1. Provide a plausible mechanism for the following reaction.

\[
\begin{array}{c}
\text{AcO Me} \\
\text{CO}_2\text{Et} \\
\end{array}
\xrightarrow{\text{PtCl}_2 (10 \text{ mol\%})} \\
toluene, 100 ^\circ \text{C}, 6 \text{ h}
\begin{array}{c}
\text{Me} \\
\text{CO}_2\text{Et} \\
\end{array}
\]

Sarpong JACS 2006, 128, 6786.

2. Platinum-containing metallacycles are known to exhibit antitumor activity. Predict the structure of the resulting complex with a 7-membered platacycle (with a mechanism for its formation) and determine the overall electron count. *(Hint: Solvent is not innocent in this case)*

\[
\begin{array}{c}
\text{Cl} \\
\text{Br} \\
\end{array}
\xrightarrow{\text{PtCl}_2(\text{Me}_2\text{SO})_2} \\
\text{benzene, 90 }^\circ \text{C}
\]


3. Provide the structure and electron count of the platinum catalyst used in this cross-coupling reaction and predict the isolated product.

\[
\begin{array}{c}
\text{F} \\
\text{Br} \\
\end{array}
\xrightarrow{\text{Pt}_2\text{Me}_4(\text{SMe}_2)_2 (5 \text{ mol\%})} \\
0.6 \text{ equiv Me}_2\text{Zn} \\
\text{MeCN, 60 }^\circ \text{C, 8h}
\]


4. Provide a plausible mechanism for the following transformation.

\[
\begin{array}{c}
\text{MeNH}_2 \\
\text{F}_3\text{C} \\
\text{O} \\
\end{array}
\xrightarrow{\text{Karstedt's catalyst (0.5 mol\%)/dppe}} \\
\text{4 equiv PhSiH}_3 \\
\text{nBu}_{2}\text{O, 120 }^\circ \text{C, 18 h then HCl workup}
\begin{array}{c}
\text{N} \\
\text{MeO} \\
\text{O} \\
\end{array}
\]

Beller JACS 2014, 136, 14314.

5. Provide a detailed mechanism (including electron counts for each metal-containing intermediate) for the following transformation.

\[
\begin{array}{c}
\text{MeEtO}_2\text{N} \\
\text{MeNH}_2 \\
\end{array}
\xrightarrow{1. \text{TsOH, toluene}} \\
\text{MeOH} \\
\begin{array}{c}
\text{Ph} \\
\text{N} \\
\end{array}
\xrightarrow{2. [\text{Me}_3\text{Pt}(\mu-\text{SMe})_2]_2} \\
\text{TIOH} \\
\text{(~MeH)} \\
\begin{array}{c}
\text{N} \\
\text{Me} \\
\end{array}
\xrightarrow{1. \text{EtOH}} \\
\text{2. KCN} \\
\text{3. NH}_2\text{OH}
\]