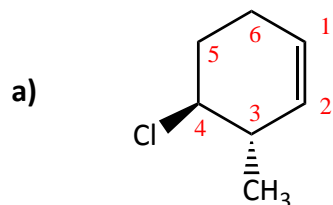


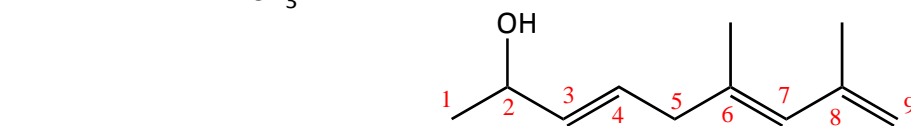


1. (12 pts) Write a **systematic name** for a and b complete with stereochemistry.  
Draw a structure for c, d and e.



trans-4-chloro-3-methylcyclohexene

3 pts

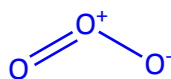


(3E, 6E)-6,8-dimethyl-3,6,8-nonatrien-2-ol

3 pts

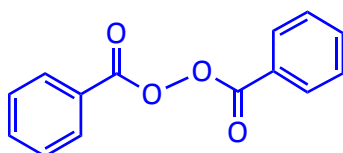
c) ozone

2 pts



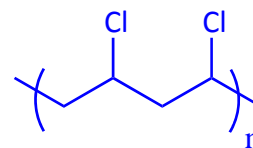
d) benzoyl peroxide

2 pts



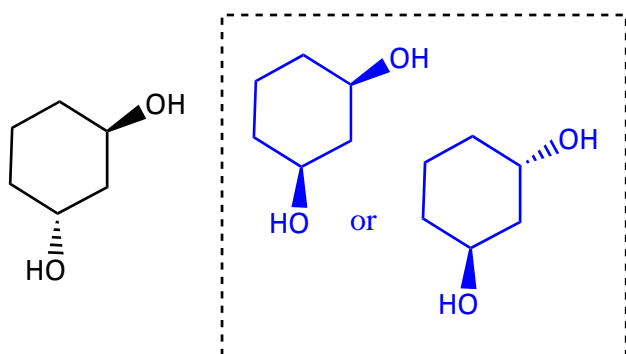
e) polyvinyl chloride

2 pts

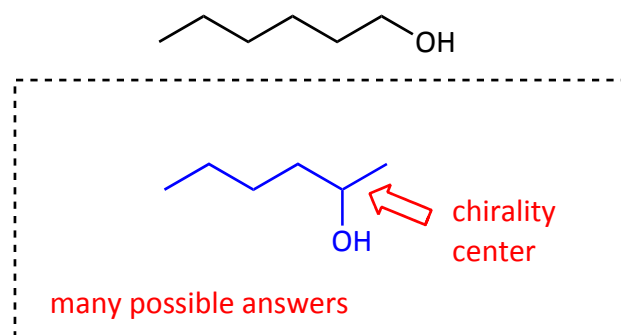


2. (12 pts) Draw structures corresponding to each of the following.

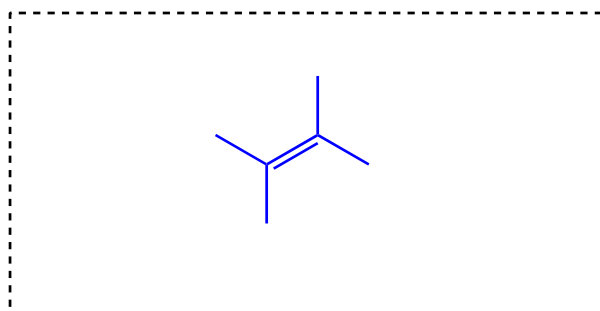
a) A **stereoisomer** of the structure shown:



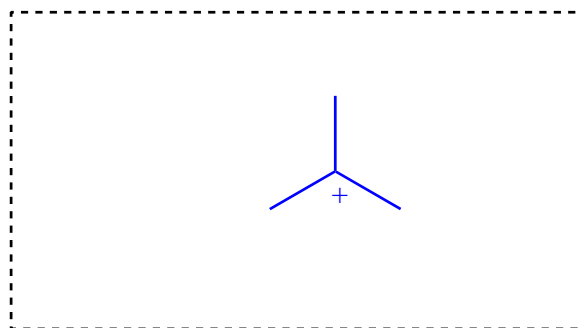
b) A **CHIRAL constitutional isomer** of 1-hexanol:



