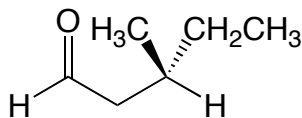
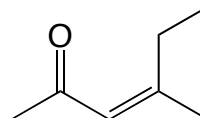


1. Provide an unambiguous name (IUPAC or common) for each of the following molecules. (12 points)

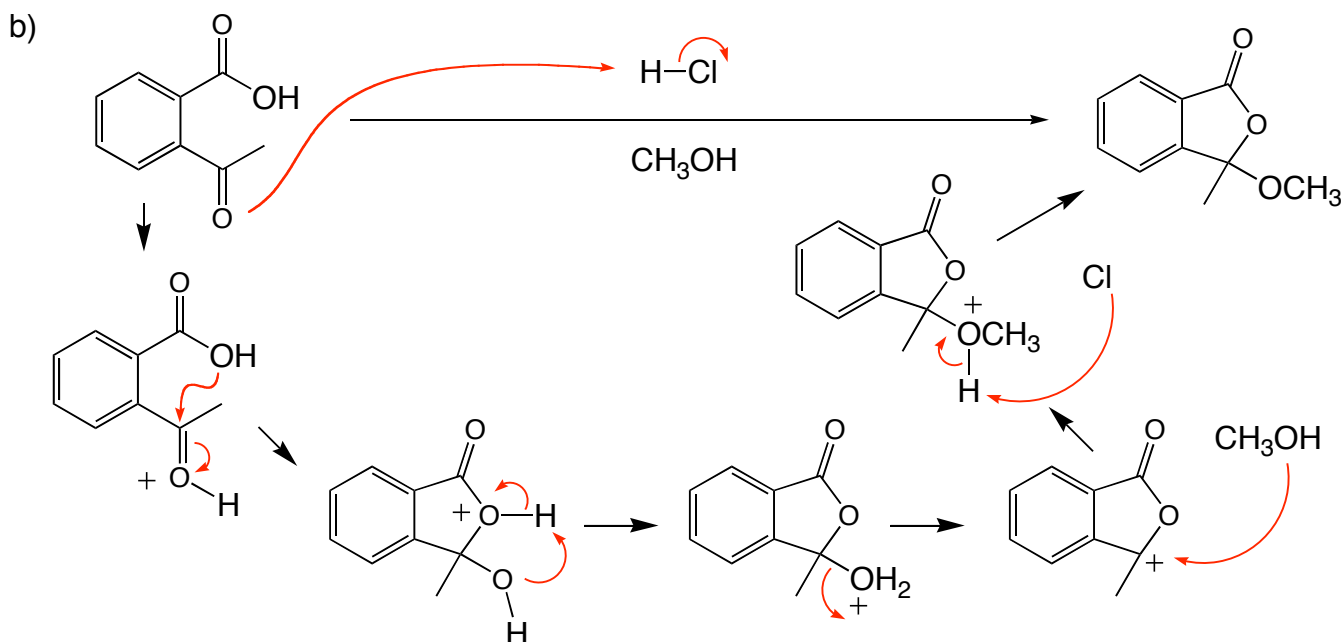
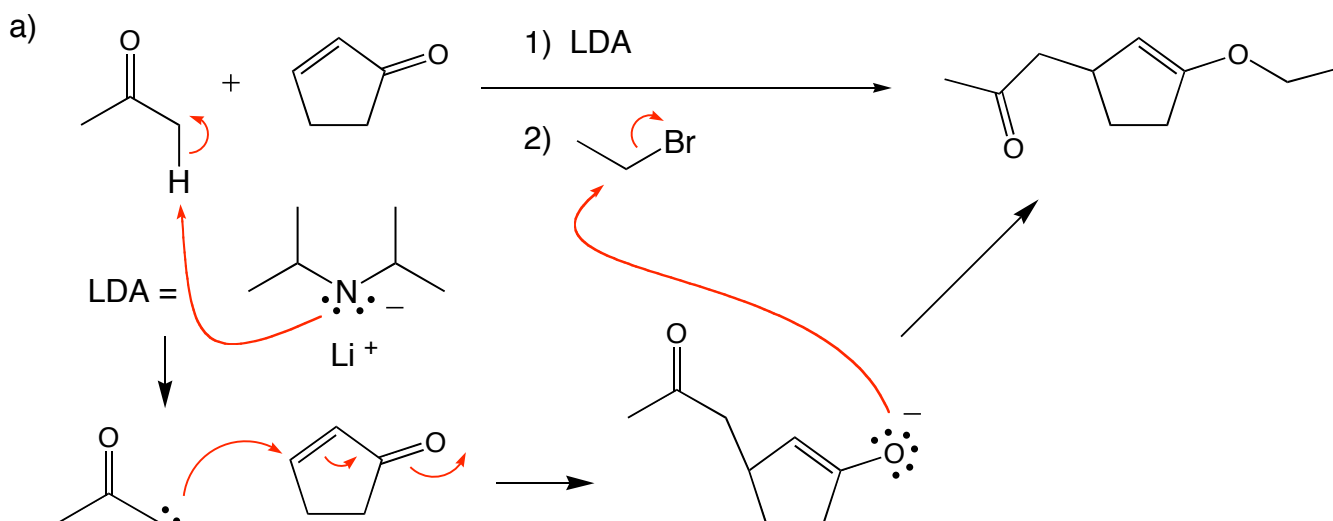


