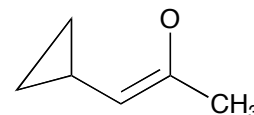
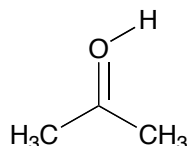
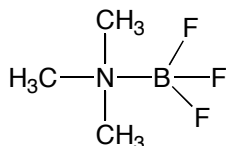


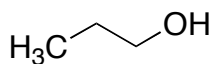
**Final Exam (209 points)**

1. Fill in any missing lone pair electrons and assign charges to the heteroatoms in the following molecules? (9 points)

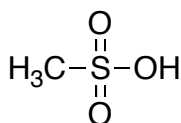


2. Rank the following compounds or elements: (12 points)

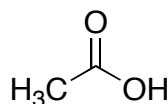
(a) In order of acidity:



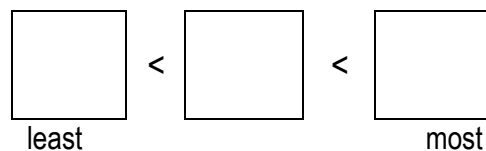
**A**



**B**



**C**



(b) In order of electronegativity:

**F**

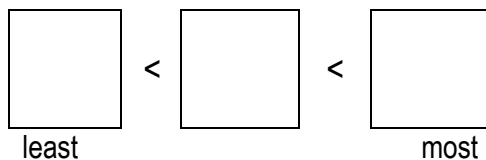
**A**

**B**

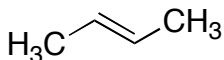
**B**

**Cl**

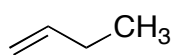
**C**



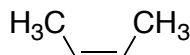
(c) In order of stability:



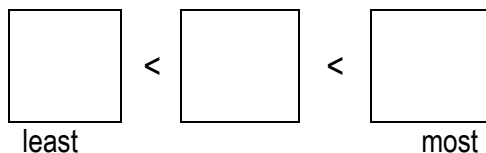
**A**



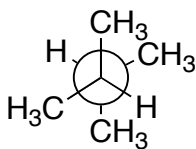
**B**



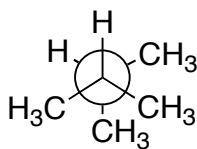
**C**



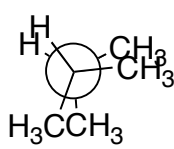
(d) In order of stability:



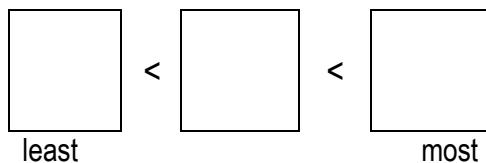
**A**



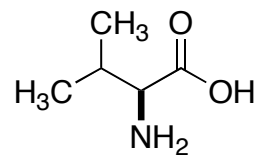
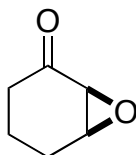
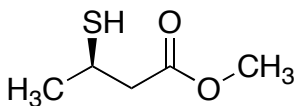
**B**



**C**



3. Name the functional groups found in each of the following molecules. (12 points)



(a) \_\_\_\_\_

(c) \_\_\_\_\_

(e) \_\_\_\_\_

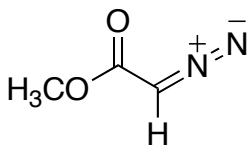
(b) \_\_\_\_\_

(d) \_\_\_\_\_

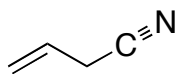
(f) \_\_\_\_\_

4. Draw resonance structures for the following compounds. Be sure to clearly indicate electron pairs, formal charges, and arrows. (16 points)

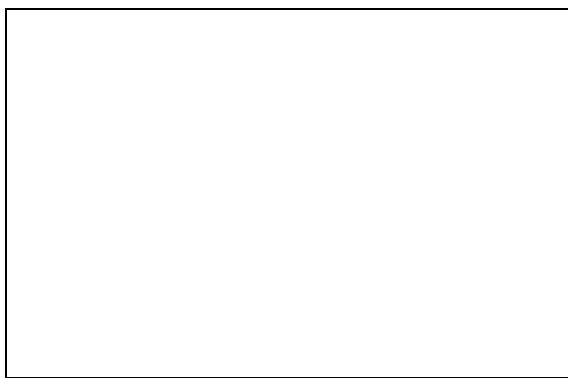
(a)