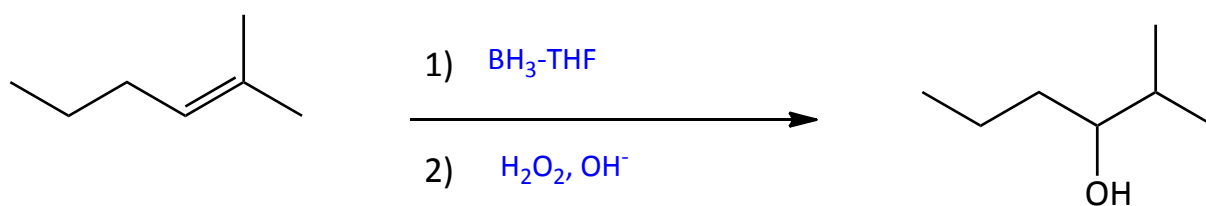
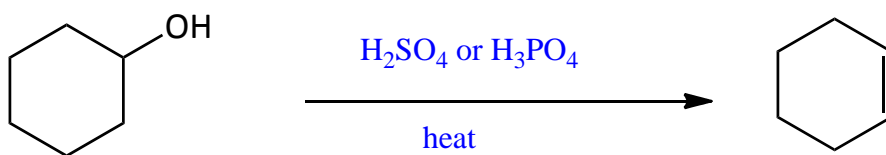
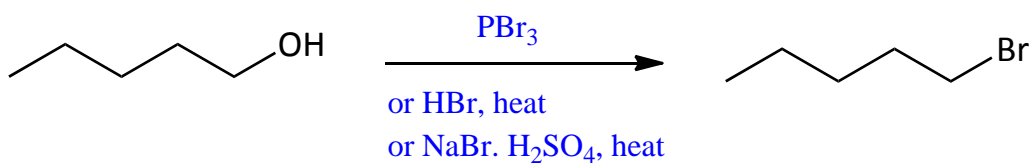
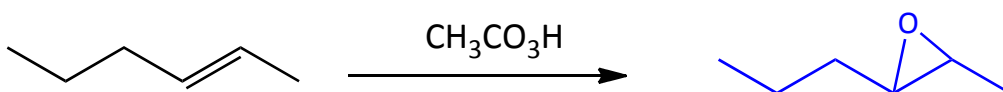
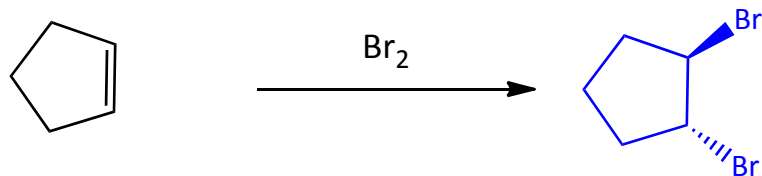
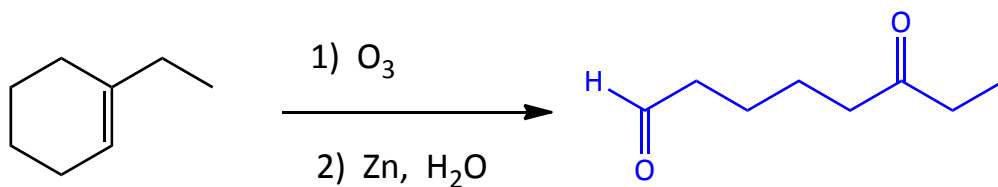
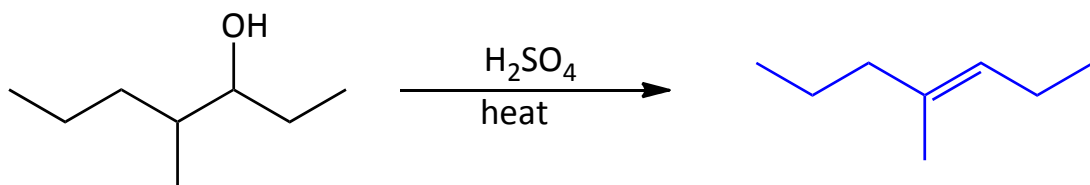
c) The **most thermodynamically stable** alkene of molecular formula  $C_6H_{12}$ .



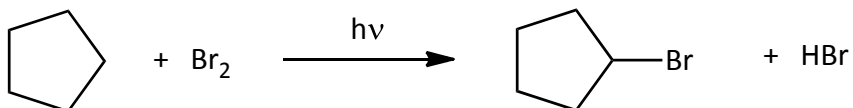
d) A **tertiary** carbocation.



