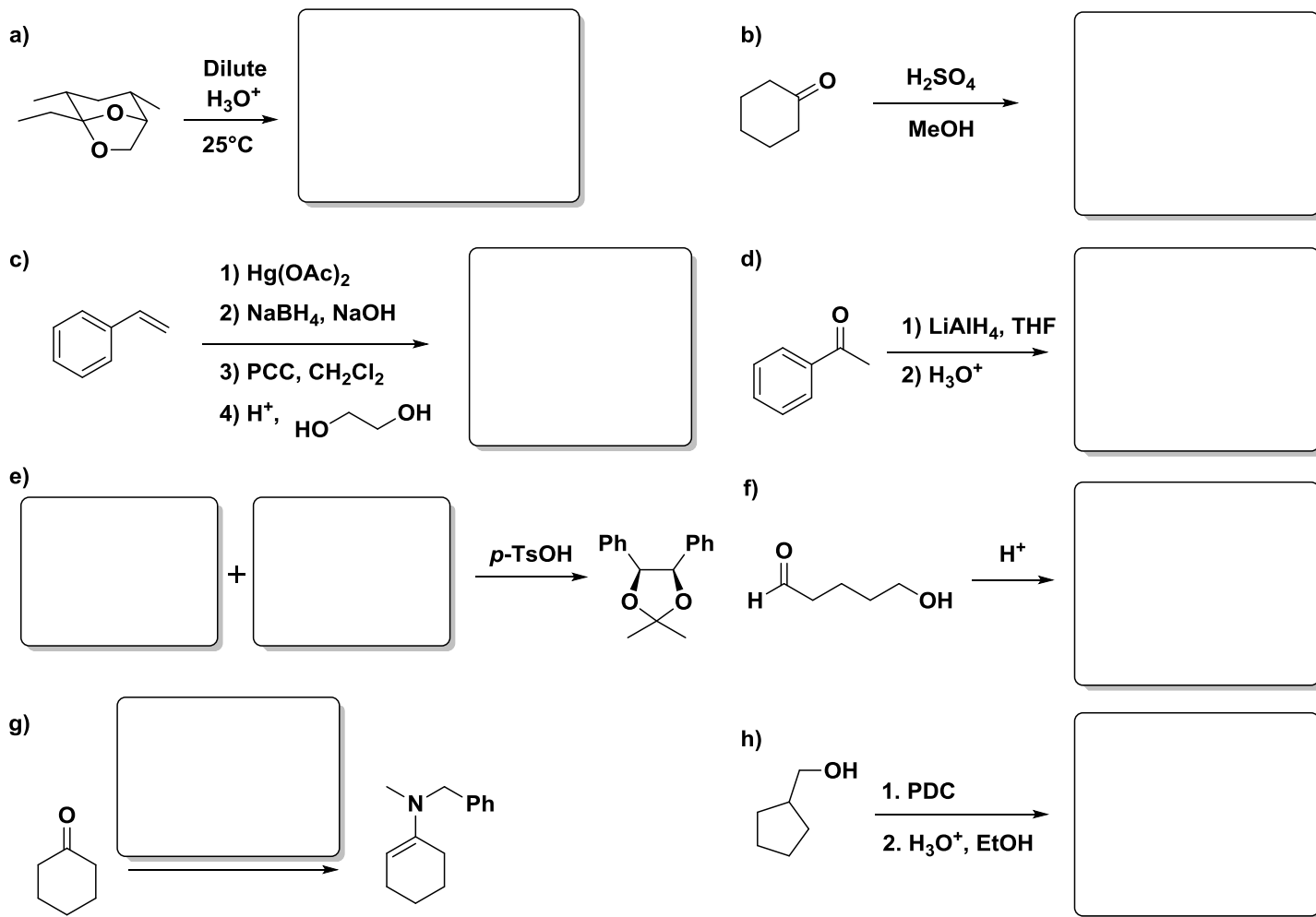
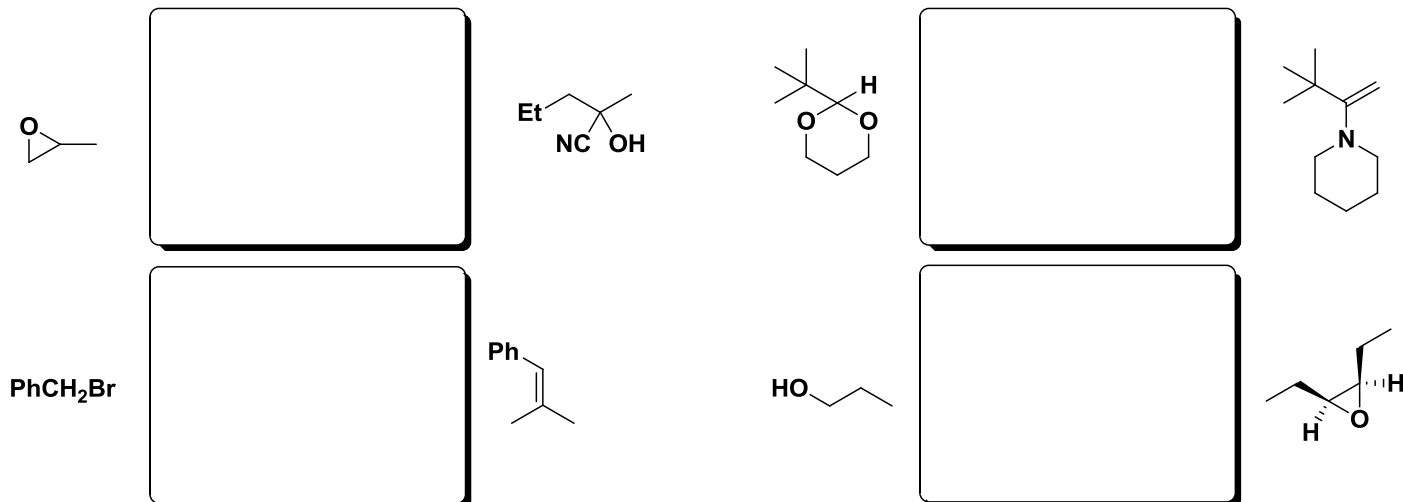


