Work these problems on a blank copy of your Personal Workshop Form.

1. Show how the following compound could be prepared using either of the four cross coupling reactions (Heck, Suzuki, Stille, and Sonogashira) as the first step. Your TA will assign each group a specific assignment.

2. Determine the structures of compounds A-E.

4. The catalytic homogeneous hydrogenation of ethane using Wilkinson’s catalyst is as follows.

\[ \text{H}_2\text{C} \equiv \text{CH}_2 + \text{H}_2 \xrightarrow{\text{Rh}[(\text{C}_6\text{H}_5)_3\text{P}]_3\text{Cl}} \text{H}_3\text{C} \equiv \text{CH}_3 \]

Shown below is the cyclic mechanism for this process.

(a) Give the electron count of each intermediate of the catalytic cycle.
(b) Classify each step in the reaction cycle by fundamental reaction type: ligand dissociation or association, ligand insertion or deinsertion, oxidative addition or reductive elimination.