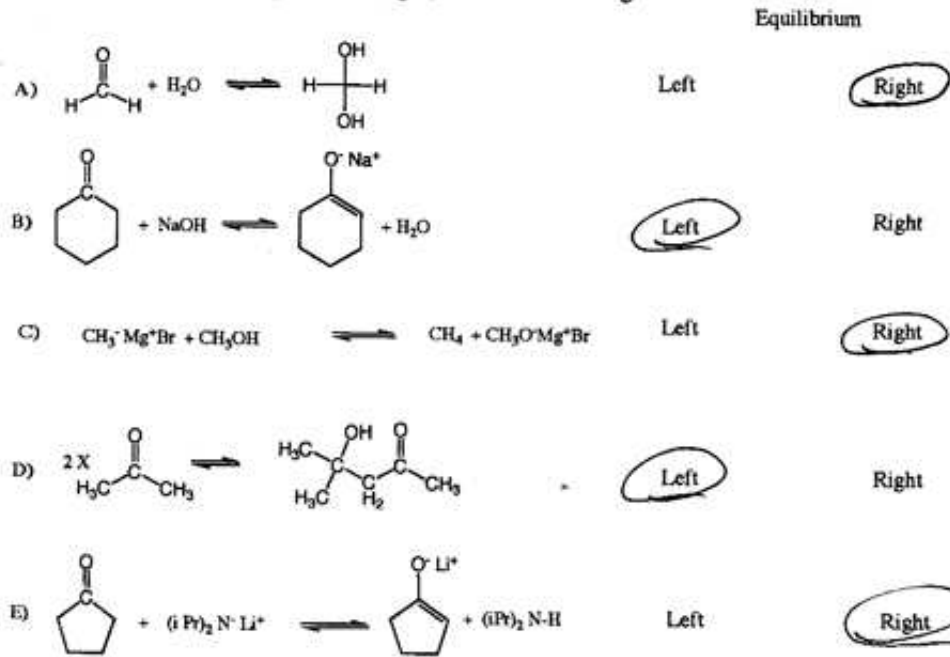
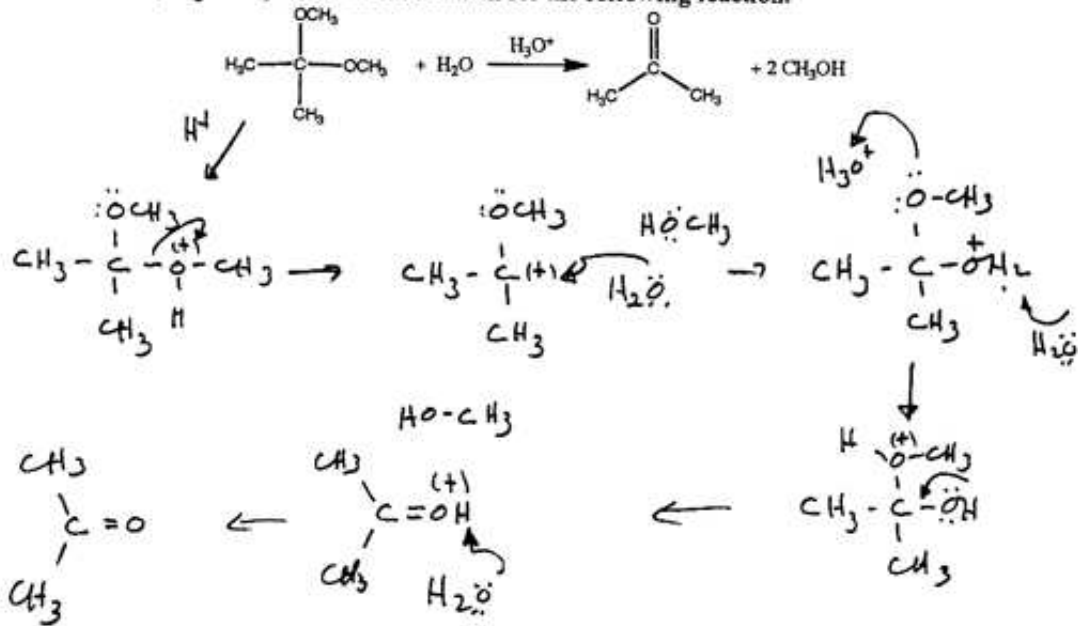


