

Name: _____
Last First MI

Grading Page: Exam 2

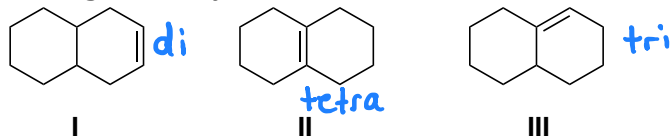
Page	Points Possible	Points Earned
Multiple Choice (3-5)	40	
6	22	
7	20	
8	18	
TOTAL	100	

Multiple-Choice

Choose the one best answer for each of the following questions. Record each answer on the provided Scantron sheet. (2 points each)

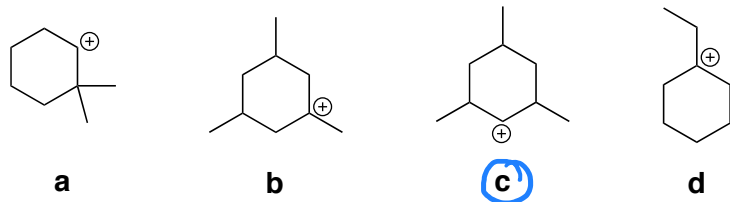
1. In cyclopropane, which of the following would be the **least** significant when determining its overall stability.
- Angle Strain
 - Torsional Strain
 - Steric Strain
 - All of the above would be significant

2. Arrange the bicyclic alkenes below in order of increasing stability

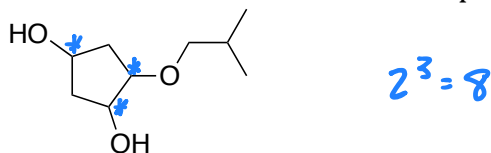


- I < II < III
- III < II < I
- II < III < I
- I < III < II
- III < I < II

3. Which one of the carbocations shown below is most likely to undergo a hydride shift?

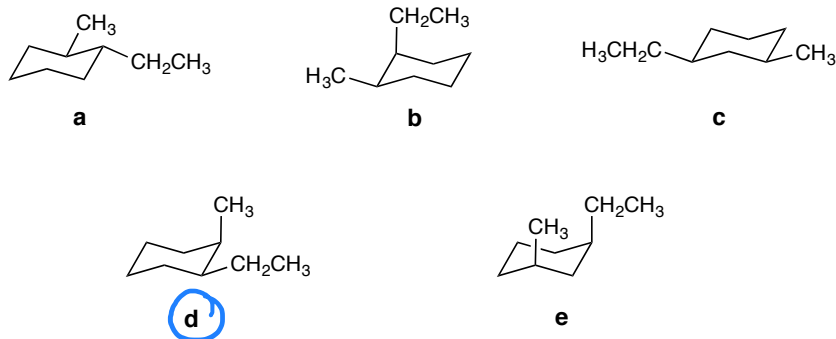


4. What is the maximum number of possible stereoisomers for the compound shown below?

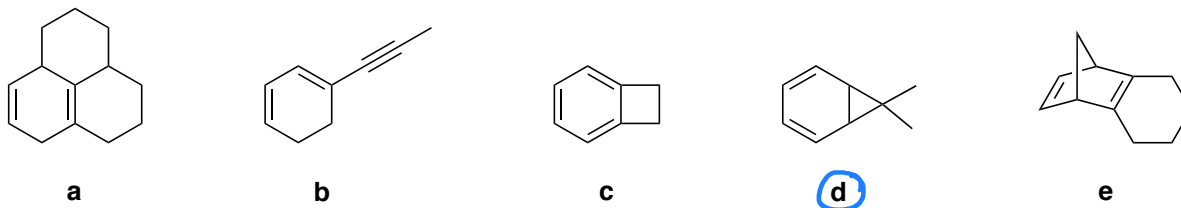


- Two
 - Three
 - Eight
 - Nine
 - Sixteen
5. Which one of the following statements is **false**?
- A meso compound is achiral.
 - A racemic mixture is optically active.
 - Diastereomers generally have different boiling points.
 - A pair of enantiomers have equal optical rotations with opposite signs.
 - A pair of enantiomers have identical melting points.

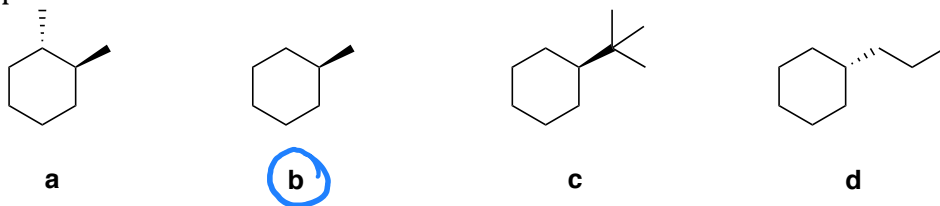
6. Which of the following is the most stable chair conformation of *cis*-1-ethyl-2-methylcyclohexane?



