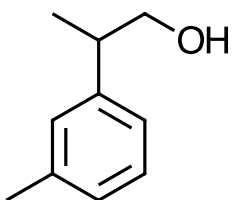
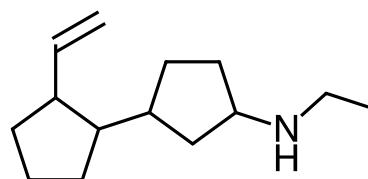


- 1) [20pts] Fill in the table with the expected results* of the simple chemical tests for compounds A-D

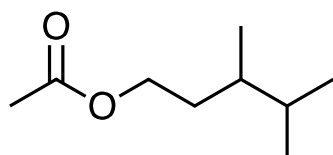
Test\Compound	A	B	C	D
soluble in water	0	0	0	+
sol in conc H ₂ SO ₄	+	+	+	+
sol in dil aq HCl	0	+	0	+
sol in dil. aq NaOH	0	0	0	+
bubbles in aq NaHCO ₃	0	0	0	+
decolorizes Br ₂ /CCl ₄	0	+	0	0



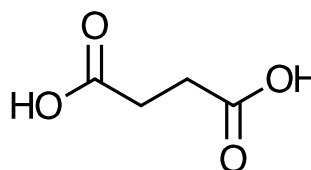
A



B



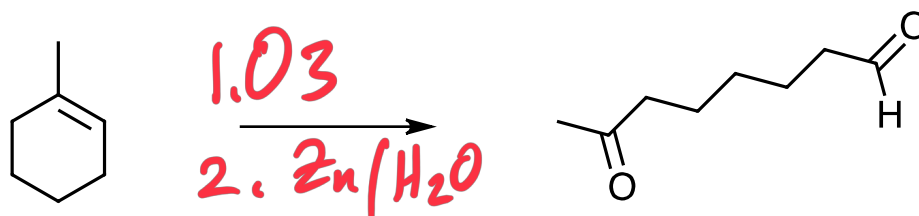
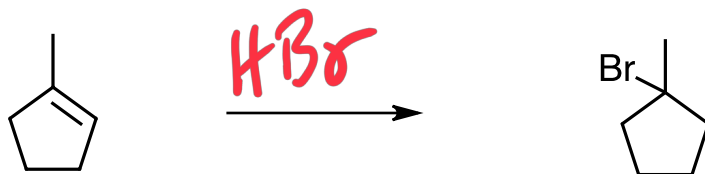
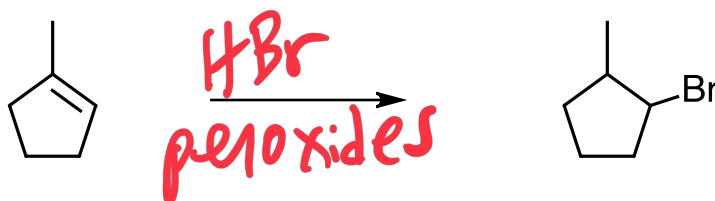
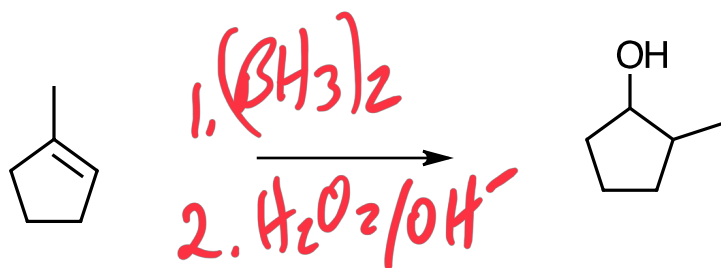
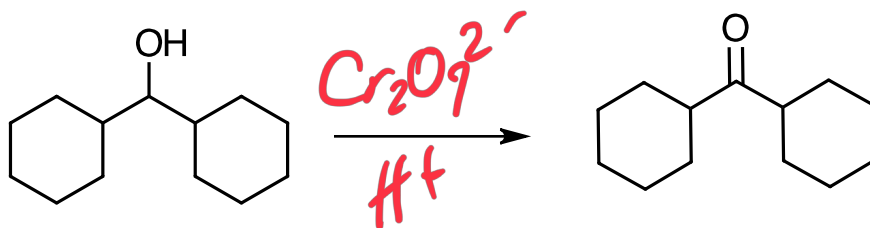
C



