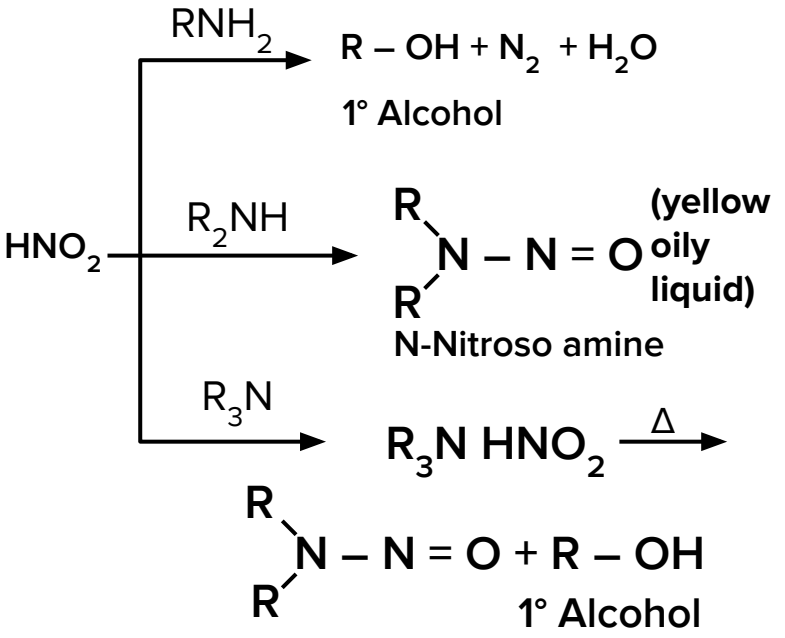
(Dialkyl hydroxylamine)