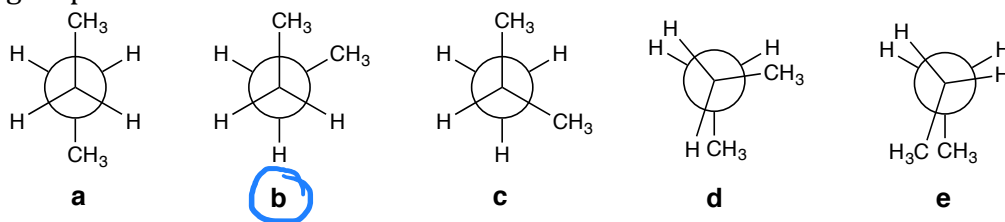
7. Which molecule below does not have 5 unsaturations?



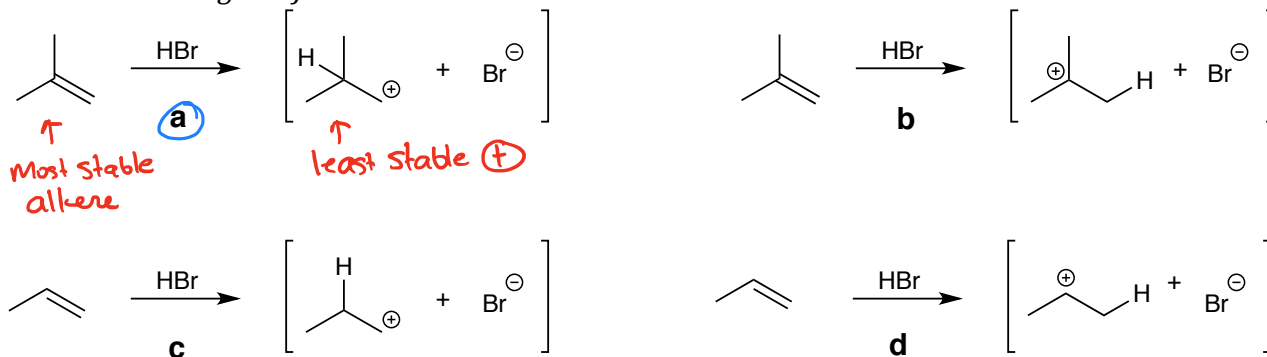
8. For which of the following would you expect the greatest percentage of molecules existing in **axial** position?



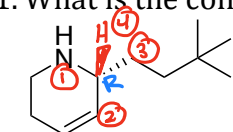
9. Which one of the Newman projections below has a 60° dihedral angle between the two methyl groups?



10. Which reaction step shown below is the most endergonic? *Hint: draw energy diagrams comparing the relative energies of the alkenes and carbocation intermediates.*



11. What is the configuration at the chiral center in the molecule shown below?

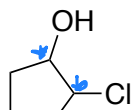


- a. R-configuration
b. S-configuration

For questions 12-15, determine whether each molecule is:

(a) Chiral, (b) Achiral, or (c) Meso-Achiral

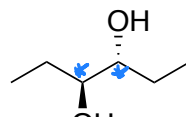
Bubble these answers in on your Scantron sheet for credit!



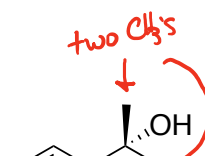
12.



13.



14.

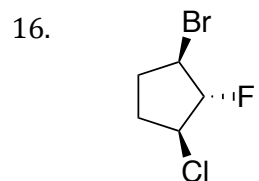


15.

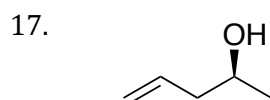
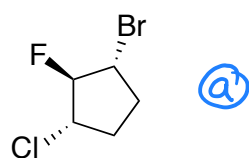
For questions 16-20, determine whether each pair of molecules represent:

(a) Identical Compounds, (b) Constitutional Isomers, (c) Enantiomers, or (d) Diastereomers

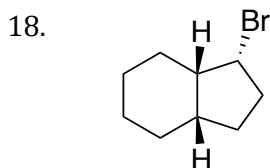
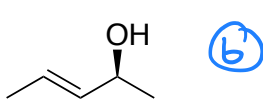
Bubble these answers in on your Scantron sheet for credit!