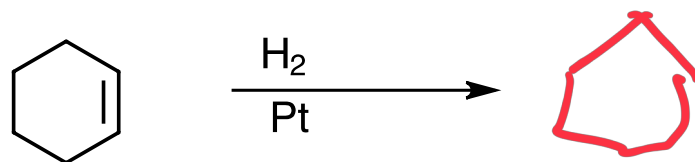
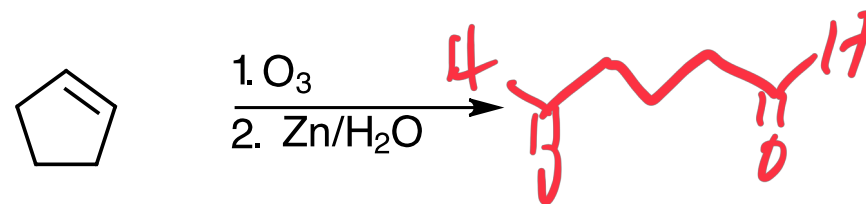
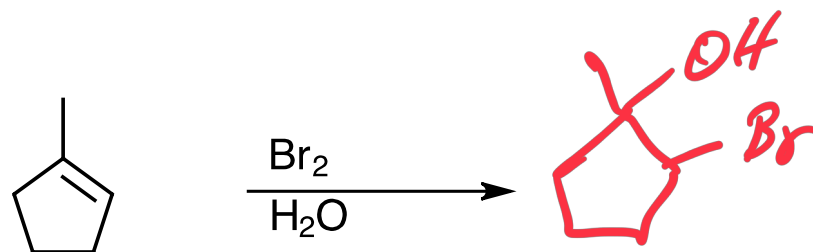
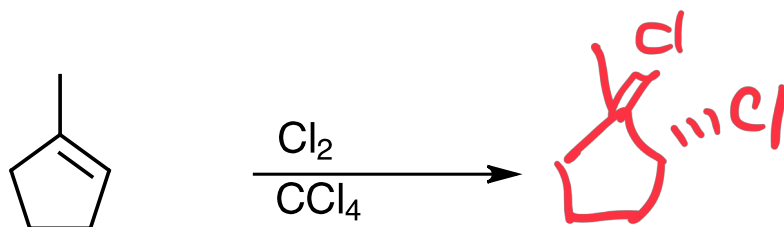
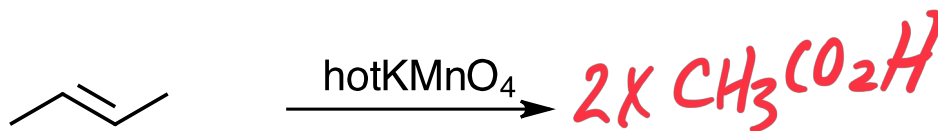
D

*Note: A zero for the solubility tests means the compound is insoluble in that reagent; a plus means the compound is soluble. A plus for Br₂/CCl₄ means the orange bromine color is discharged; a zero means the color remains. A zero for NaHCO₃ means no CO₂ bubbles are produced; a plus means CO₂ is evolved.

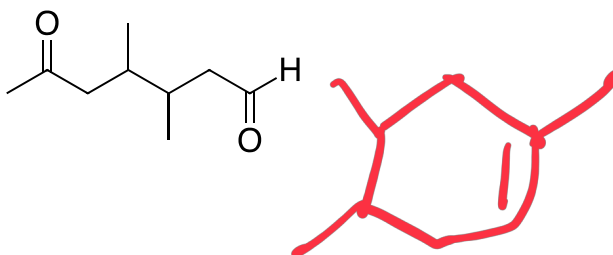
- 2) [40 pts] Place the appropriate reagents over the arrows for the following reactions:



3) [40 pts] Show the expected major organic products:



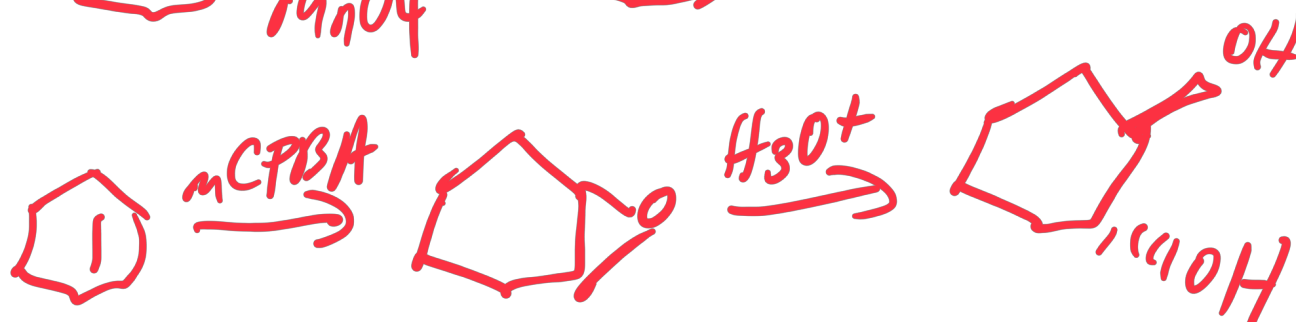
- 4) [20 pts] Ozonolysis of an alkene gave the product below. What was the alkene?



