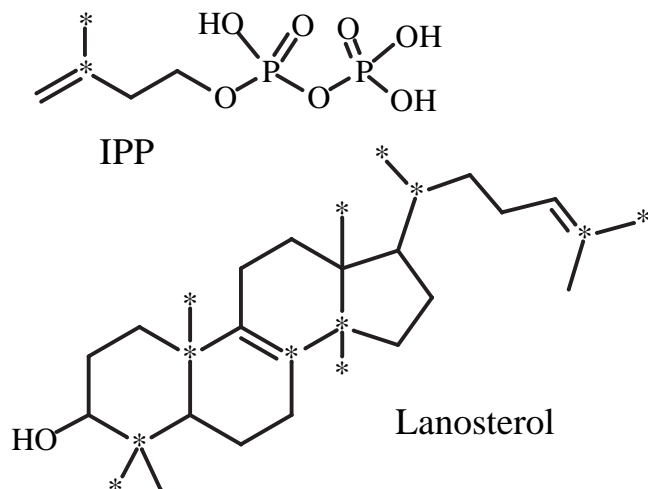


1. (4 minutes) **Explain** what the methyl signals in the CMR spectrum of lanosterol, biosynthesized in the presence of a small amount of isopentenyl pyrophosphate (IPP) containing ^{13}C in both starred positions, show about the mechanism of lanosterol biosynthesis.



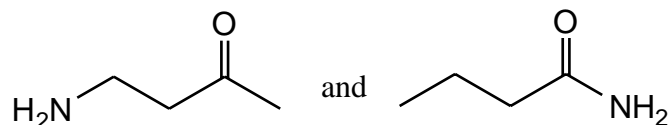
[2003: This was covered on the previous exam, but would still be fair game on the final]

2. (6 minutes) Explain how you would use IR spectra to distinguish between the following pairs of compounds. (For each case say what you would look for in the spectrum, and how the feature would differ between the two compounds)

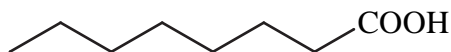
Ethyl chloride and ethyl iodide

1-butyne and 2-butyne

cyclobutanone and cyclohexanone

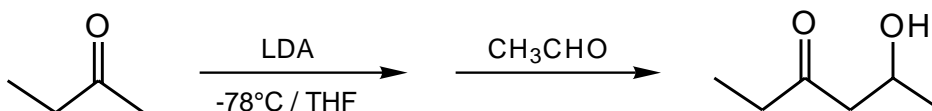


3. (5 minutes) Which carbons in the following compound could be **selectively** halogenated in high yield, and by what reagents?

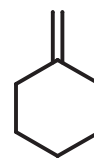
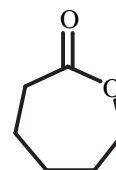
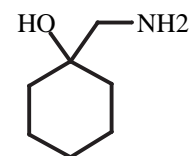
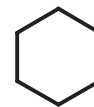
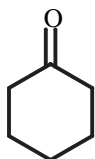


[2003: I hope we get to these reactions on Wednesday]

4. (5 minutes) In the first step of the following conversion, one might drip the LDA solution into a cold flask containing 2-butanone, or 2-butanone into a cold flask containing LDA solution. Explain why one uses LDA rather than NaOH for this reaction, and which type of addition should be better for generating a high yield of the desired product.

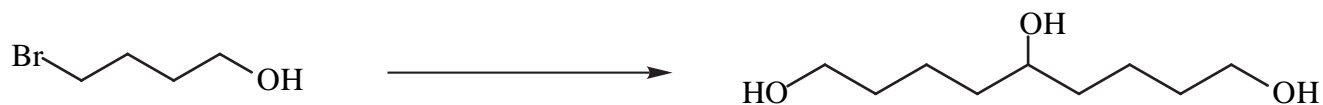


5. (6 minutes) Give reagents for converting cyclohexanone to each of the following compounds **in high yield**. No mechanisms are required.

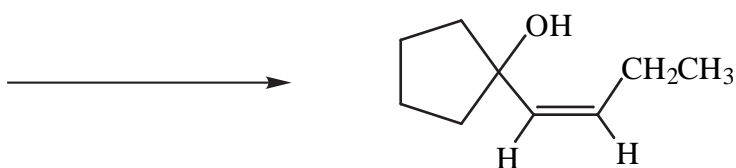


6. (5 minutes) Explain why the OH group of an alcohol typically gives a more complicated spectrum in the IR than in proton NMR. (Your answer should mention relevant frequencies.)

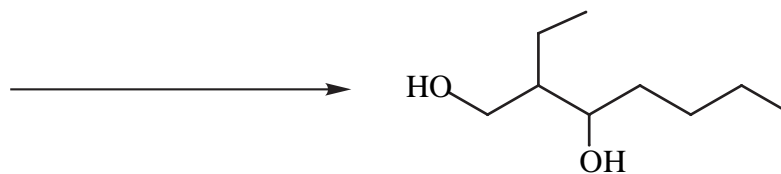
7. (12 minutes) Suggest reagents for effecting each of the following three transformations in good yield. You need **not** give **mechanisms** (reactive intermediates or curved arrows), **but** if several successive reactions are involved **do show intermediate products**.



Any monofunctional compound containing 5 or fewer carbons



Any aldehyde containing 6 or fewer carbons



8. (7 min) In the synthesis of norlutin the α,β -unsaturated ketone was protected as doubly unsaturated ethyl ether by treating with ethanol under acid catalysis. **Show the mechanism of this conversion in detail with curved arrows and important resonance structures.** [Plenty of skeletons are given to assist your drawing, you won't need them all. The wavy lines show connections to the remainder of the large molecule, which is irrelevant for this reaction.]

