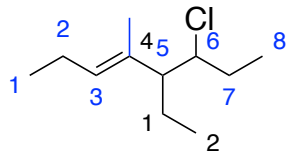
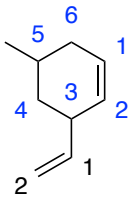
CEM 251, Problem Set 5: Chapters 5,6 , Alkenes

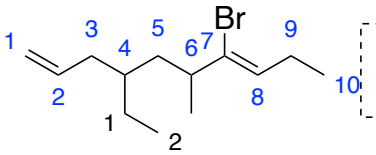
1. Name the following compounds (include stereochemistry, cis/trans, E/Z when appropriate).



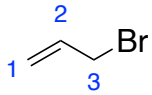
(*E*)-6-chloro-5-ethyl-4-methyloct-3-ene



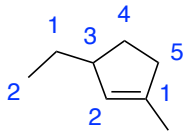
5-methyl-3-vinylcyclohex-1-ene



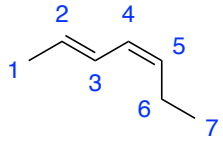
(*Z*)-7-bromo-4-ethyl-6-methyldeca-1,7-diene



3-bromoprop-1-ene



3-ethyl-1-methylcyclopent-1-ene



(2*E*,4*Z*)-hepta-2,4-diene

2. Calculate the degrees of unsaturation (RDBs) for the following molecular formulas.

C_8H_8

$$RDB = \frac{2n + 2 - \#Hs - \#Xs + \#Ns}{2} = \frac{2x8 + 2 - 8}{2} = \mathbf{5}$$

$C_{12}H_{19}NO_2$

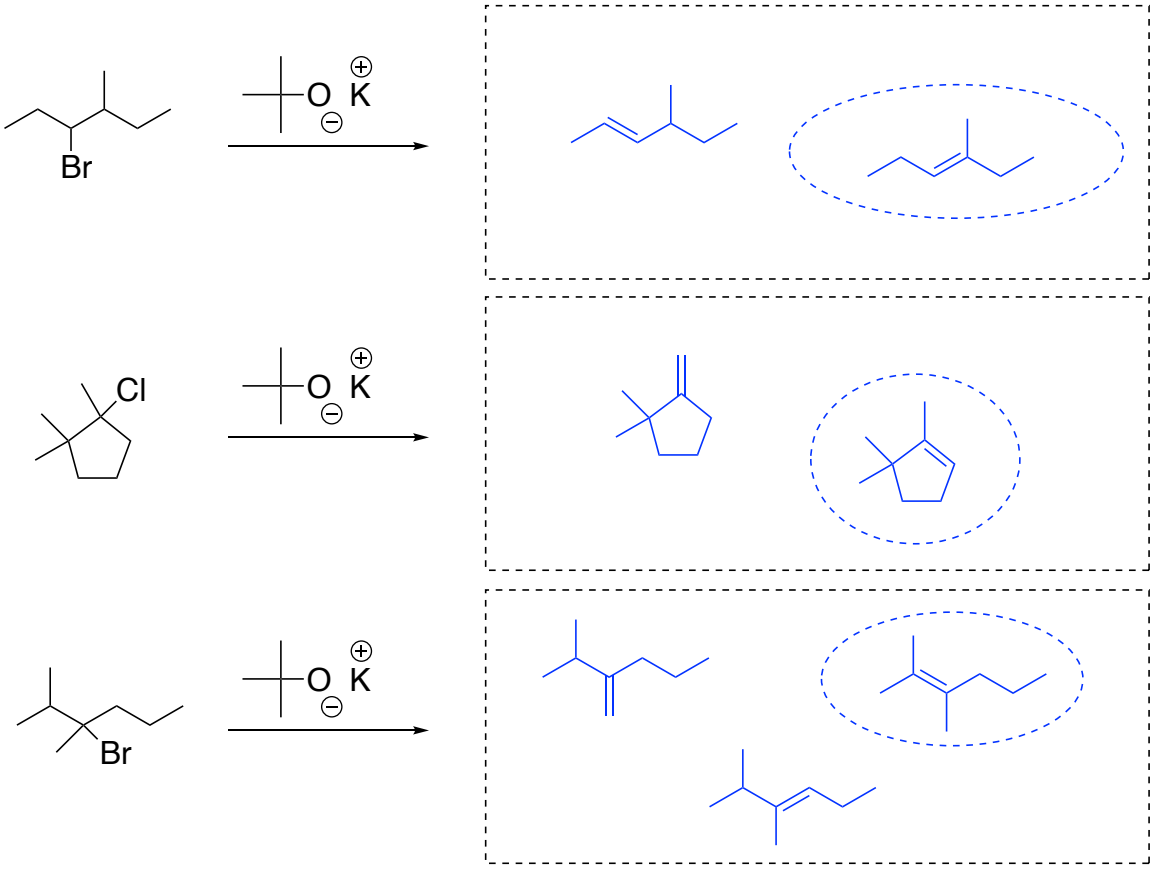
$$RDB = \frac{2x12 + 2 - 19 + 1}{2} = \mathbf{4}$$