(R)-3-methylpentanal

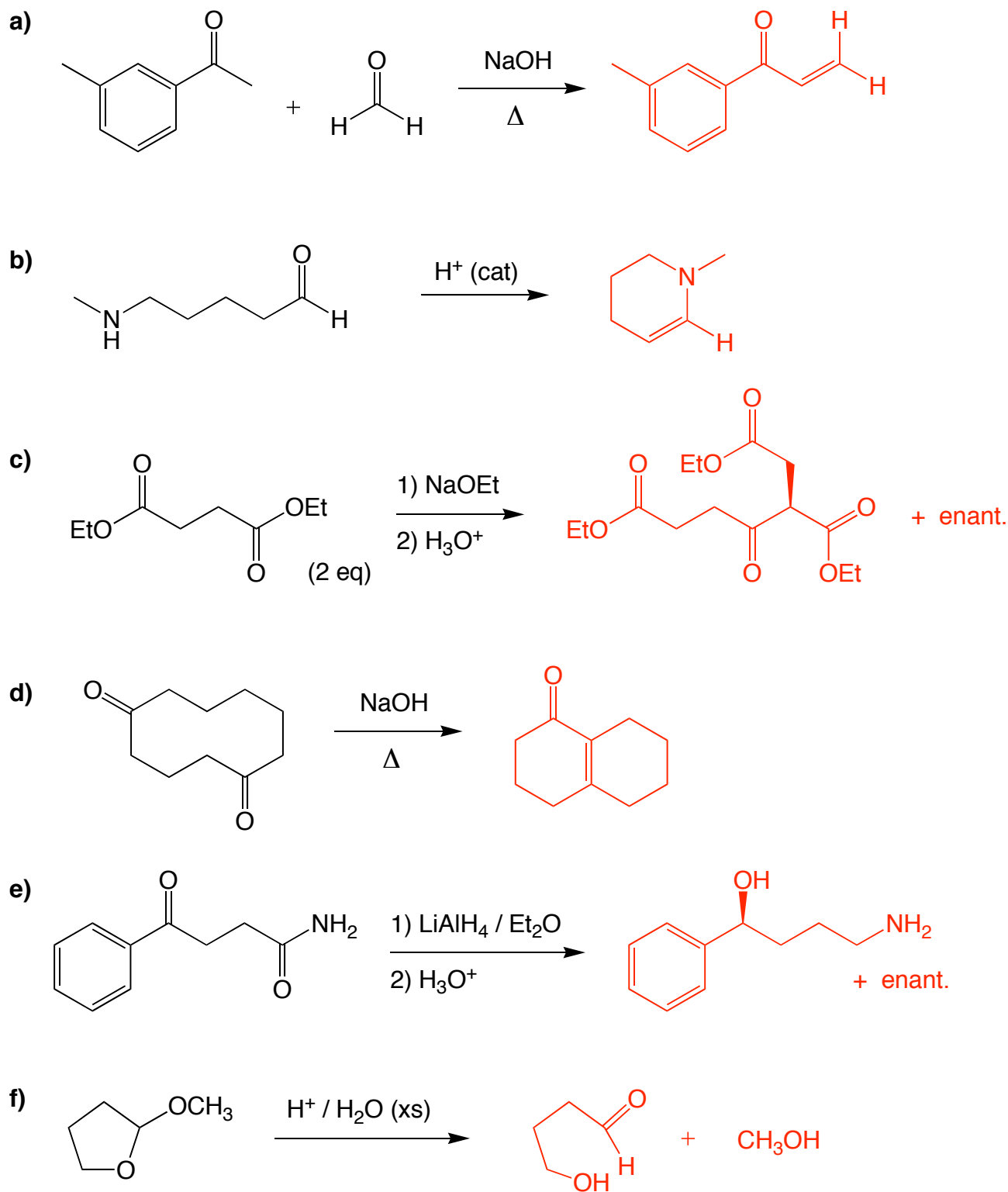


(Z)-4-methyl-3-hexen-2-one

2. Provide a mechanism for each of the following reactions. You must show the products of each step and all formal charges for full credit. (15 points)

