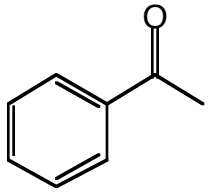
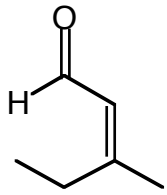
CHEM117 Spring 2001 Exam #3
Prof. Thomas Poon
Joint Science Department, The Claremont Colleges

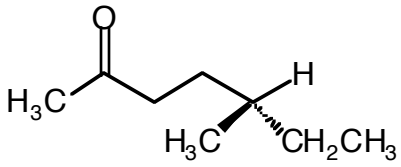
1. Provide an unambiguous name (IUPAC or common) for each of the following molecules. (15 points)



1-Phenylethanone or acetophenone



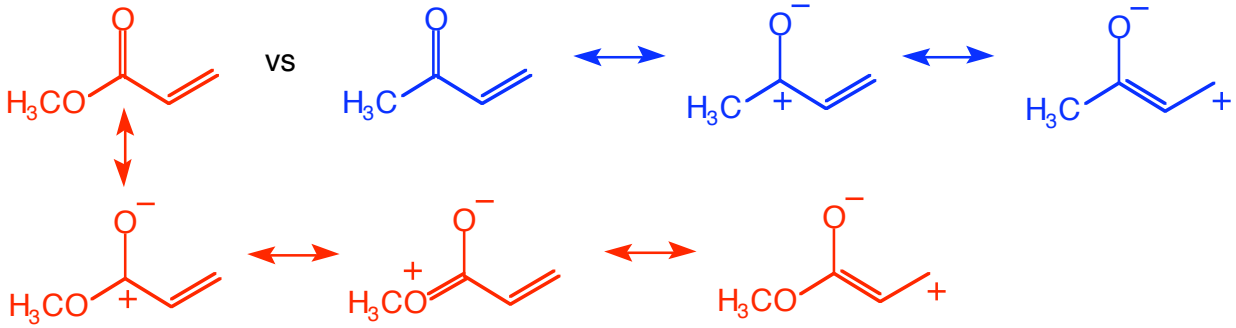
(*Z*)-3-Methylpent-2-enal



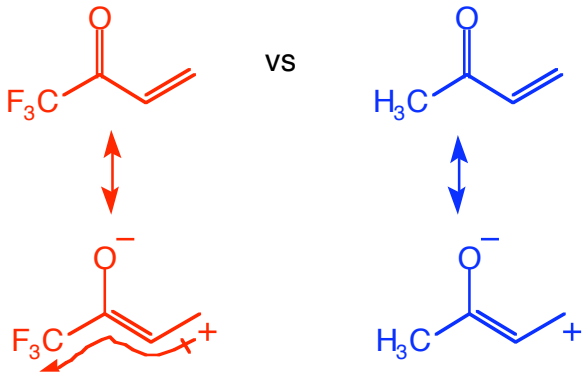
(*S*)-5-Methylheptan-2-one

2. For each pair of molecules below, circle the one that is *more reactive* towards conjugate addition by a weakly basic nucleophile. Draw pictures that illustrate your point and provide a concise explanation for your decisions in the space provided to the right. (10 points)

Explanation



The ester possesses 4 resonance structures versus 3 for the ketone. This means that the positive charge is more delocalized in the ester than in the ketone. The delocalization makes the β-carbon less positive and thus less reactive towards nucleophiles.



The electronegative fluorines withdraw electron density away from other parts of the molecule. This makes the β-carbon more positive and the trifluoroketone more reactive towards nucleophiles.

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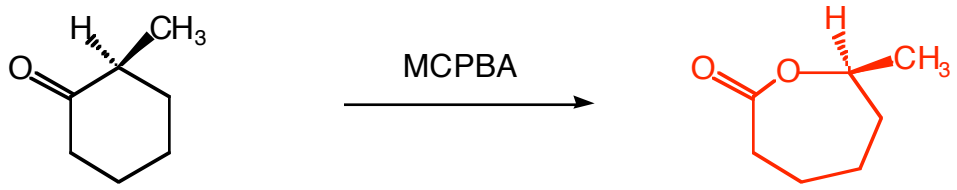
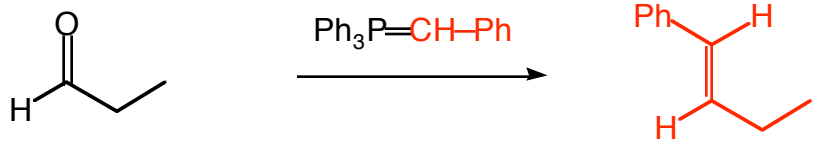
3. Provide the major product(s) for the following reactions. In all cases, assume multiple equivalents of reagents. Circle your final answers. (45 points)