$C_{13}H_{21}ClN_2O$

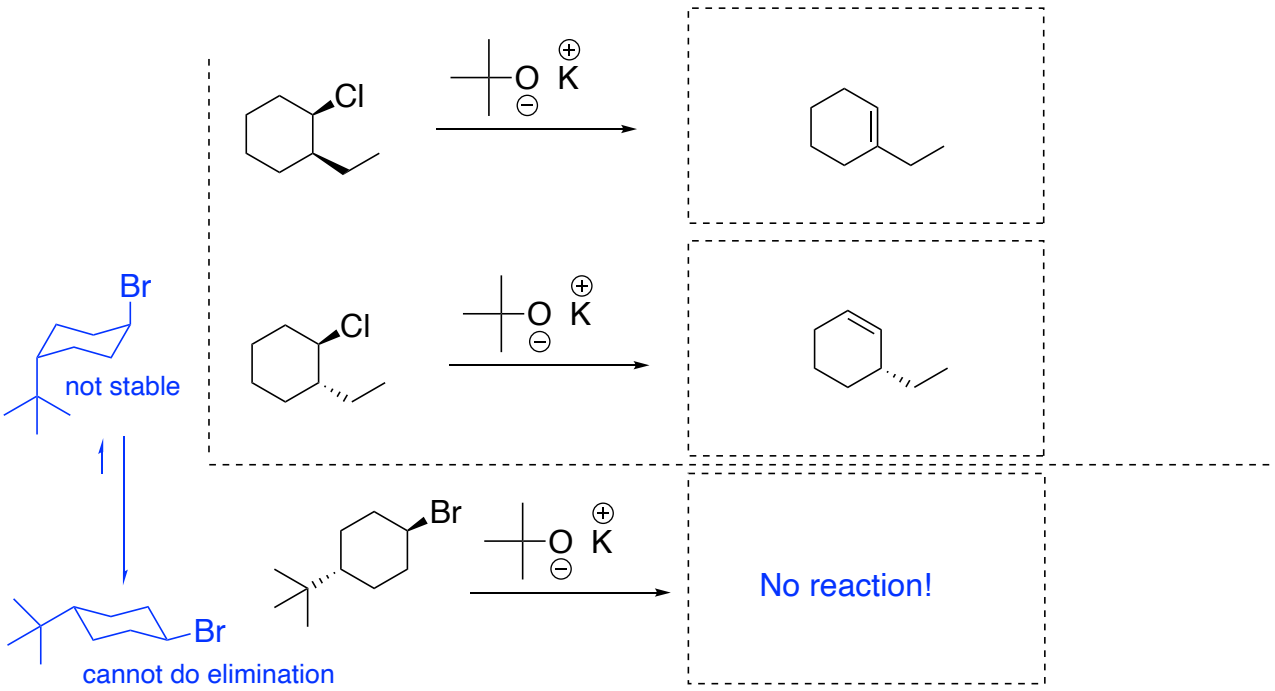
$$RDB = \frac{2x13 + 2 - 21 - 1 + 2}{2} = \mathbf{4}$$

3. β-Eliminations that follow an E2 mechanism have stereochemical implications that need to be addressed. Elimination MUST occur from a conformation with an "anti periplanar" between the leaving group and β-hydrogen. This corresponds to a "trans-diaxial" elimination in cyclohexane chairs.