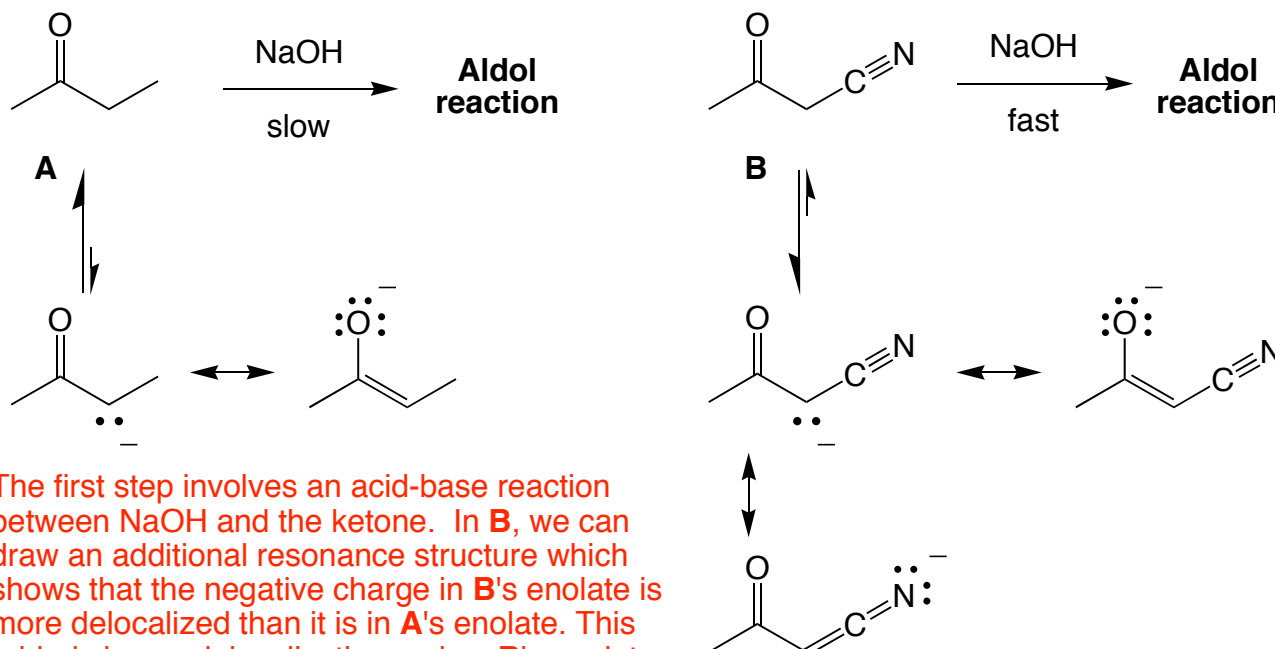


3. Predict the *major* organic product of each of the following reactions. You may draw other products for partial credit, however if you do, you must *circle* the major product for full credit. (30 pts)



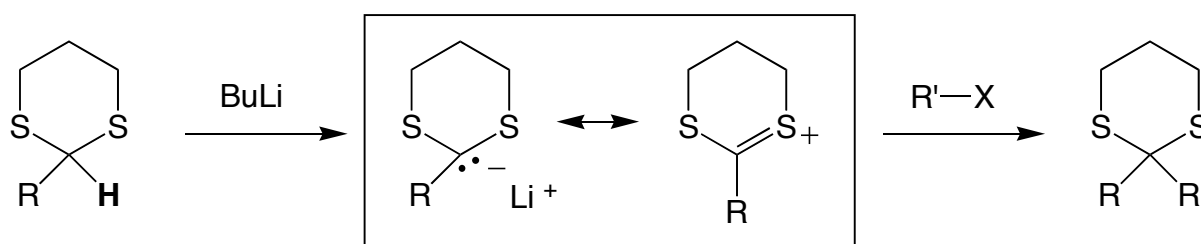
show all products that contain carbon

4. The Aldol reaction of **A** proceeds slowly, while that of **B** proceeds much faster. Provide an explanation for the rate difference. Note: you must use pictures and words in your answer for full credit. (10 pts)



The first step involves an acid-base reaction between NaOH and the ketone. In **B**, we can draw an additional resonance structure which shows that the negative charge in **B**'s enolate is more delocalized than it is in **A**'s enolate. This added charge delocalization makes **B**'s enolate more stable than that of **A**. With this added stability, one would expect the enolate of **B** to be more abundant at equilibrium than that of **A**, giving it a higher probability of reacting in an Aldol reaction.

5. The thioacetal proton is much more acidic than the acetal proton. This allows thioacetals to be used as nucleophiles after deprotonation as shown below. Provide an explanation for the difference in acidity between these protons. (9 pts)



Sulfur, being a 3rd row element, can expand its valence to exceed the octet rule. This allows the resonance structure shown above to be drawn, illustrating the charge delocalization in the deprotonated thioacetal. The deprotonated acetal cannot delocalize its charge in this manner, and is therefore less stable and less likely to form.

6. Propose a synthesis for each of the following transformations. Provide the products of each step for full credit. (24 pts)