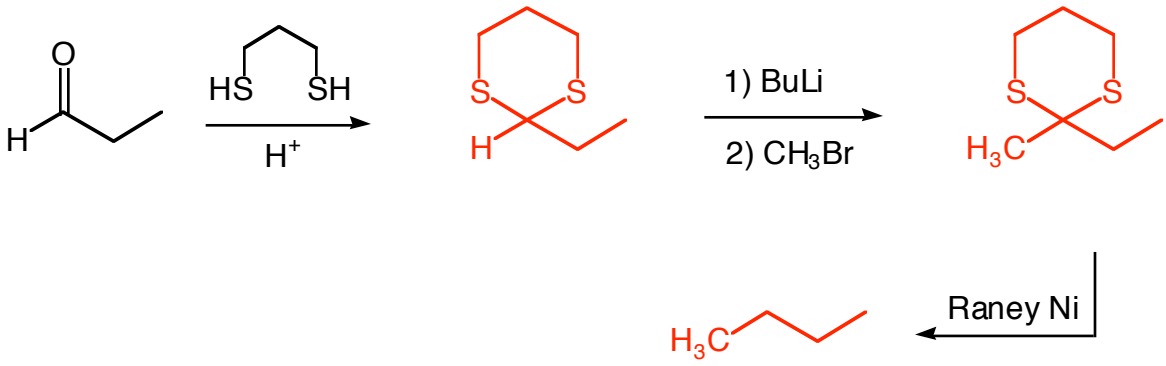
a)



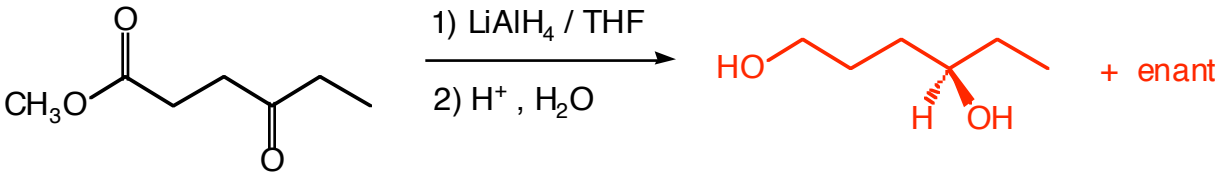
b)



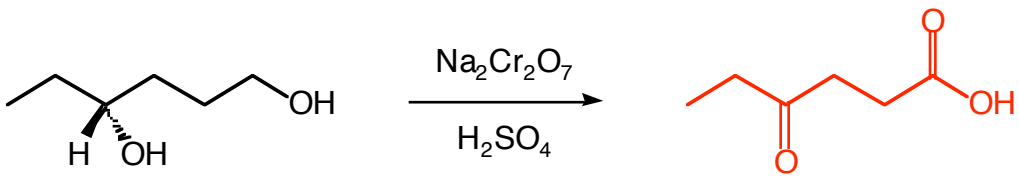
c)



d)



e)