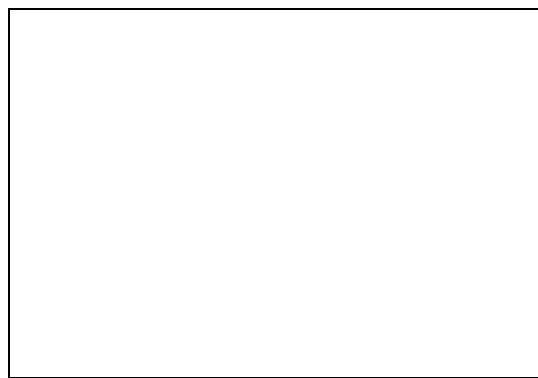
(b)



5. Draw a picture showing the orbitals, bonds, and geometry of the following molecules (12 points):



(a)

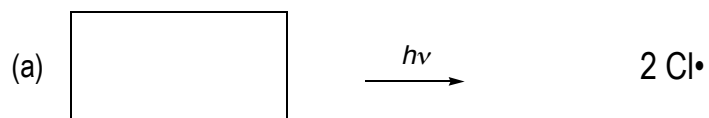


(b)

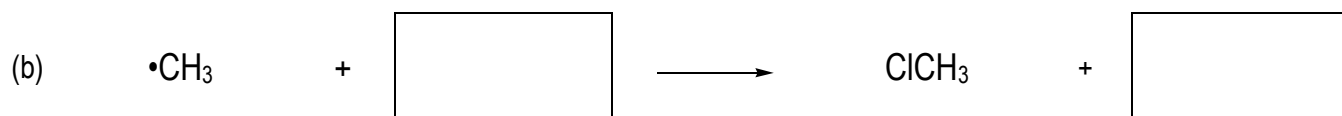
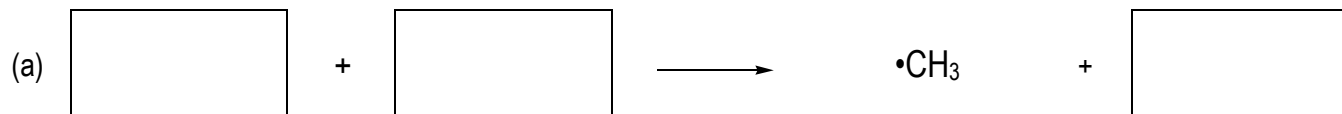


6. Fill in the boxes for the following free radical chain reaction (20 points):

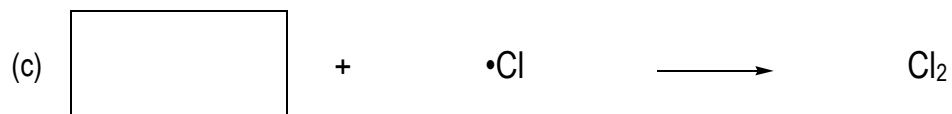
i) Initiation:



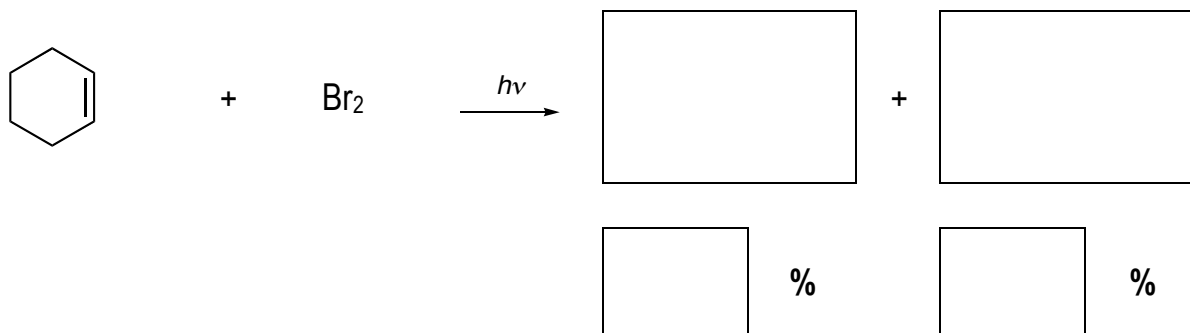
ii) Propagation



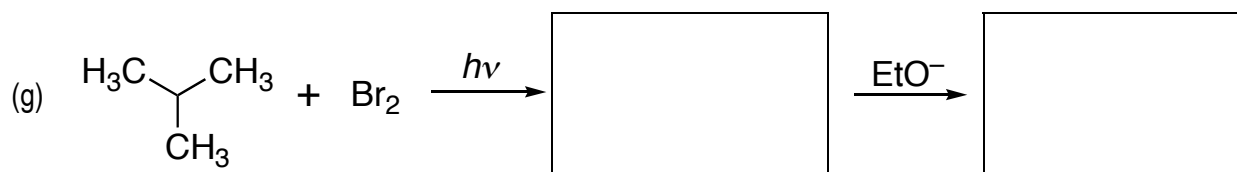
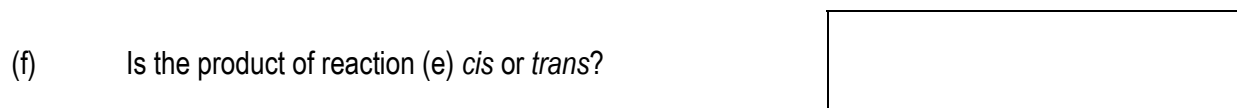
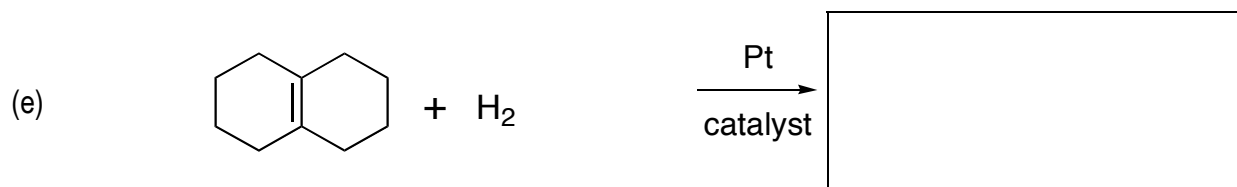
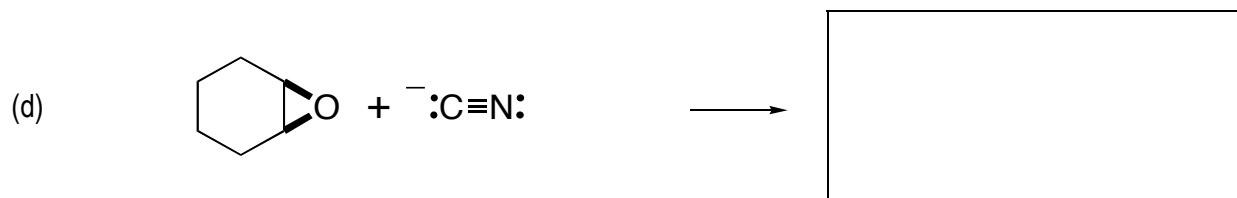
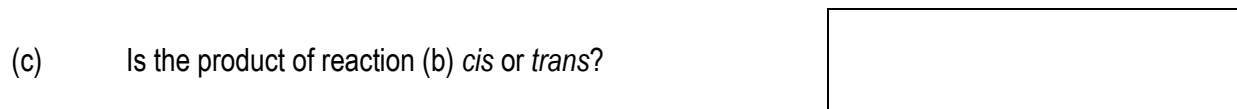
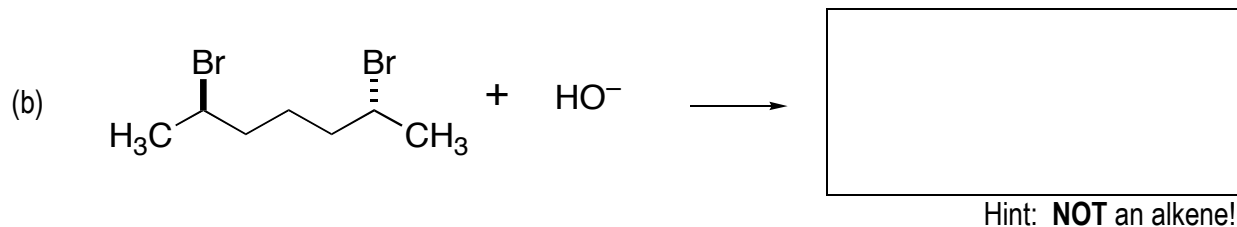
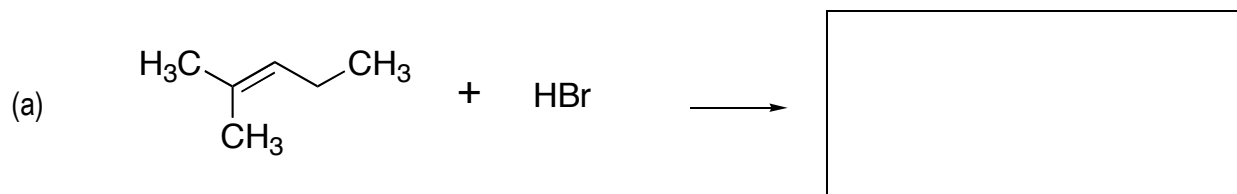
iii) Termination