3. (28 pts) Complete the expected **major products** or **necessary reagents** for each reaction below. NO reaction is not an option in any case.



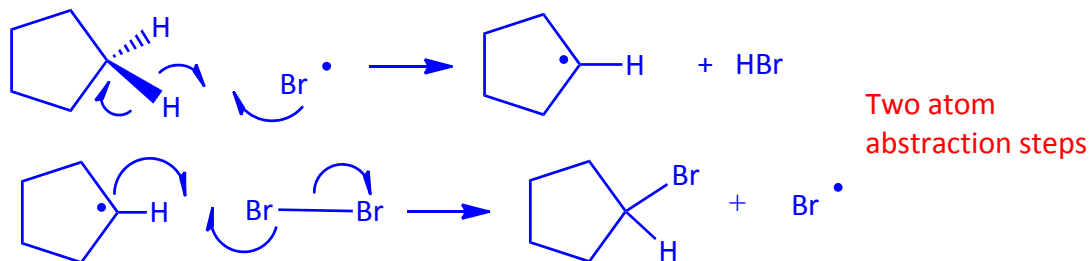
4. (20 pts) a) Write a **complete stepwise mechanism** for the reaction below. Use curved arrows to represent electron movement.



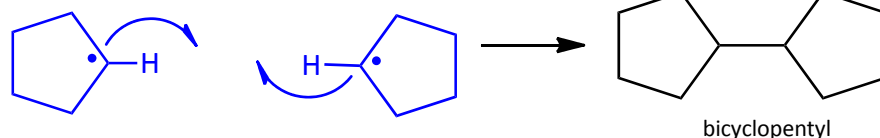
Initiation



Propagation Steps



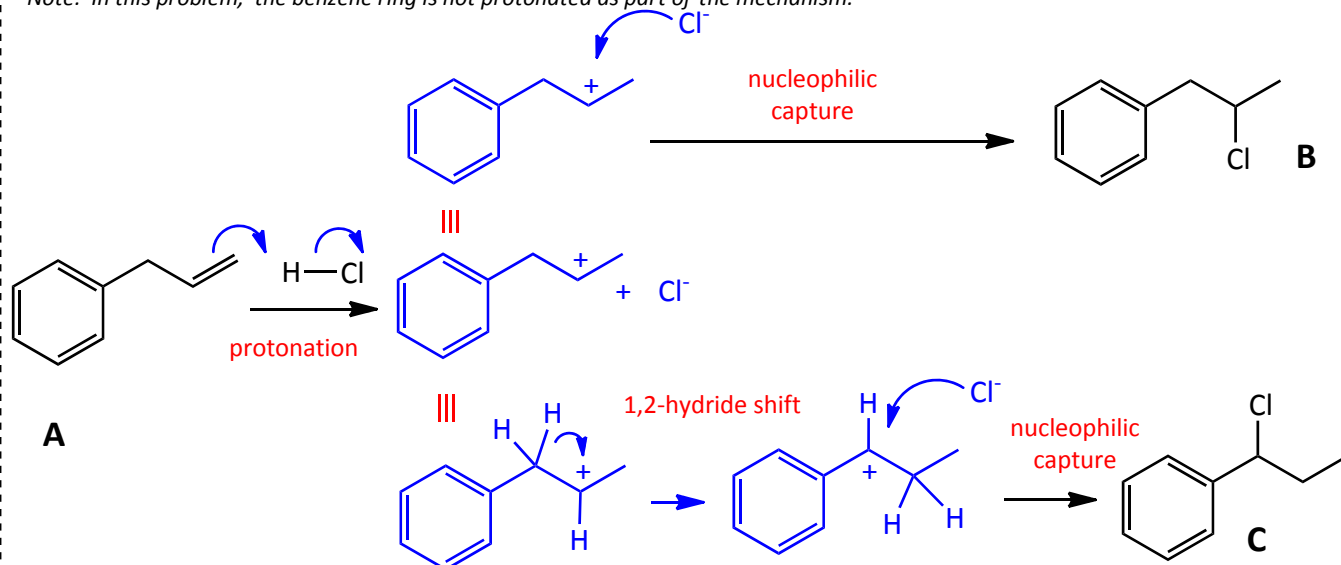
Careful analysis would probably show a trace of bicyclopentyl among products. **Write an equation to explain its origin.**



b) Reaction of allylbenzene (A) with HCl yields a mixture of B and C. **Draw a complete mechanism** leading to both products. Use curved arrows to represent electron movement.

