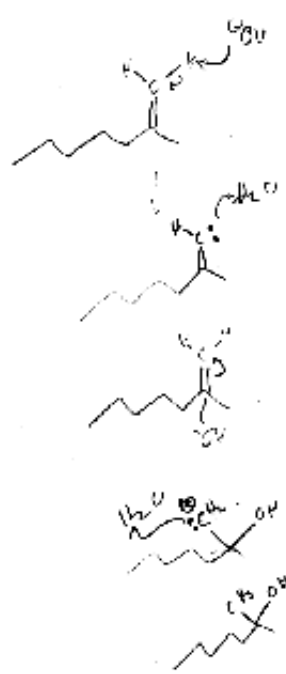
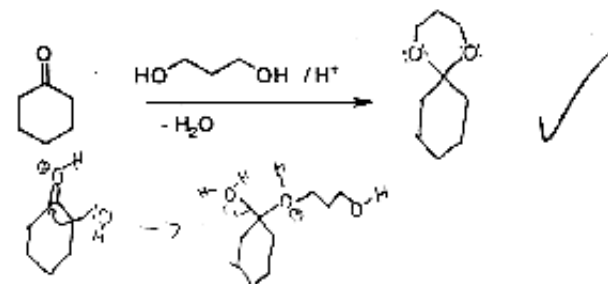
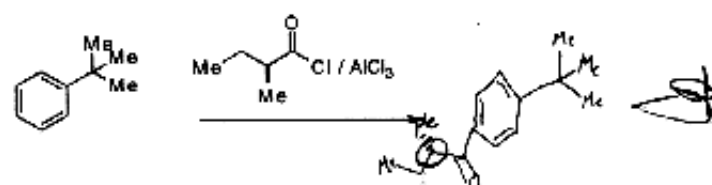
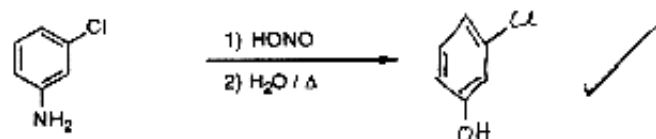
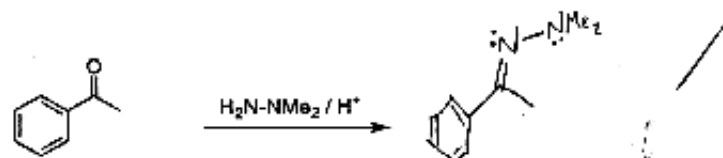
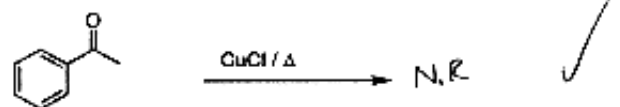
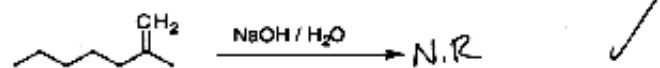
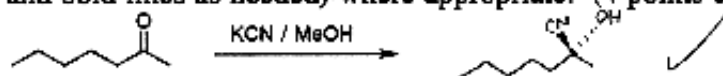
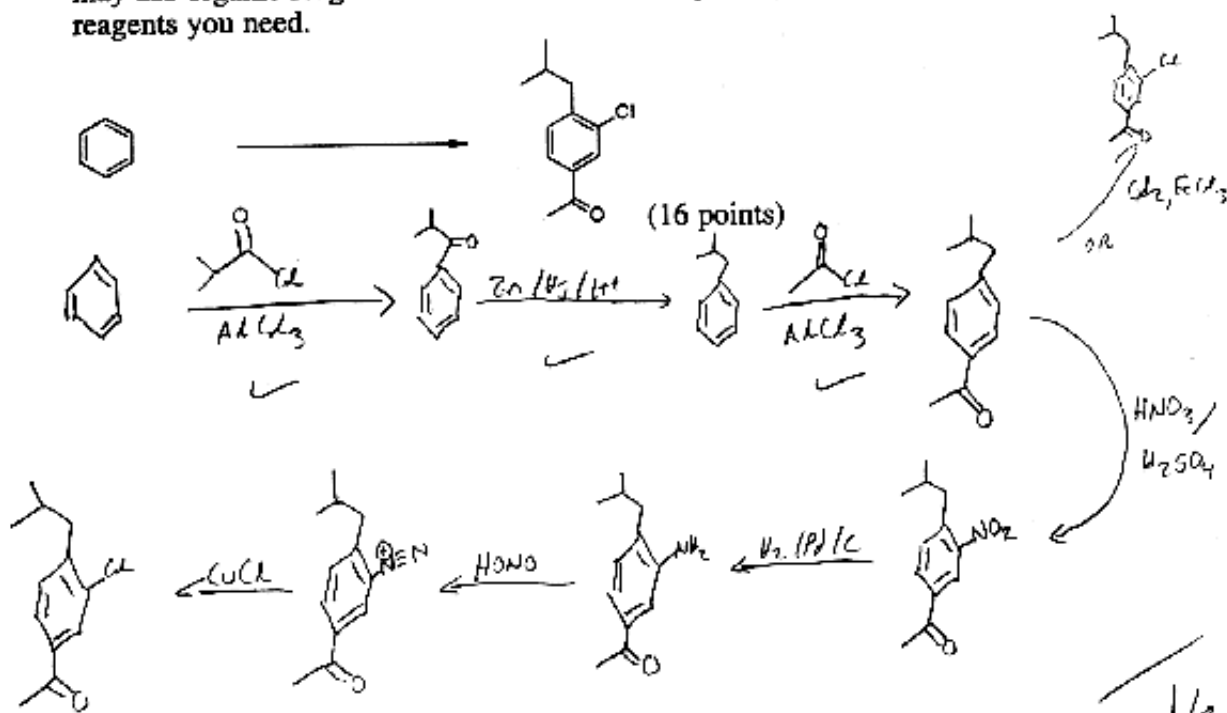