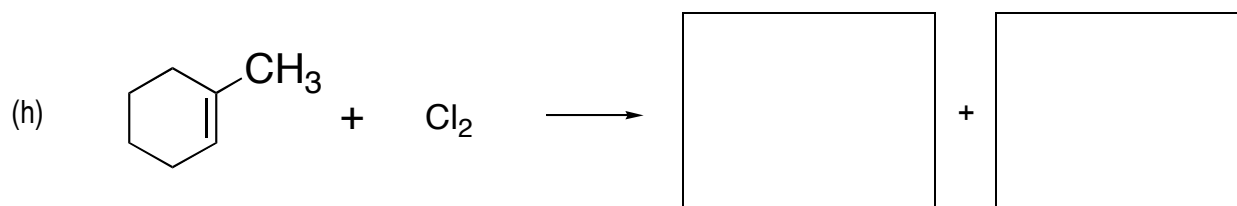


7. If radical bromination has a 19 to 1 preference for bromination at allylic (next to a double bond) carbons versus bromination at normal secondary carbons, predict the monobromination products and their ratio. (8 points)

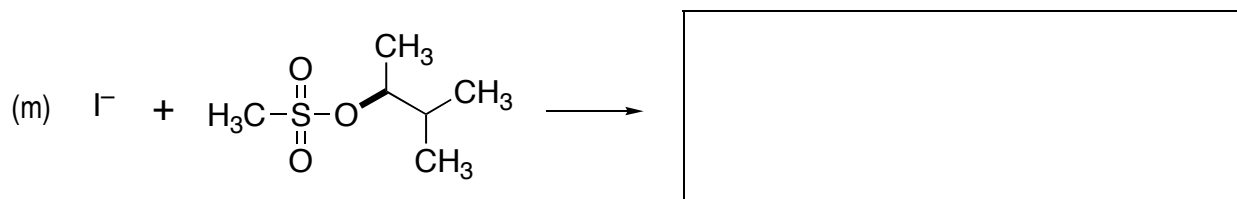
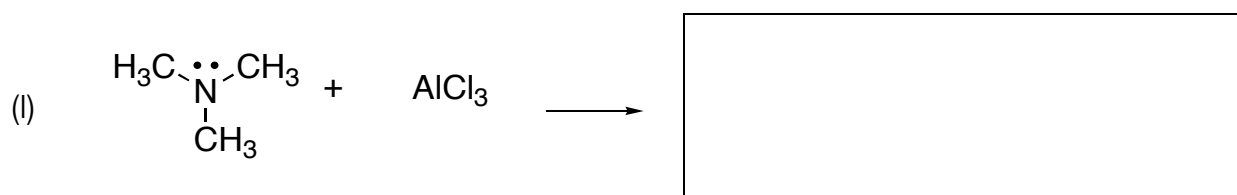
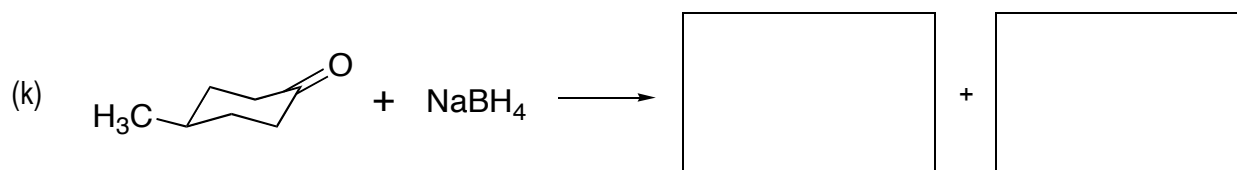
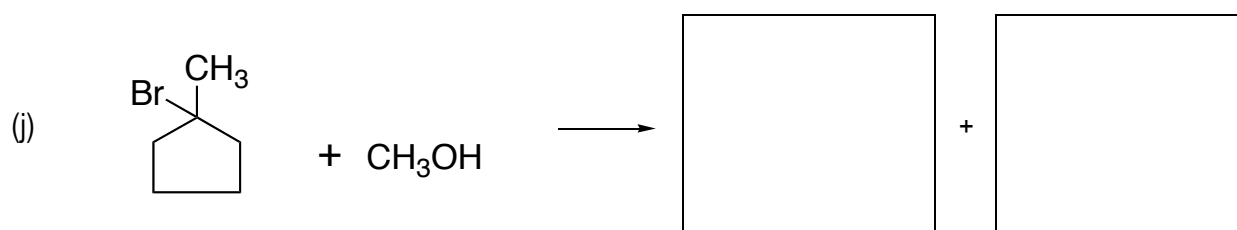


