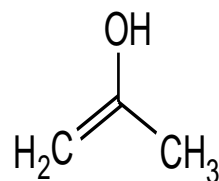
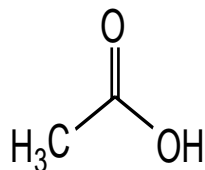
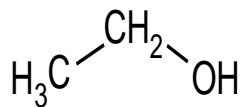
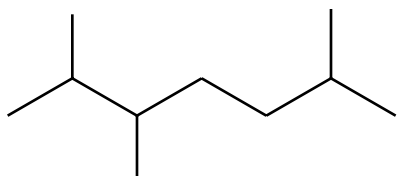


1. (3 minutes) Give approximate pK_a values for the following compounds (no explanations required):



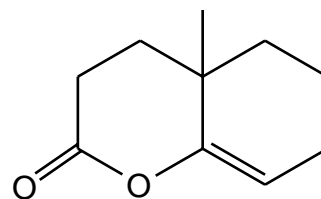
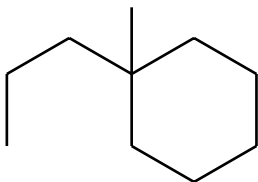
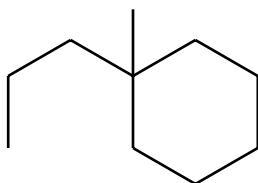
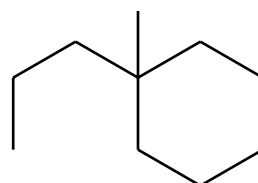
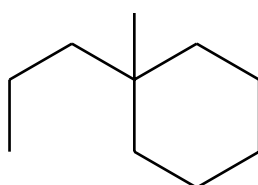
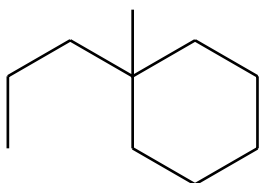
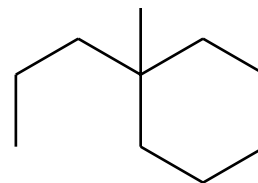
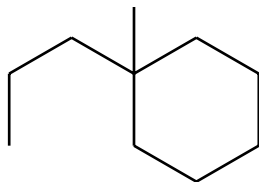
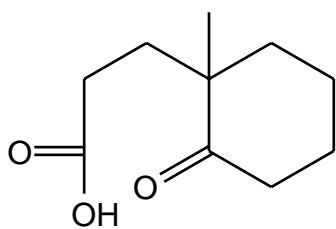
2. (3 minutes) What lesson about the design of a synthesis is taught by the practical preparation of $(\text{CH}_3)_3\text{C}-\text{NH}-\text{NH}_2$?

3. (6 minutes) Show a sequence of reagents and intermediate products that would allow preparation of the following 10-carbon alkane in good yield. You may use any reagents you wish, but **all carbons must come from a single 5-carbon compound**. No mechanisms or curved arrows are necessary, just reagents and intermediates.



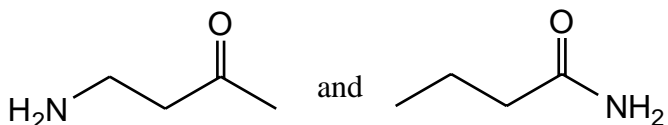
4. (8 minutes) One reaction in Woodward's synthesis of cortisone involved acid-catalyzed conversion of a keto acid to an enol lactone. Add necessary atoms, bonds, and arrows to the following structures to show every step involved in this conversion. **Draw only one curved arrow in each structure.** You will probably not need all of the structures.

keto acid



enol lactone

5. (6 minutes) Explain where you would look in the IR spectra to distinguish between the two compounds in each of the following pairs. Be as specific as you can. [Continued on following page]

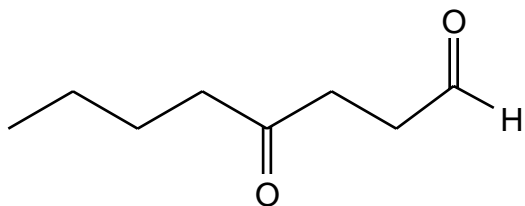


heptane and octane

5. (IR Question Continued)

EtOH and EtSH

6. (6 minutes) Describe a high-yield preparation of the following compound from starting materials containing **five or fewer carbons**. No mechanisms are required, just show reagents and intermediate products.



7. (8 minutes) Explain why reaction in the dark between Br_2 and acetone (2-propanone) starts slowly and then accelerates.

8. (10 minutes) Show practical reactions to illustrate the use of five of the following seven reagents. Be as specific as you can. **Choose only 5 of the 7. (some have been omitted)**

$\text{Br}_2 / \text{PBr}_3$

$\text{H}_2\text{NNH}_2 / \text{strong base}$

a peroxy acid