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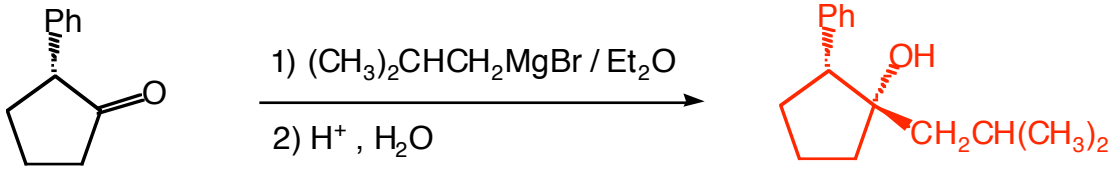
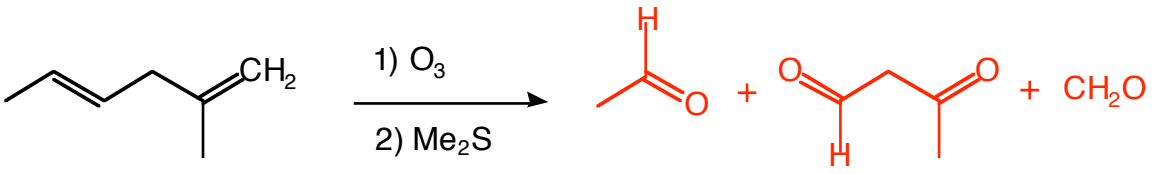
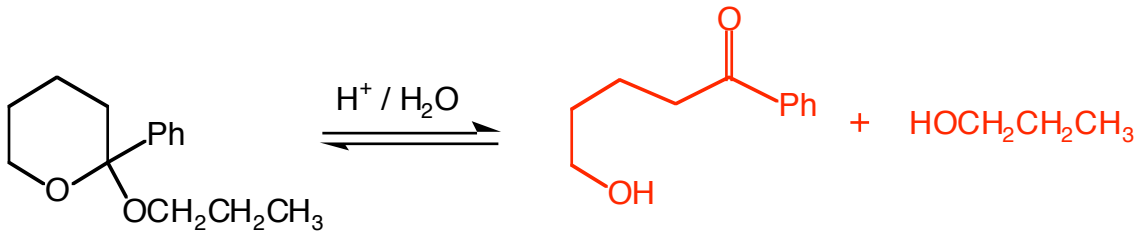
f)



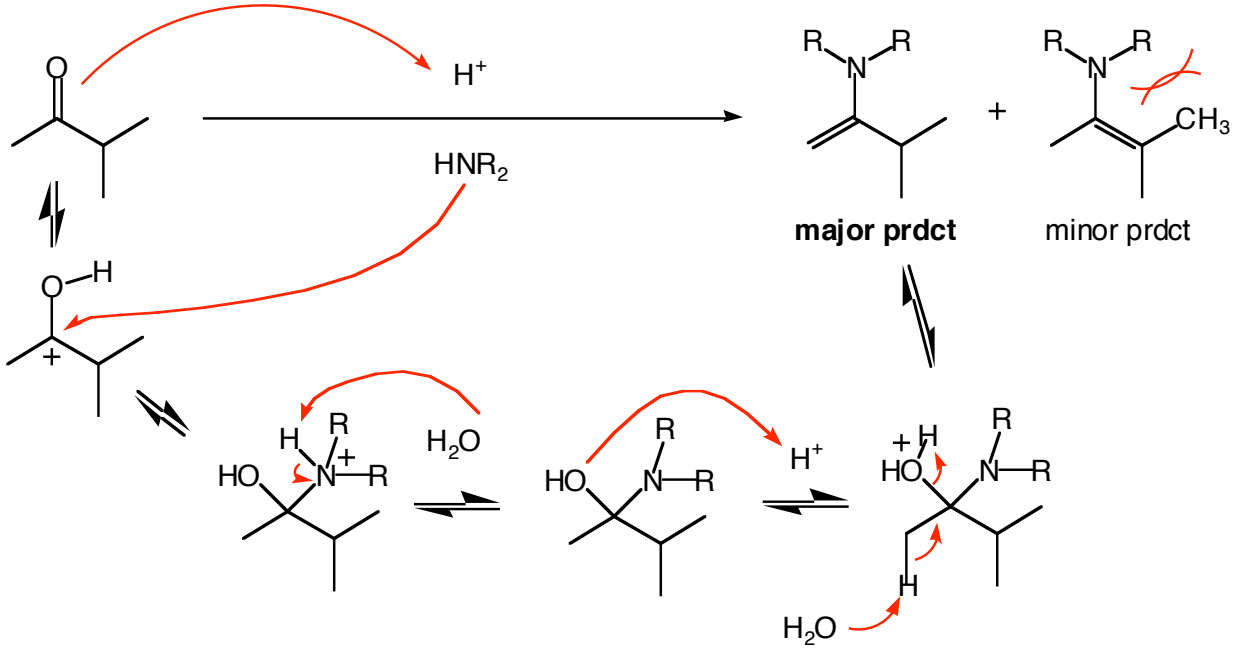
g)



h)



4. In lecture, we had discussed the formation of enamines and deduced that the more substituted double bonds are favored. After some literature research, I discovered that this is incorrect! It is the *less substituted* alkene that is favored. Draw the mechanism for the formation of the major product below and explain why the less substituted alkene is favored. (14 points)



Formation of the less substituted alkene minimizes steric interactions between the amine "R" groups and vinyl substitutents that are *cis* to them.

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5. Provide a synthesis for each of the following transformations. For full credit, be sure to draw all intermediary products along the way. (16 points)