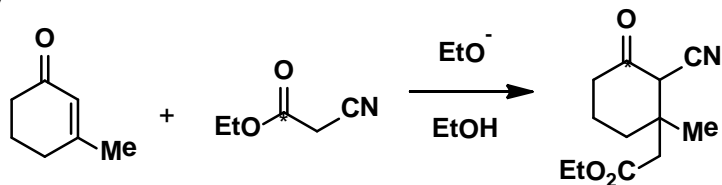






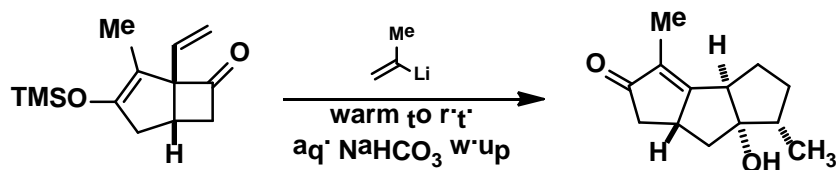
2. **Problem:** The following reaction is an example of what is referred to as the “abnormal Michael Reaction.” Provide a mechanism for this reaction that is consistent with the isotope labeling pattern shown (\*). Please answer the question in the space provided below. (20 PTS)



**Answer:**



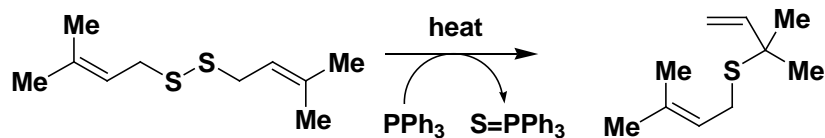
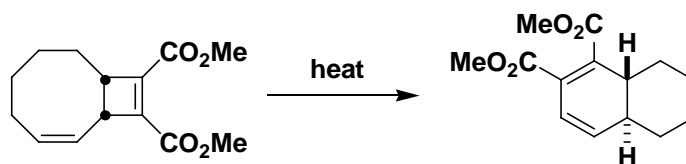
3. **Problem:** Classify this reaction as polar acidic, polar basic, pericyclic, or free-radical. Then, number the atoms in the product(s) appropriately, and make a list of bonds made and broken between heavy atoms. Assume aqueous workup in all cases. For bonus points (**10 bonus**), provide the mechanism for the following transformation in great detail. Hint: An 8-membered ring forms as an intermediate. Grossman Question. (**10 PTS**) + (**10 Bonus PTS**)



**Answer:**



4. **Problem:** Suggest a mechanism for the following reactions. Problem Set Question. (30 PTS)





5. **Problem:** Show how you would synthesize the following molecule. Use retro-synthetic analysis to break the pertinent bonds. Provide mechanisms for every step you use. As a hint, start with cyclohexanone and some other compound of your choice. (15 PTS)