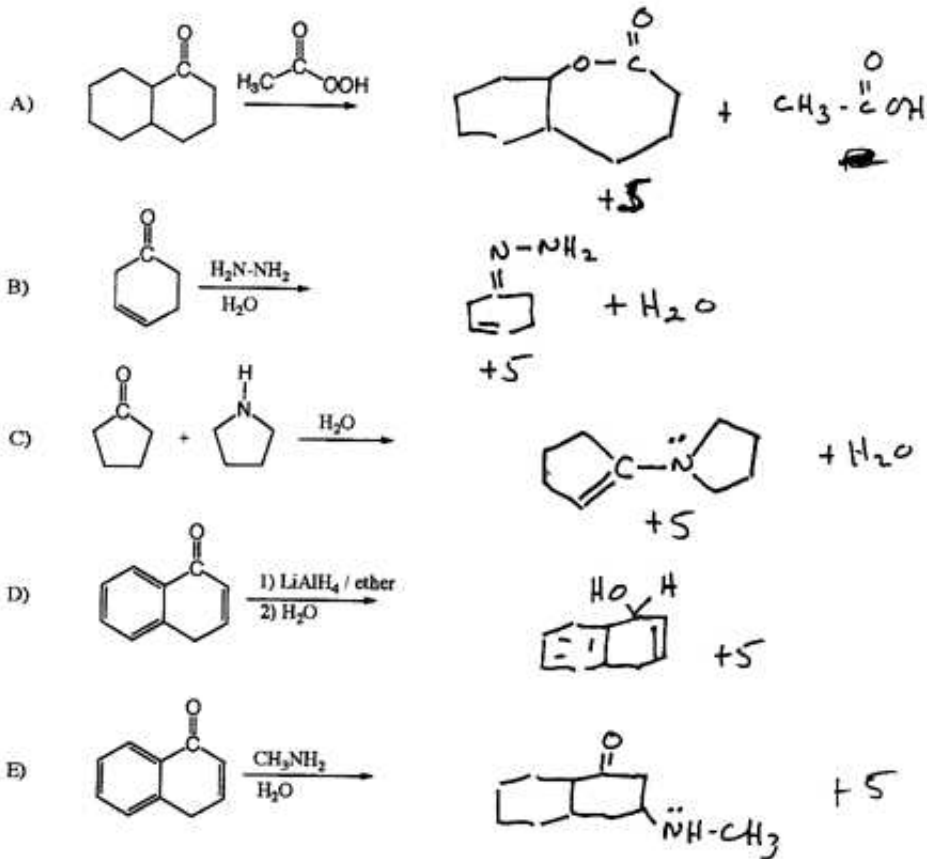
**Problem 1 (10 points).** For the following reactions indicate whether the equilibrium lies towards the reactant (left) or the products (right). Circle left or right.



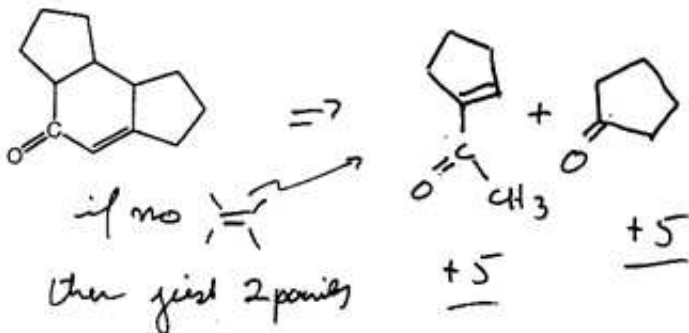
**Problem 2. (10 points)** Give the mechanism for the following reaction.



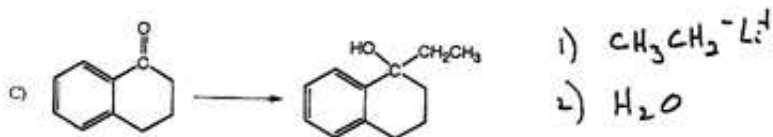
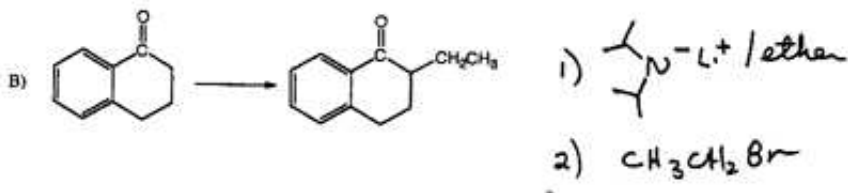
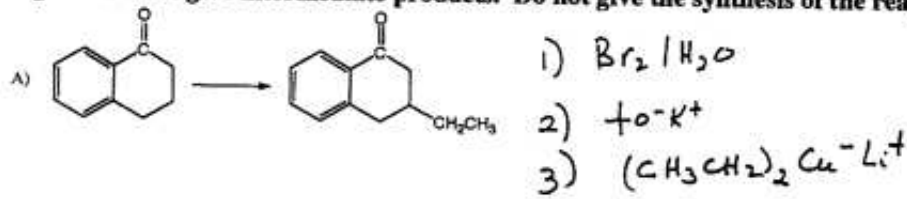
**Problem 3. (25 points)** Give the **major product** for the following reactions. If there is more than 1 step, just give the final product. **Circle your answer.** If no reaction occurs, state so.



**Problem 4. (10 points)** Using the Robinson annulation, what two molecules would you use to synthesize the following compound? **Circle your answer.**



**Problem 6. (30 points)** What reagents would you use to carry out the following reactions. More than one step may be required. If more than one step is required, number each step. Circle the reagents. Do not give intermediate products. Do not give the synthesis of the reagents.



**Problem 7. (15 points)** How would you carry out the following transformation? Do not use the Grignard reagent or any free radical chemistry.