---

Tertiary amine: No Oxidation with $KMnO_4$

# Properties of Amines

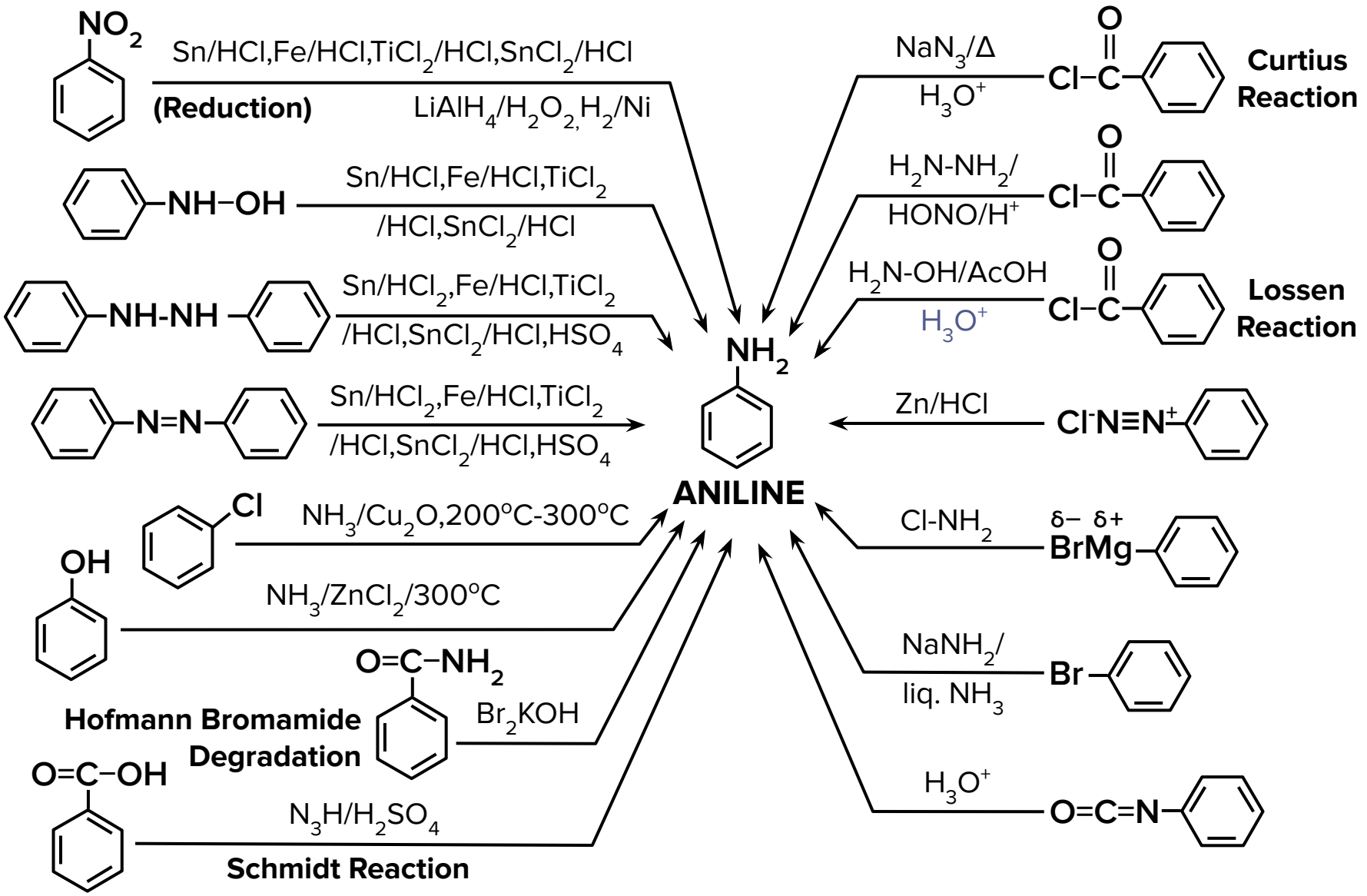


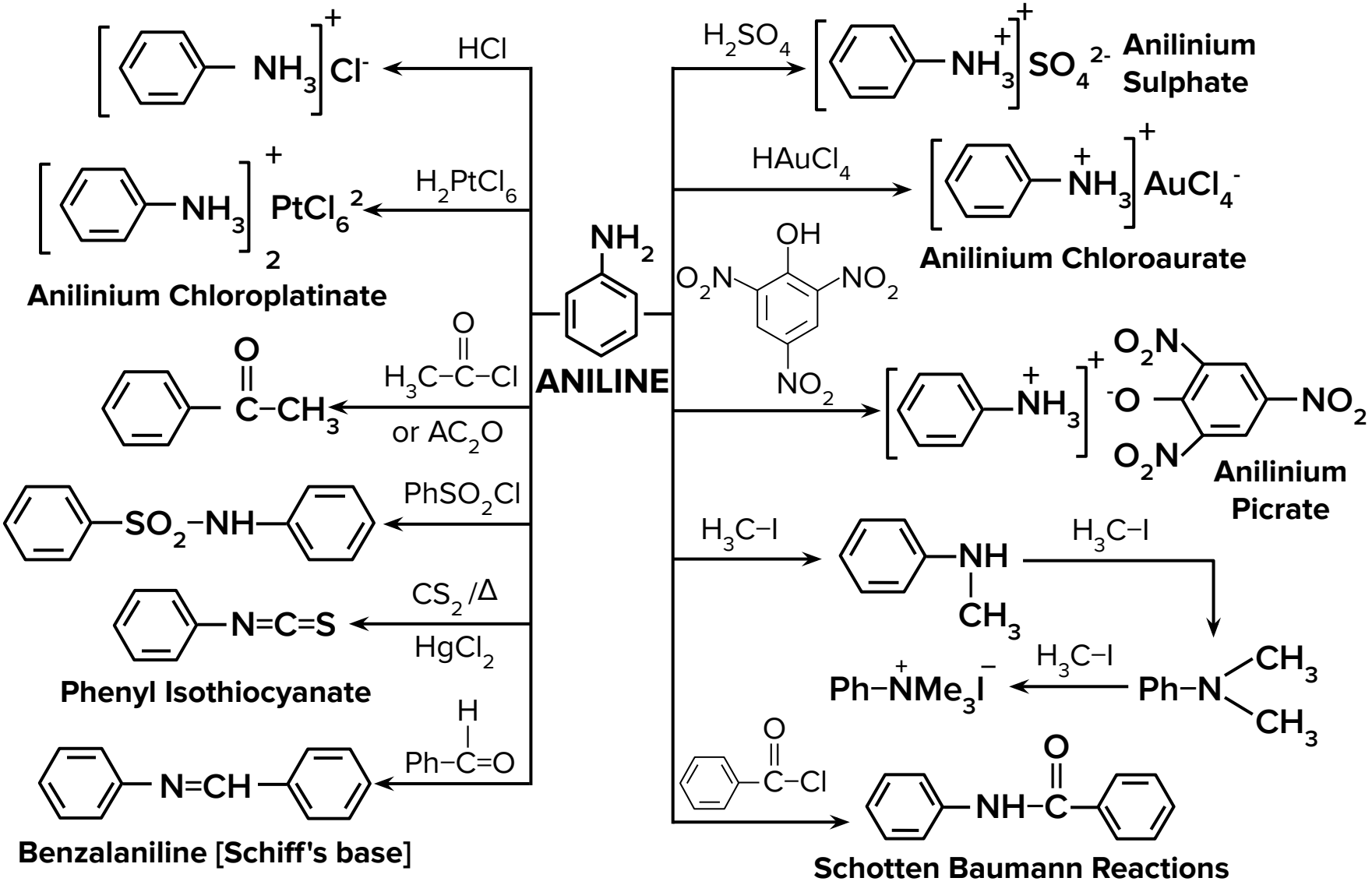

$$2RNH_2 + S = C = S \longrightarrow S = C \begin{matrix} NHR \\ SH \end{matrix} \xrightarrow{HgCl_2} R - N = C = S + RNH_2 + HgS + 2HCl$$