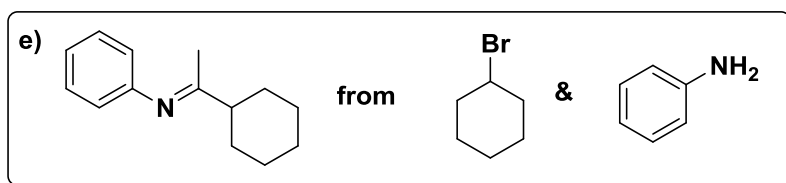
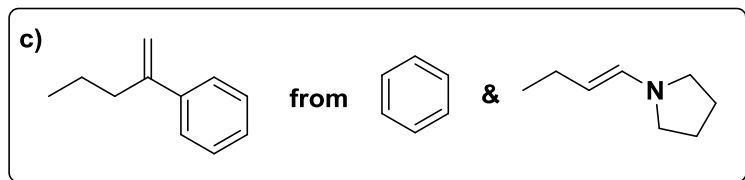
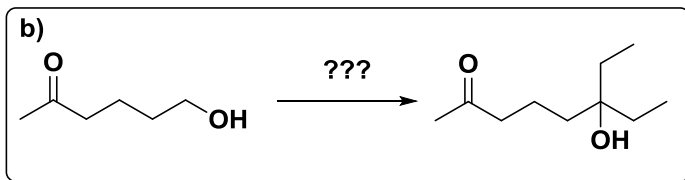
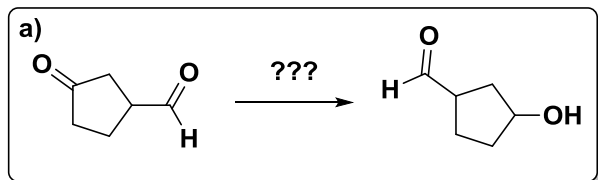
1. Provide the missing component(s) of the following reactions. For reactions that ask for products, only provide the major product.



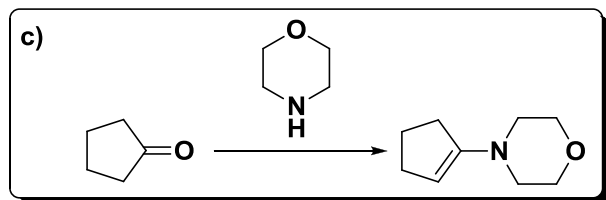
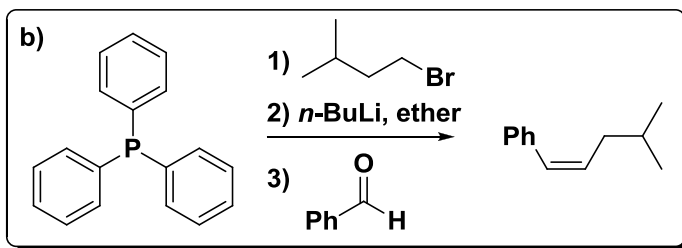
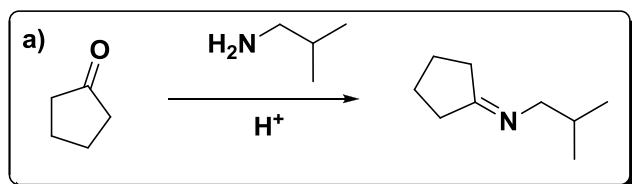
2. Provide the reagents needed to complete the following transformations. You might need more than one step.



3. Provide a reasonable synthesis for the following compounds from readily available reagents and starting materials as indicated.



4. Propose a detailed mechanism for the reactions shown below. Include all intermediate and resonance structures. Use proper curved arrows to show movement of electrons.



5. The position of the equilibrium between the carbonyl-addition to form a hydrate is influenced by electronic and steric factors. For the following five carbonyl substrates, match the % conversions to the hydrate form: ~100, 95, 50, 17, 0.14. Explain the yields for the hydrate formation based on electronic and steric influences.

