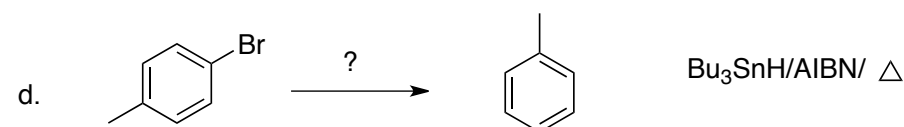
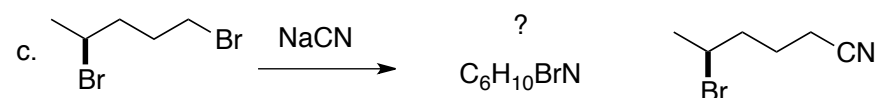
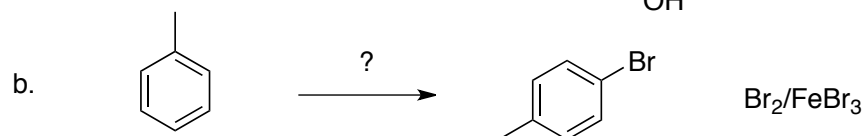
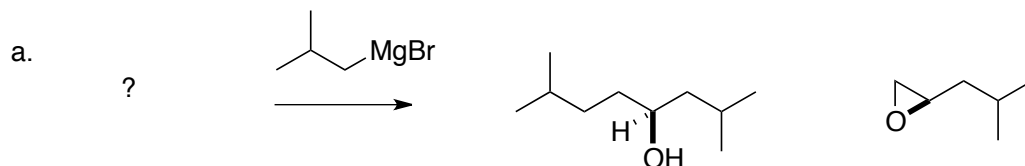
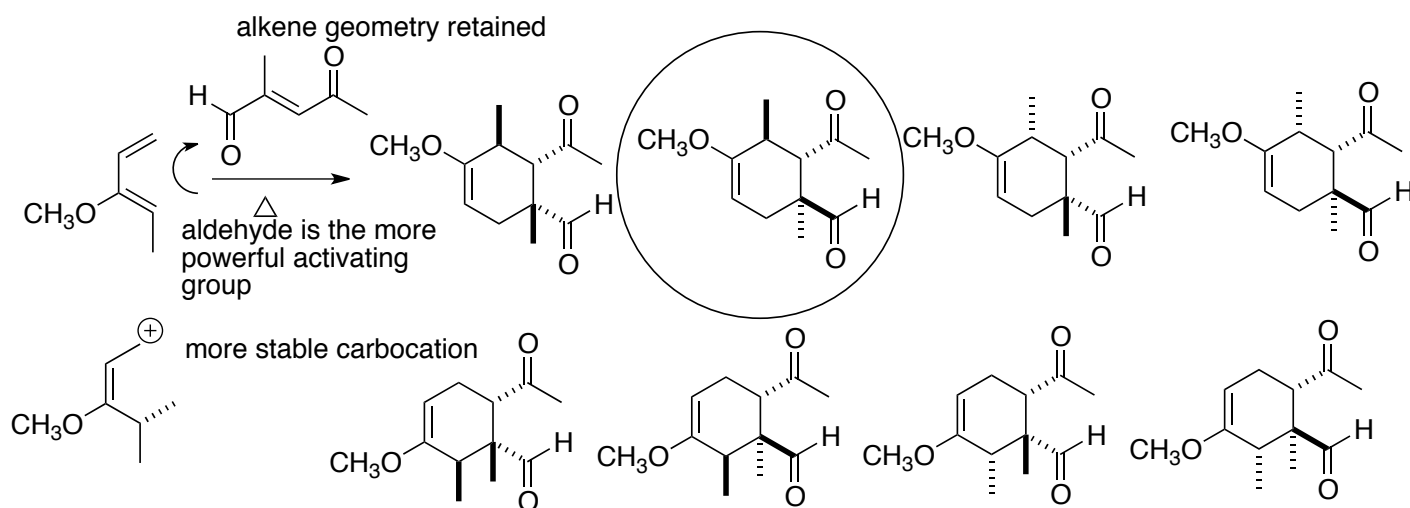


This is an open-book, open notes exam. No electronic devices are allowed.

1. (5 points each) Fill in the missing reagent, product or starting material. Stereochemistry is important!