1) Provide the products of the following reactions. If no reaction would occur, then write N.R. as the product. If more than one product can be formed, provide the MAJOR product, and indicate the stereochemistry of the products (i.e., draw the dashed and bold lines as needed) where appropriate. (4 points each)

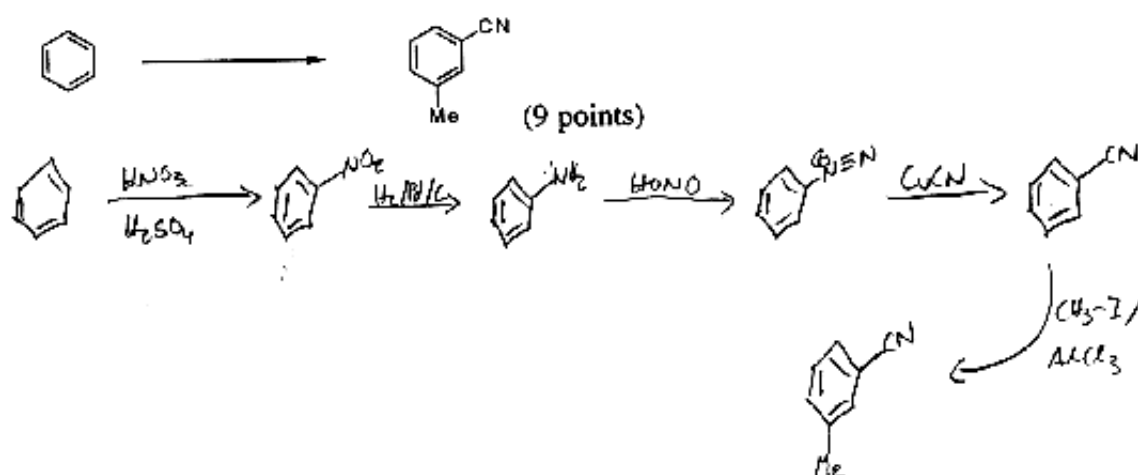


60

2) Provide the reagents required to complete the following multistep syntheses. You may use organic reagents of 6 carbons or less in your syntheses and any inorganic reagents you need.