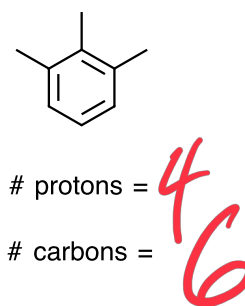
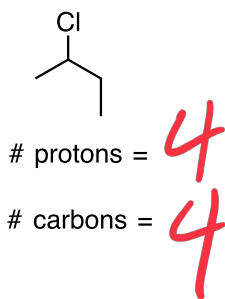
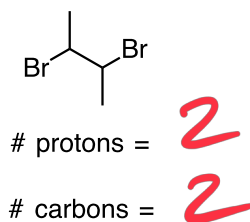
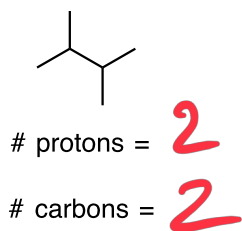
- 5) [10 pts] List three things that a carbocation can do:

rearrange *add a nucleophile* *eliminate an adjacent proton*

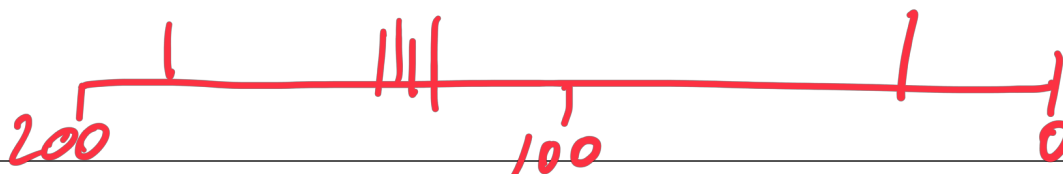
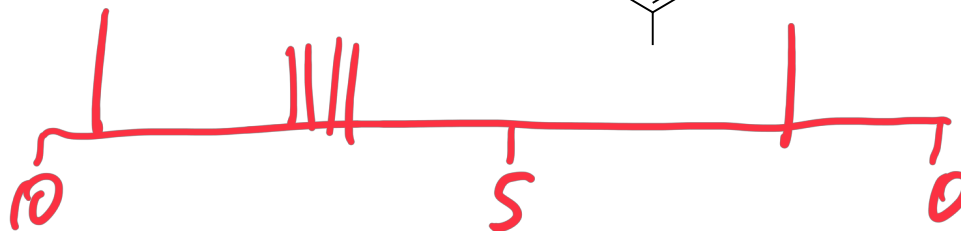
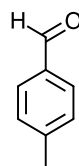
- 6) [10 points] Beginning with cyclohexene, show how you would synthesize each of the following:



- 7) [20 points] Below each structure state the number of different protons and the number of different carbons::



- 8) [20 points] Sketch the expected proton NMR and C-13 spectra for the following structure:



9) [20 points] Provide structures consistent with the provided information:

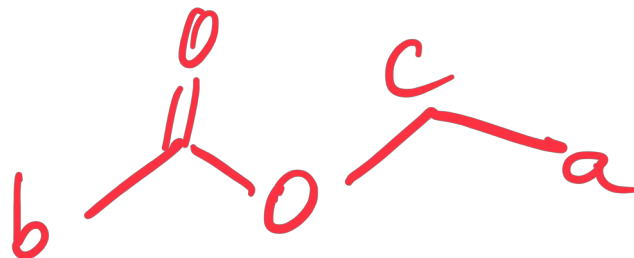
a) $C_4H_8O_2$

δ 1.2 triplet 3 H *a*

δ 2.1 singlet 3 H *b*

δ 4.1 quartet 2 H *c*

strong IR absorption at $\sim 1740\text{ cm}^{-1}$



b) $C_5H_8Br_4$

δ 3.6 singlet 8 H

