Reaction Name	Reactants	Key Reagents	Main Product	Unique Feature/Tip
Aldol Condensation	Aldehydes/Ketones with α-H	Dilute NaOH	β-hydroxy aldehyde	Formation of C-C bond.
Cannizzaro Reaction	Aldehydes with no α-H	Conc. NaOH	Alcohol + Carboxylic Acid	Disproportionation reaction.
Reimer-Tiemann	Phenol + $CHCl_3$	Aqueous NaOH	Salicylaldehyde	Introduces −CHO group to Phenol.
Kolbe's Reaction	Phenol	$NaOH, CO_2, H^+$	Salicylic Acid	Synthesis of Aspirin precursor.
Rosenmund Reduction	Acid Chloride	$Pd/BaSO_4, H_2$	Aldehyde	"Poisoned" catalyst prevents over-reduction.
Stephen Reaction	Nitriles	$SnCl_2/HCl$	Aldehyde	Selective reduction of Cyanides.
Clemmensen Reduction	Carbonyl Group	Zn−Hg/HCl	Alkane	Best for acid-stable molecules.
Wolff-Kishner	Carbonyl Group	NH_2NH_2/KOH	Alkane	Best for base-stable molecules.
Williamson Synthesis	Alkyl Halide + Alkoxide	NaOR	Ether	S_N2 mechanism; use 1◦ halides.
Hoffmann Bromamide	Amide	$Br_2/NaOH$	1◦ Amine	Degrades chain by 1 Carbon atom.
Gabriel Phthalimide	Phthalimide	KOH, Alkyl Halide	Pure 1◦ Amine	No 2◦ or 3◦ amine contamination.
Sandmeyer Reaction	Diazonium Salt	CuCl/CuBr	Haloarene	Replaces $-N_2^+$ with Halogen.
Wurtz Reaction	Alkyl Halide	Na / Dry Ether	Higher Alkane	Doubles the carbon chain length.
Fittig Reaction	Aryl Halide	Na / Dry Ether	Biphenyl	Coupling of two aromatic rings.
Friedel-Crafts Alk.	Benzene + R−Cl	Anhydrous $AlCl_3$	Alkylbenzene	Electrophilic substitution.
Etard Reaction	Toluene	CrO_2Cl_2	Benzaldehyde	Selective oxidation of methyl group.
Hell-Volhard-Zelinsky	Carboxylic Acid	Red P/X_2	α-halo acid	Halogenation at the α-carbon.
Gatterman-Koch	Benzene + CO/HCl	Anhyd. $AlCl_3$	Benzaldehyde	Industrial synthesis of Benzaldehyde.
Hunsdiecker	Silver Salt of Acid	Br_2/CCl_4	Alkyl Bromide	Decarboxylative bromination.
Swarts Reaction	Alkyl Chloride/Bromide	AgF or Hg_2F_2	Alkyl Fluoride	Best way to synthesize Fluorides.