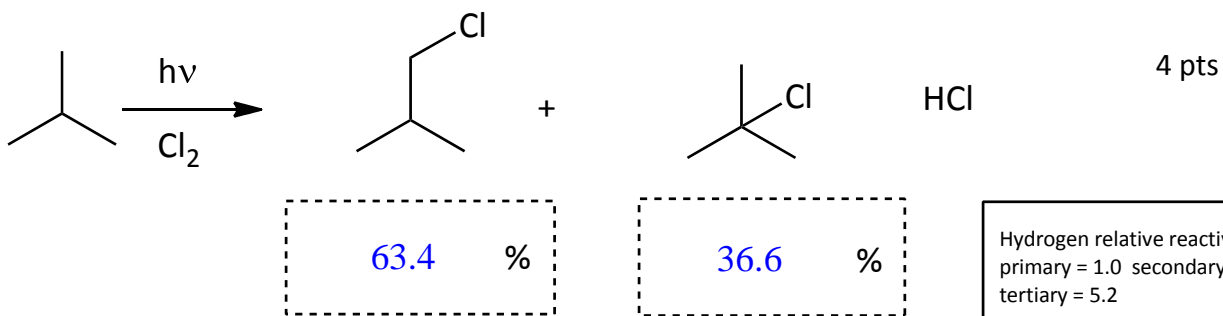
10 pts

*Note: In this problem, the benzene ring is not protonated as part of the mechanism.*



5. (14 pts) More mechanisms!

a) Two organic products are formed in the chlorination of 2-methylpropane. HCl is another reaction product. Using the relative reactivities for different types of hydrogen, **calculate the percentage of each product in the mixture.**



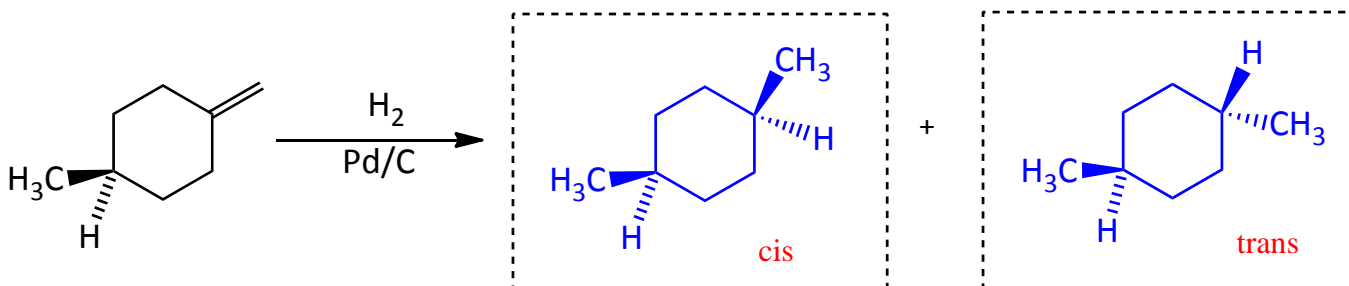
Hydrogen relative reactivities  
 primary = 1.0 secondary = 3.9  
 tertiary = 5.2

Show your work.

$9 \text{ primary hydrogens} \times 1 = 9$        $9/14.2 \times 100 = 63.4 \%$   
 $1 \text{ tertiary hydrogen} \times 5.2 = 5.2$        $5.2/14.2 \times 100 = 36.6\%$

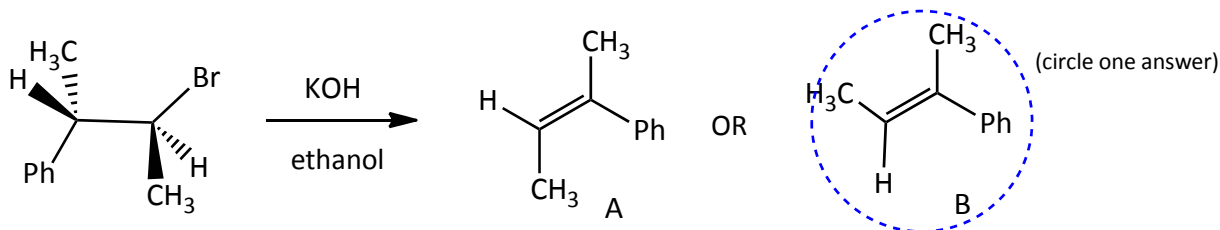
b) Hydrogenation of the alkene shown gives a pair of stereoisomers. **Propose structures** for the two products.

