1. 

\[
\begin{align*}
\text{MeO} & \quad \text{MeO} \\
\text{Me} & \quad \text{Me} \\
\text{MeO} & \quad \text{MeO}
\end{align*}
\]

\[
\text{TiOH} \quad 1) \text{TBHP, Triton B, THF, rt} \\
\text{CH}_2\text{Cl}_2, 0 \, ^\circ\text{C} \quad 2) \text{SiO}_2, \text{rt}, 76\% \text{ (2 steps)}
\]


2. 

\[
\text{Et}_3\text{Si} \quad \text{Et}_3\text{Si} \quad \text{O} \\
\text{Si} & \quad \text{Si} \\
\text{Et} & \quad \text{Et}
\]

\[
\text{t-BuLi (3.0 eq.)}^* \quad \text{THF-HMPA} \\
\text{–78} \, ^\circ\text{C} \quad E:Z = 1:1
\]

*theoretically 1 eq.


3. 

\[
\text{OMe} \quad \text{MeO} \\
\text{Me} & \quad \text{Me} \\
\text{MeO} & \quad \text{MeO}
\]

\[
\text{K, NH}_3 \\
\text{t-BuOH} (1 \text{ eq}) \\
\text{THF, –78} \, ^\circ\text{C}; \\
\text{MeOH, rt} \\
\text{95%}
\]

\[
\text{piperylene; Mel} \\
\text{LiOMe} \\
\text{THF, –78} \, ^\circ\text{C} \\
\text{87%}
\]


4. 

\[
\text{i-Pr} \quad \text{OH} \\
\text{Me} & \quad \text{Me}
\]

\[
\text{Me} \quad \text{Me} \\
\text{Si} & \quad \text{H} \\
\text{H} & \quad \text{Si}
\]

\[
\text{NaH (20 mol%) hexane, reflux} \\
\text{87%}
\]

\[
\text{1) Rh(acac)(CO)}_2 \\
\text{(1 mol%)} \\
\text{CO (1000 psi)} \\
\text{benzene, 60} \, ^\circ\text{C} \\
\text{62\% (2 steps)} \\
d.r. = 15:1
\]