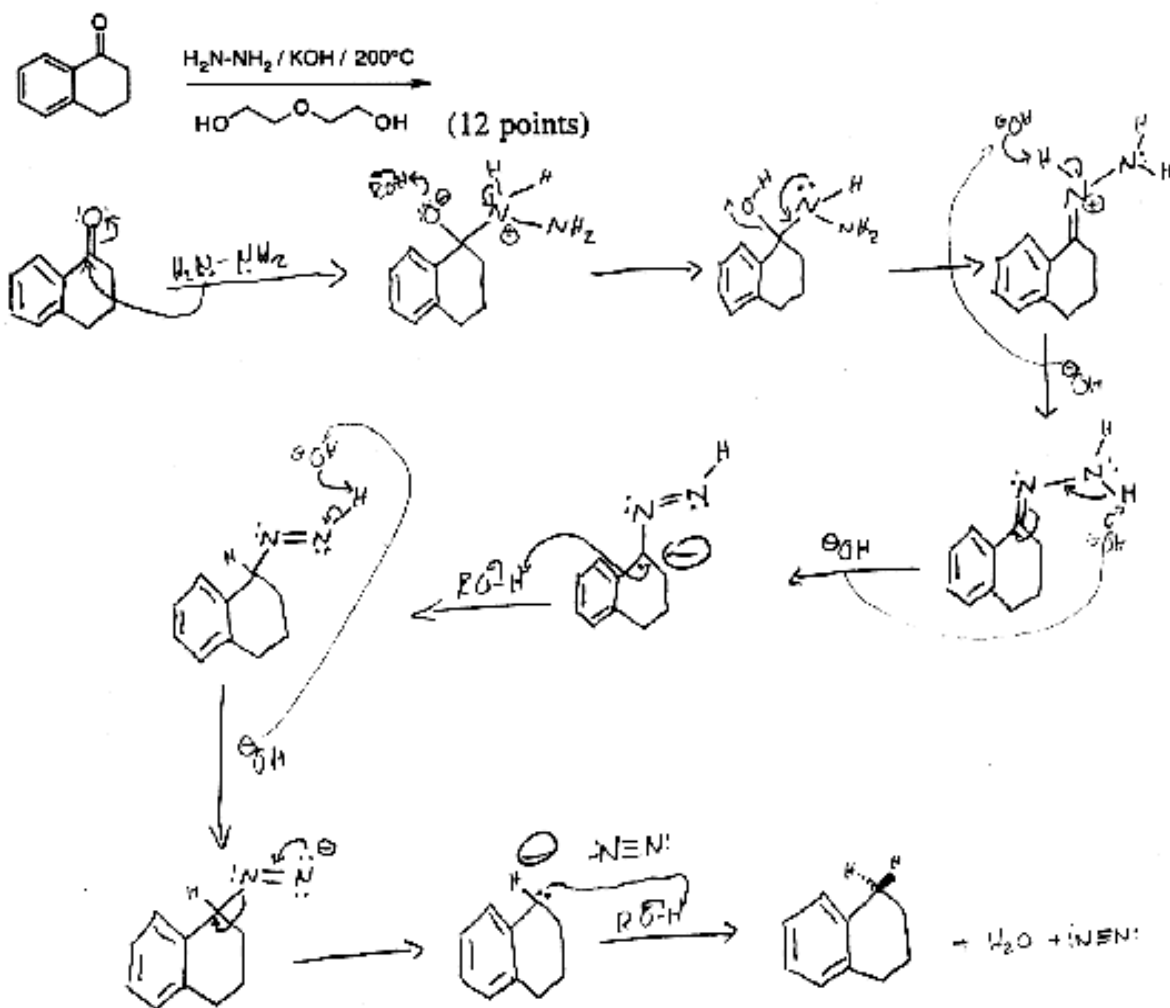
16



9

25

3) Provide the product and mechanism for the reaction shown below. Be sure to draw each arrow, show every formal charge, and show each step of the reaction for full credit. Be sure your answer is legible!



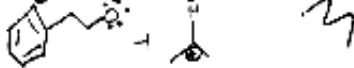
12

4) The mass spectrum of the compound shown below was found to contain several signals due to fragmentation.

a) Draw 3 sets of fragmentation products which would appear in the mass spectrum. Be sure to provide the correct charge for each fragment in the pair. (9 points)



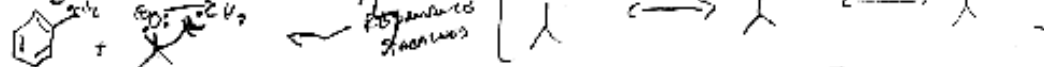
First set of fragmentation products:



Second set of fragmentation products:

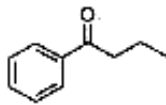
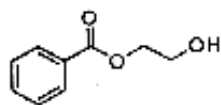


Third set of fragmentation products:



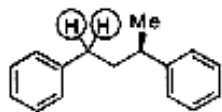
b) A small peak at M/Z 165 was also observed. IN ONE COHERENT SENTENCE explain the origin of this peak. (note, the molecular weight of C = 12, H = 1, O = 16) (4 points). THE PEAK AT M/Z 165 CAME FROM A PARENT MOLECULE THAT WAS NOT FRAGMENTED, PLUS THIS PARENT MOLECULE HAD A ¹³C INCORPORATED INTO IT SOMEWHERE

5) Could the two molecules shown below be distinguished by IR? IN ONE COHERENT SENTENCE explain your answer (4 points).