Alkyl isothiocyanate

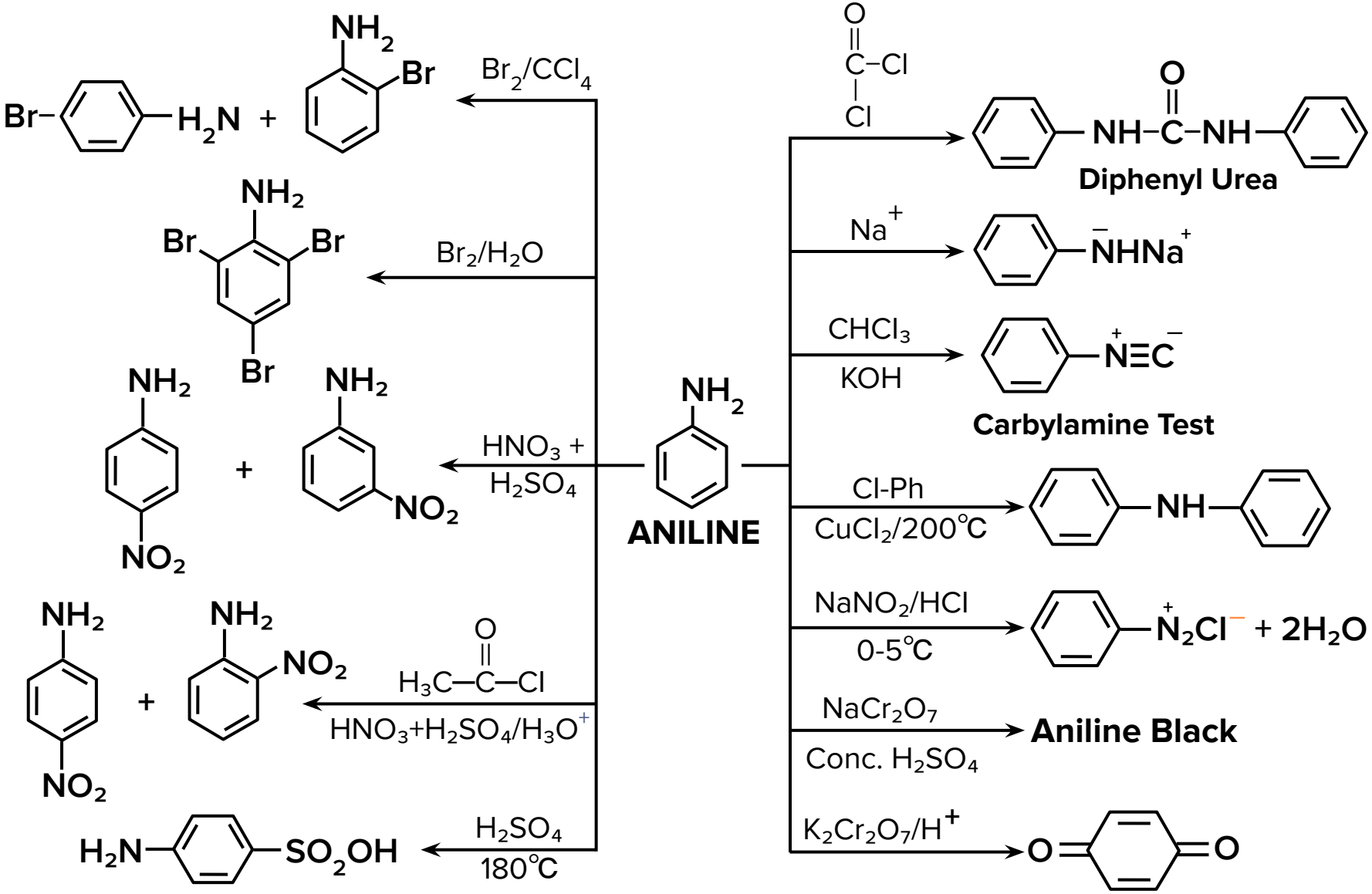
# Preparation of Aniline



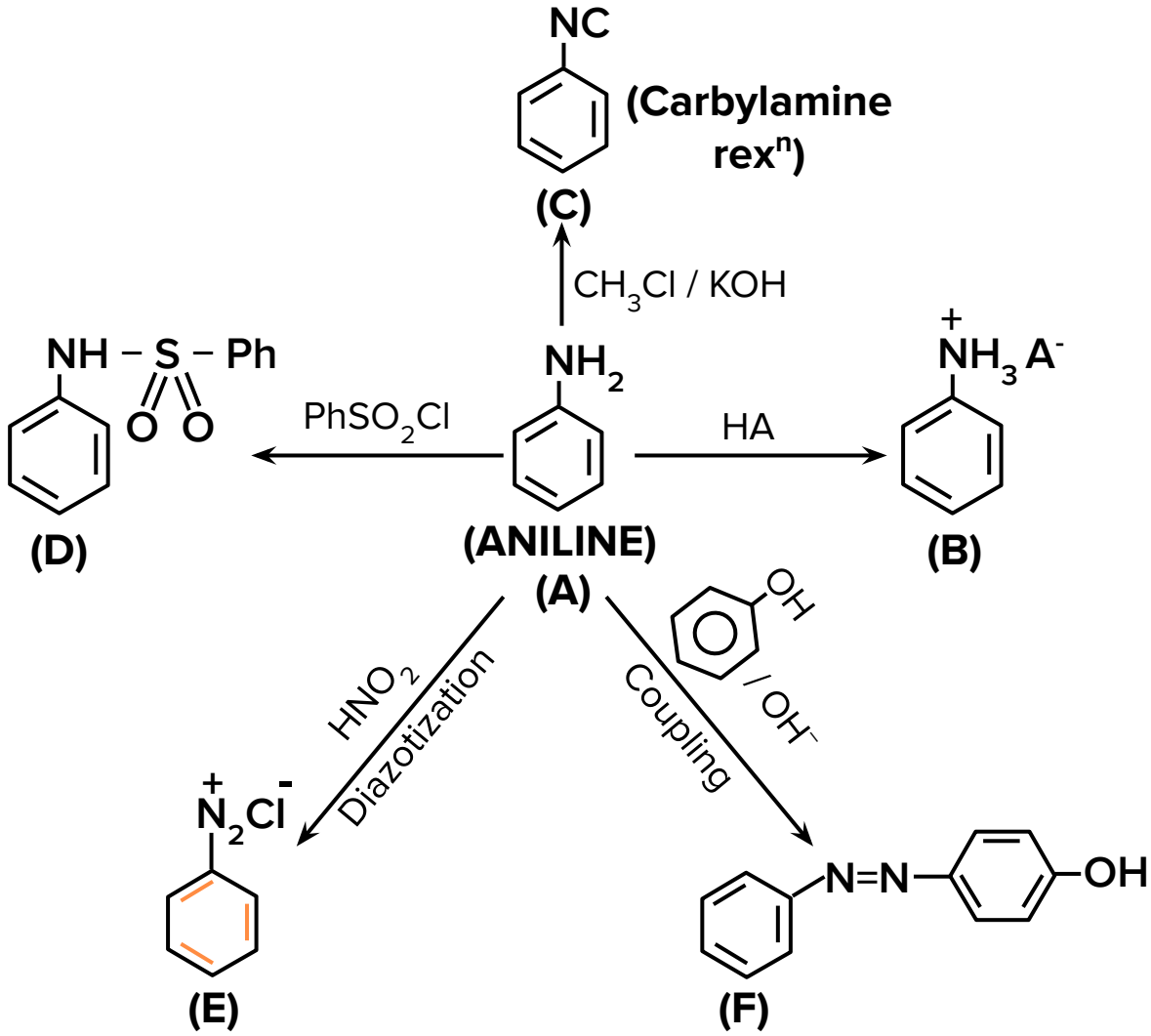