8. Draw the products of the following reactions or give answers to the questions. (two pages, 48 points)





(i) What is the relationship between the products in reaction (h),  
**C**: constitutional isomers, **E**: enantiomers, or **D**: diastereomers?



9. Name one way in which enantiomers have different properties. (3 points)

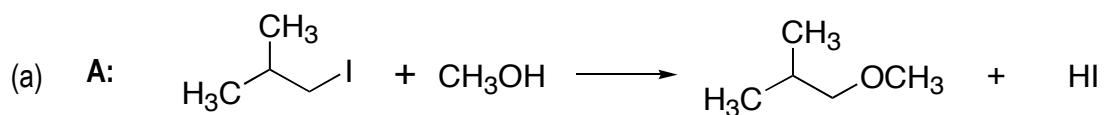
10. Give correct structures for the following compounds, showing the proper stereochemistry: (12 points)

(a) (*R*)-3-methyl-3-bromopentane

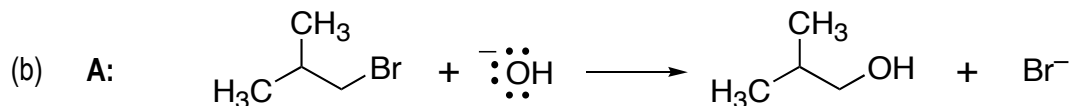
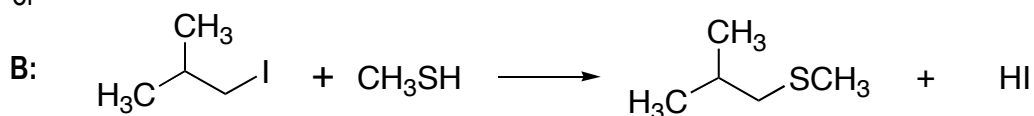
(b) (*Z*)-3-bromo-2-butene

(c) *meso*-2,3-dimethoxybutane

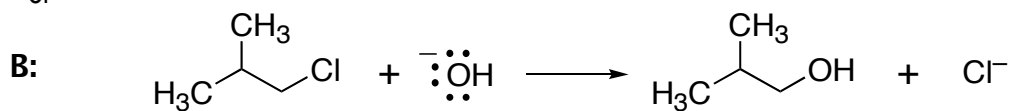
11. For each entry, which of the following  $S_N2$  reactions will be FASTER? (6 points)