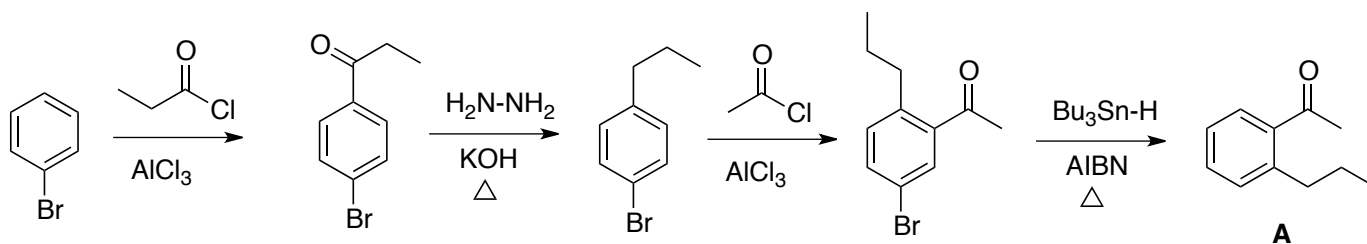


2. (20 points) Which product would be formed, and why? Explain in detail.

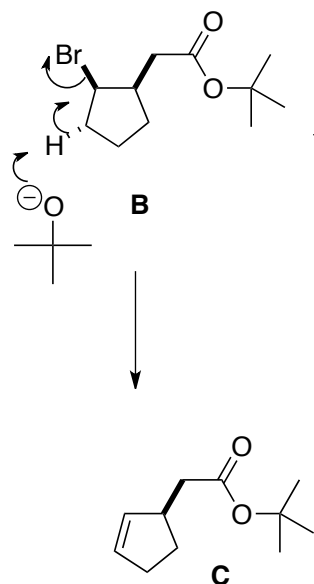


aldehyde is endo in the transition state, so trans substituent on the diene, the Me group, will be cis to aldehyde

3. (20 points) Using any monosubstituted benzene that contributes six carbons to the final product, and any other pieces that contribute three or fewer carbons to the final product, outline a synthesis of **A**.



4. (20 points) Deduce the structure of **C**, and draw an arrow-pushing mechanism for the conversion of **B** to **C**.



IR: 3051, 2977, 2934, 2853, 1729, 1367 cm<sup>-1</sup>

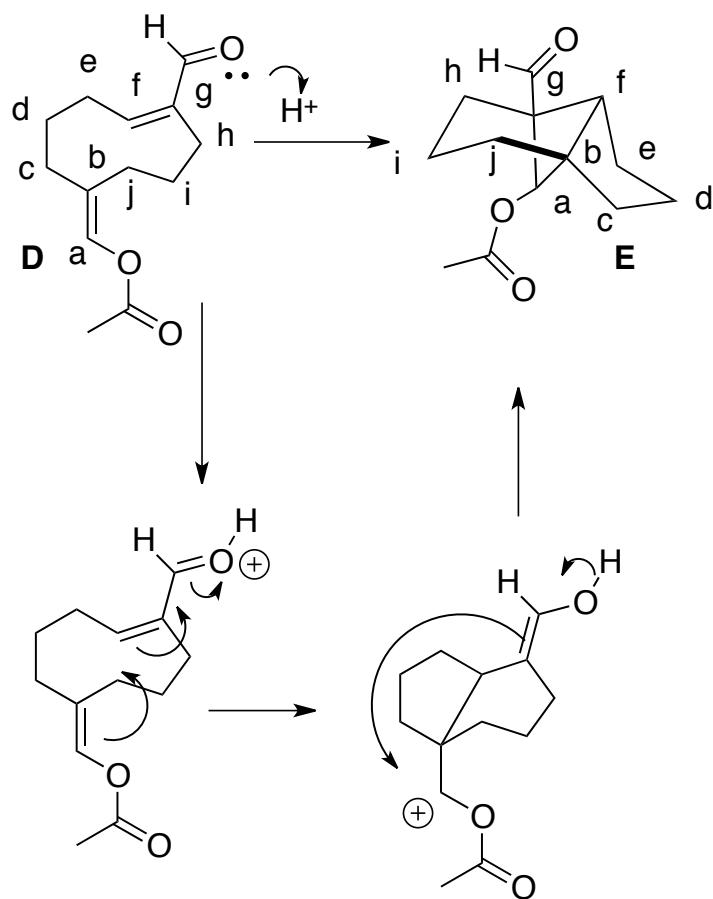
<sup>13</sup>C NMR:

172.3, s  
133.9, d  
131.2, d  
80.1, s  
42.3, d  
41.8, t  
31.8, t  
29.5, q (3)  
28.1, t

<sup>1</sup>H NMR:

5.7, m, 2H  
3.05, m, 1H  
2.55, dd, J = 6.5, 15.1 Hz, 1H  
2.42, dd, J = 5.4, 15.1 Hz, 1H  
2.2, m, 4H  
1.46, s, 9H

5. (20 points) Outline a mechanism for the transformation of **D** to **E**.



bb	bf
a-b	b-f
f-g	a-g