4 pts



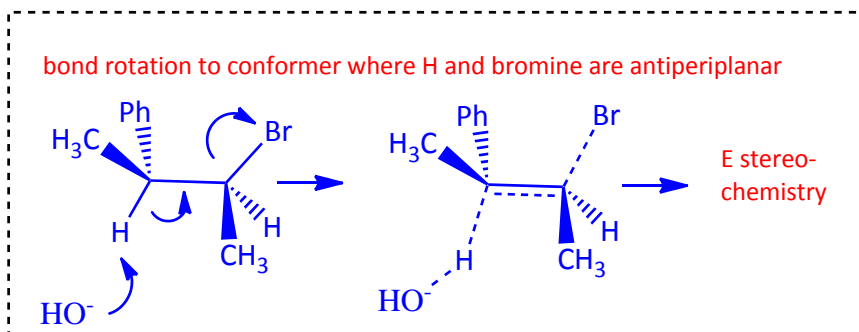
c) The E2 reaction below will yield one of the two alkenes shown. **Which one will form?**

6 pts



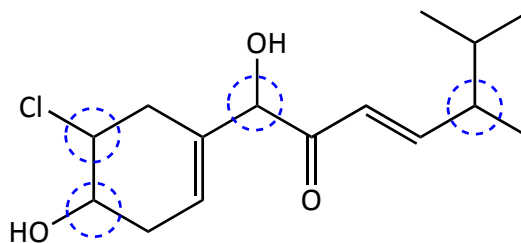
This conformer is unreactive.

Draw a **3D representation of the transition state** and explain your choice.

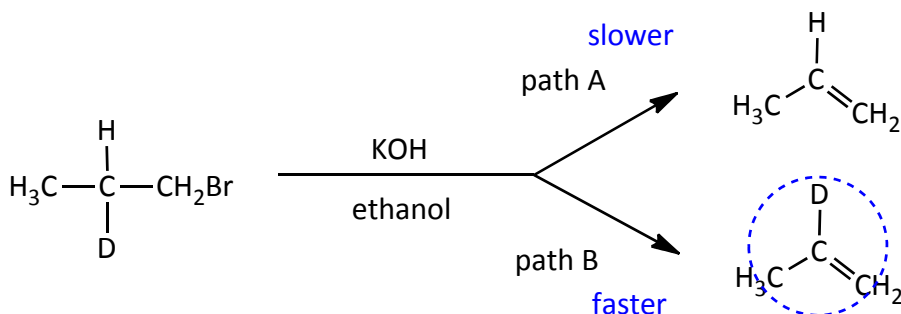


6. (12 pts) *Potpourri*

- a) Circle all of the **chirality centers** in the structure at right.



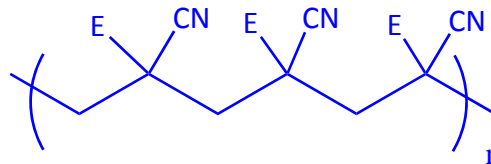
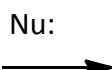
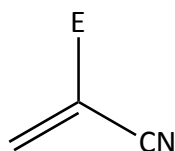
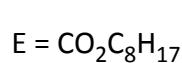
- b) **Which pathway** will be preferred in the reaction below? (circle one answer)



Briefly **explain** your choice.

The C-D bond breaks about 7 times more slowly because of a kinetic isotope effect. Thus the major product involves C-H bond cleavage.

- c) Octyl cyanoacrylate, shown below, is used as a liquid bandage. This works because water or other nucleophiles initiate anionic polymerization. **Draw the repeating structure of the polymer.**



Bonus: (3 pts). From the recent article on social networking in rodents I distributed in class, **what is a "MUP"**?

MUP = major urinary proteins - These are part of mouse "social networking" by leaving scent marks in urine.  
*Chemical and Engineering News*, October 3, 2011, p 36-37

1. \_\_\_\_\_ /12

4. \_\_\_\_\_ /22

**Total**

2. \_\_\_\_\_ /12

5. \_\_\_\_\_ /14

\_\_\_\_\_ / 100

3. \_\_\_\_\_ /28

6. \_\_\_\_\_ /14