or



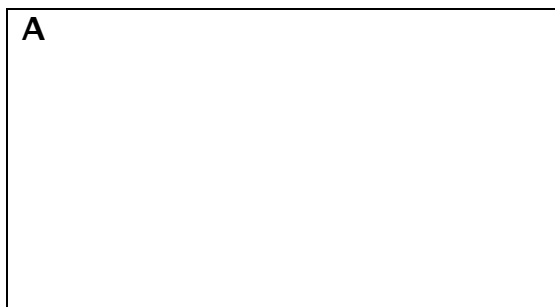
or



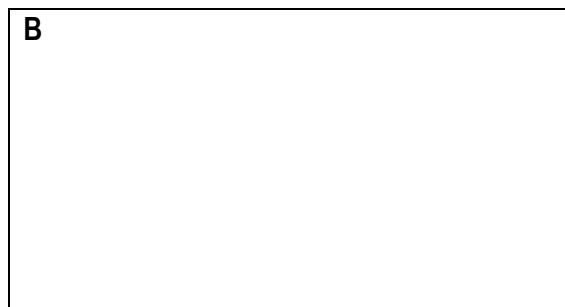
12. Draw a stepwise mechanism for the  $S_N1$  reaction 2-bromopropane with propanol. (8 points)

13. Draw the following representations of 1,3-dimethylcyclohexane. (12 points)

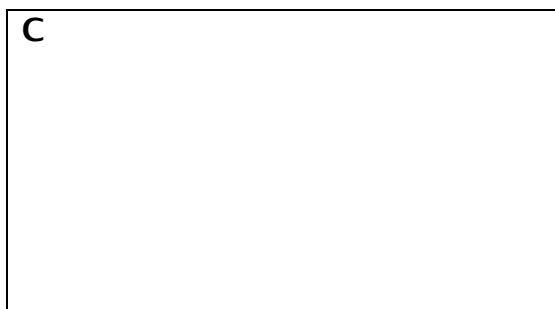
(a) The most stable conformer of the *trans*-diastereomer.



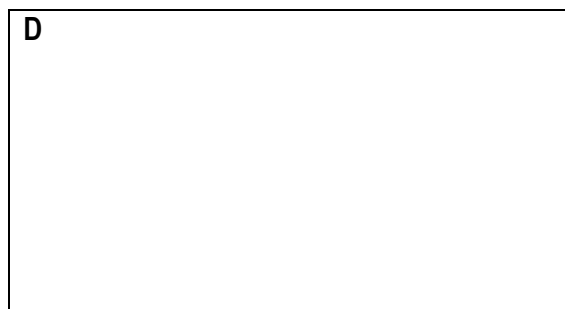
(b) The most stable conformer of the *cis*-diastereomer.



(c) The ring flipped conformer of the *trans* conformer drawn above.



(d) The ring flipped conformer of the *cis* conformer drawn above.