# Properties of Aniline



# Properties of Aniline

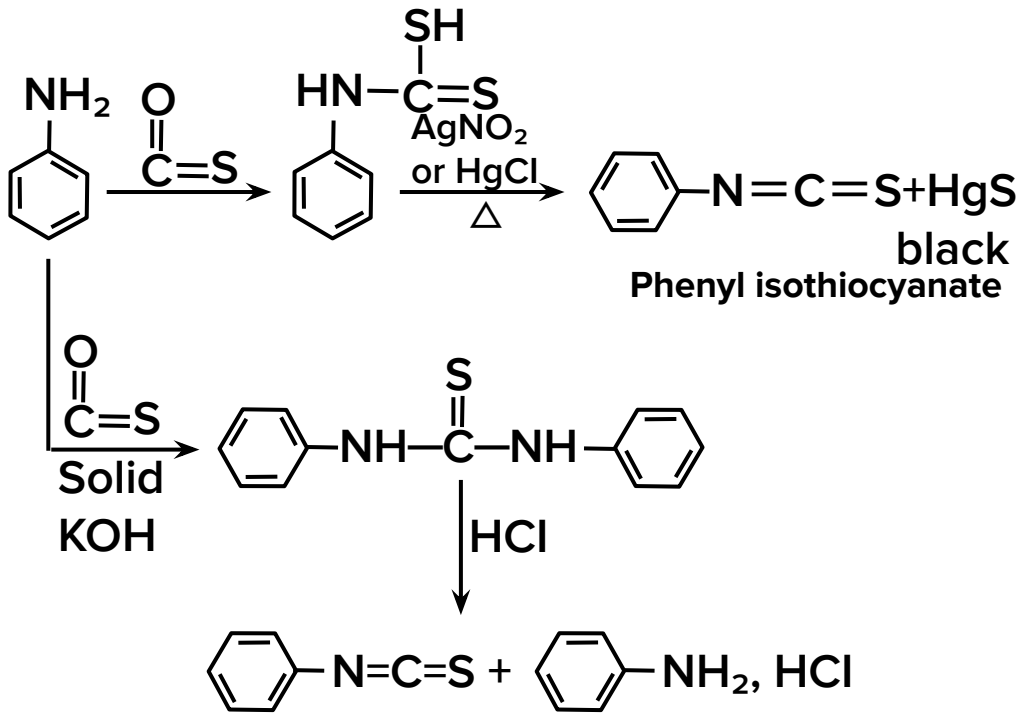


# Properties of Aniline

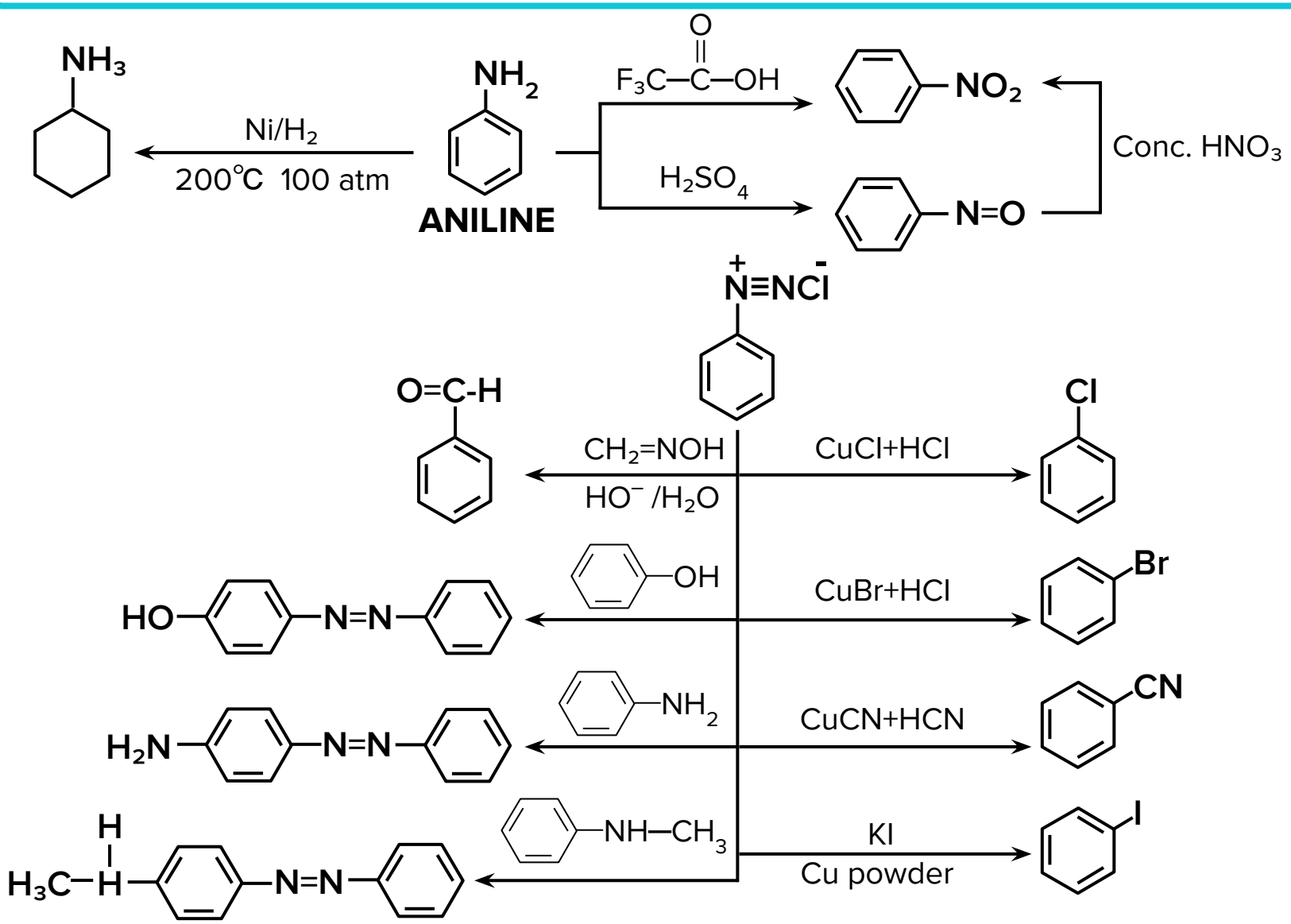


# Properties of Aniline

**Reaction with $CS_2$**



# Properties of Diazonium compounds



# Properties of Diazonium compounds