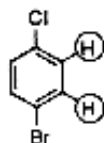
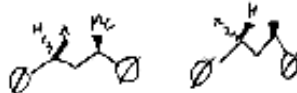


YES, THE MOLECULE ON THE LEFT WOULD CONTAIN A ν OH BOND BAND IN THE 3200-3600 REGION (CORRESPONDING TO THE ALCOHOL IT CONTAINS), THE MOLECULE ON THE RIGHT WOULD NOT CONTAIN SUCH A BAND

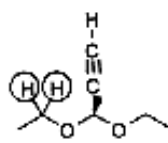
6) Label the circled protons or groups as homotopic, enantiotopic, diastereotopic, or does not apply (8 points).



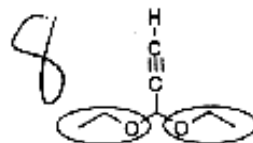
DIASTEREOTOPIC



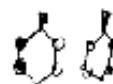
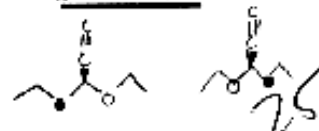
DOES NOT APPLY



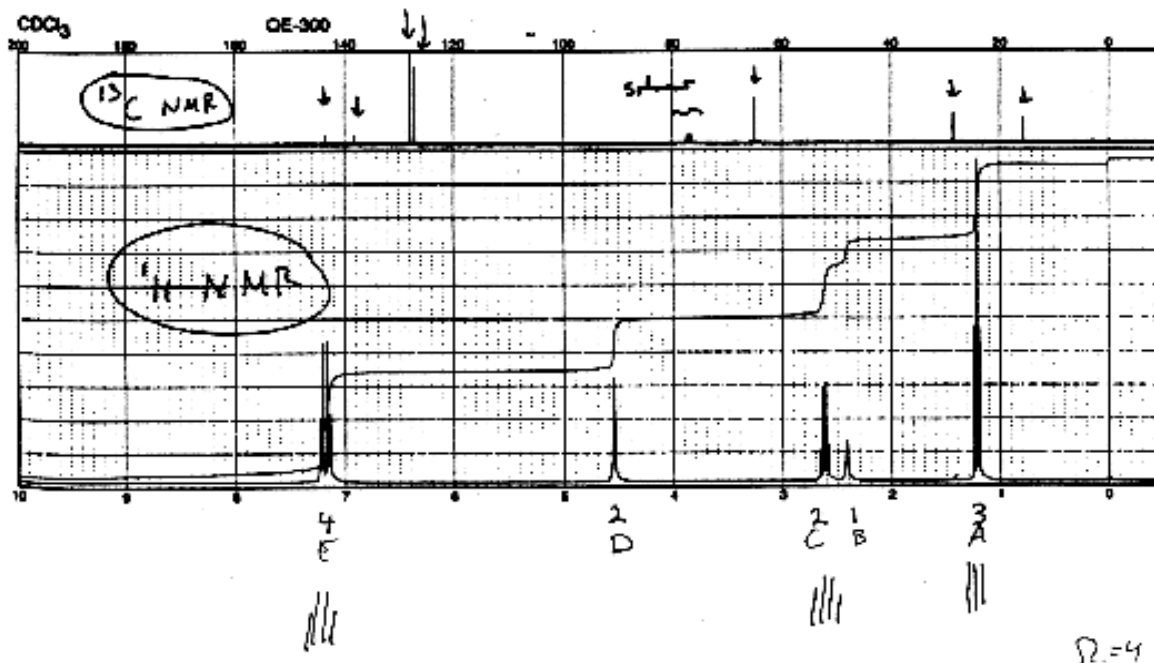
DIASTEREOTOPIC



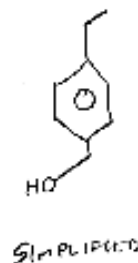
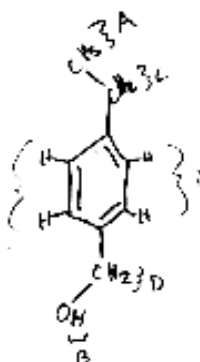
ENANTIOTOPIC



A compound has a molecular formula of $C_9H_{12}O$. The 1H and ^{13}C NMR spectra of this molecule are shown below. What is its structure (10 points)?



$\Omega = 4$



10