1. Provide a mechanism for each product and explain the solvent effect on the reaction outcome.

\[ \text{PhMgBr, THF} \rightarrow \text{Ph} \quad (78-83\%) \]

\[ \text{PhMgBr, toluene} \rightarrow \text{Ph} \quad (66\%) \]

2. Provide a mechanism for the following transformation.

\[ \text{10\% MeLi, } \text{Ph}_2\text{O, 185\degree C, 1h} \rightarrow \]

3. Older stuff.

\[ \text{MeO} \rightarrow \text{MeO} \quad (70-90\%) \]

4. Fun with gold.

\[ \text{Ph} \rightarrow \text{Ph} \quad \text{cat. AuCl}_3, 80\degree C \]

5. Good old Pd. Provide a rational for the formation of each diastereomer.

\[ \text{5 : 1} \]