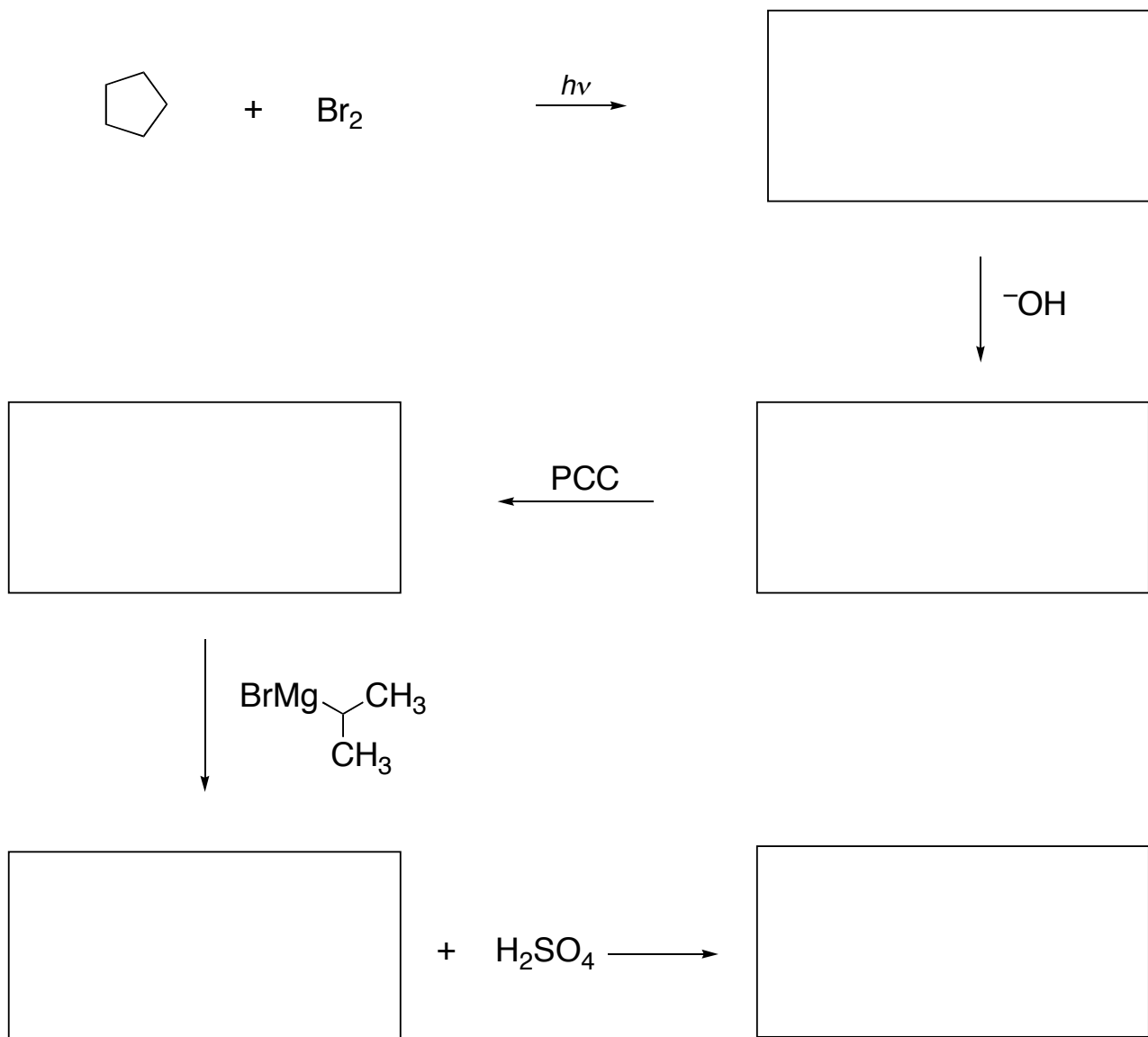
(e) Estimate the relative population of conformer **A** to conformer **C** at equilibrium.

**A:**  %    **C:**  %

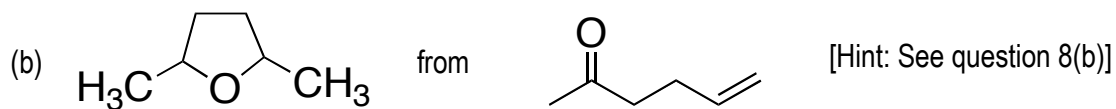
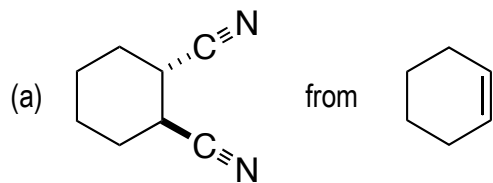
(f) Estimate the relative population of conformer **B** to conformer **D** at equilibrium.

**B:**  %    **D:**  %

14. Fill in the boxes with the correct product or reagent. (15 points)



15. Propose multi-step synthesis of the following compounds from the given starting materials. You may use any reagents or reactions covered in this class. Each one can be prepared in three steps or less, however any chemically logical sequence is acceptable. (16 points)



	<b>Points</b>	<b>Possible Points</b>
<b>Page 1</b>	_____	/ 21
<b>Page 2</b>	_____	/ 40
<b>Page 3</b>	_____	/ 28
<b>Page 4</b>	_____	/ 24
<b>Page 5</b>	_____	/ 27
<b>Page 6</b>	_____	/ 18
<b>Page 7</b>	_____	/ 20
<b>Page 8</b>	_____	/ 15
<b>Page 9</b>	_____	/ 16
<b>Total</b>	<input type="text"/>	/ 209