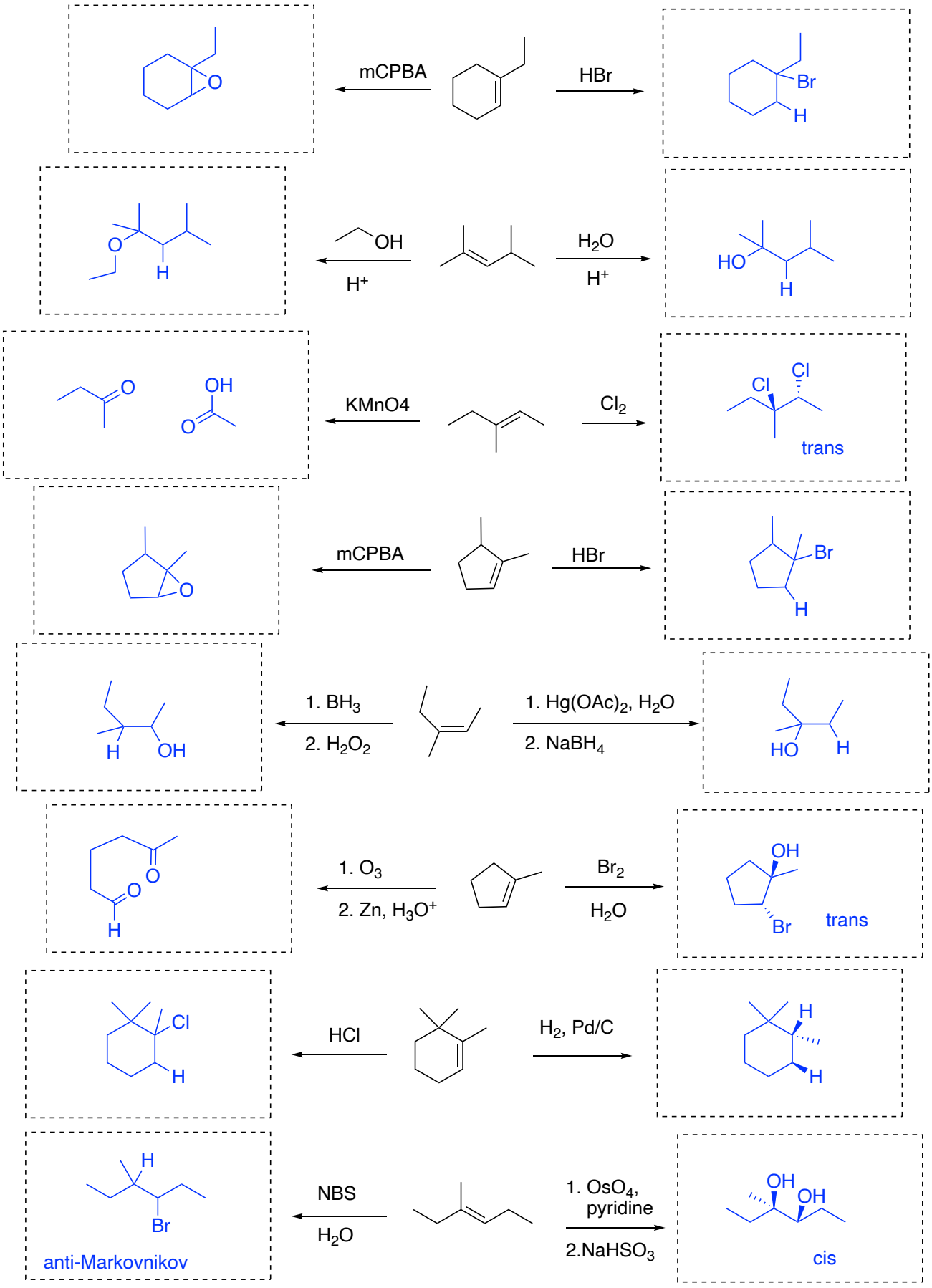
a. Draw ALL possible elimination alkene products for the following E2 reactions.
If there is more than one product possible, CIRCLE the major product (Zaitsev's rule)



b. What is the major product of the following E2 Eliminations? Note: recall that large bulky groups (i.e. tBu) CANNOT be axial.



4. Provide the major organic products for the following reactions. Be sure to include all stereoisomers and consider rearrangements.



5. Draw a detailed arrow pushing mechanism for the following transformations (show how bonds are breaking and forming for the starting material to become the product).