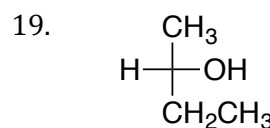
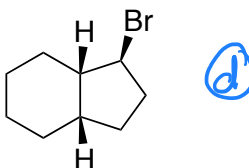
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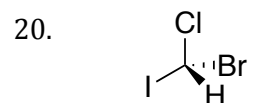
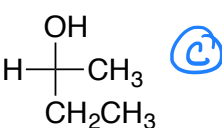
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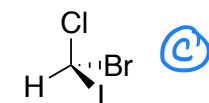
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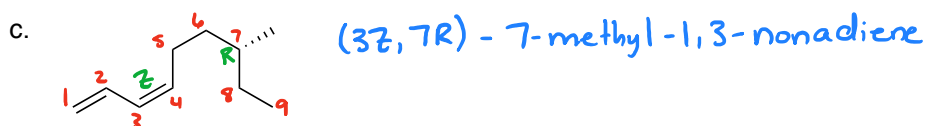
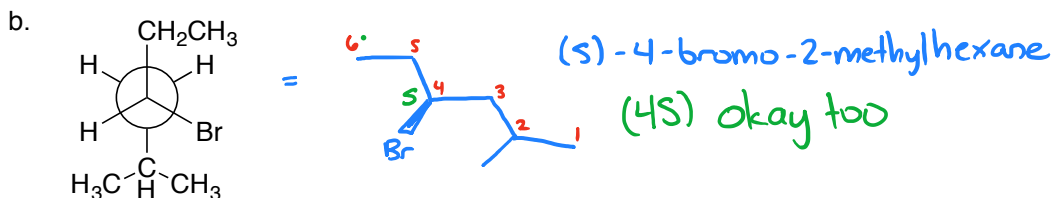
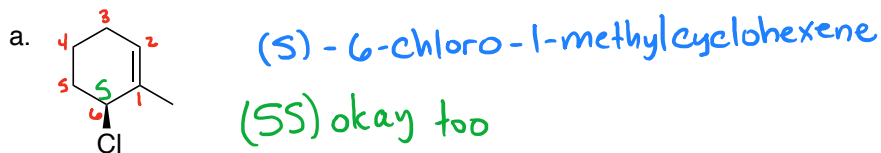
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Completion Section

Answer the remaining questions in the spaces provided.

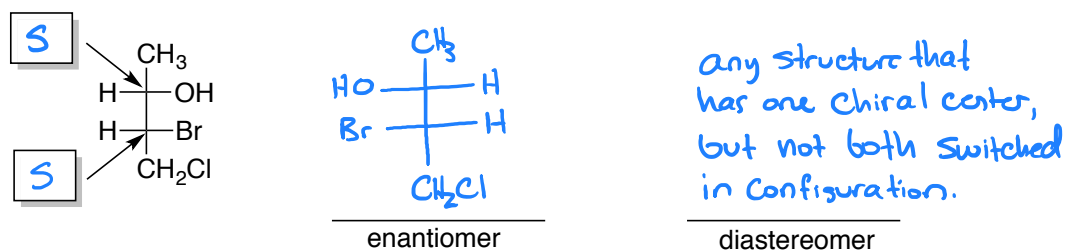
21. Provide the IUPAC name for each. Include *R*, *S*, *E*, and *Z* where appropriate. (3 points each)



22. Using the template below, complete the chair structure of (1*S*,3*S*)-1-bromo-3-chlorocyclohexane. (3 points)



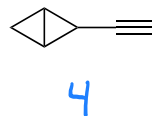
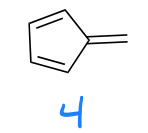
23. Assign *R/S* Configurations to the Fischer projection below. Then draw the enantiomer and a diastereomer. (6 points)



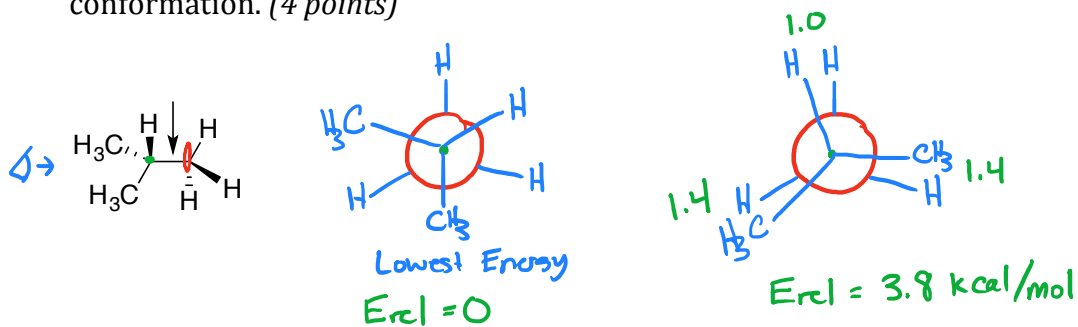
24. Determine the degree of unsaturation for each molecule or formula below. (1 points each)

$$\frac{2(10) + 2 - 18}{2} = 2$$

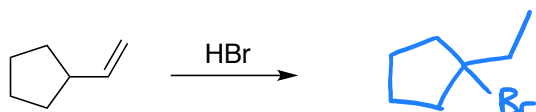
$$\frac{2(6) + 2 - 13 - 1 + 2}{2} = 2$$



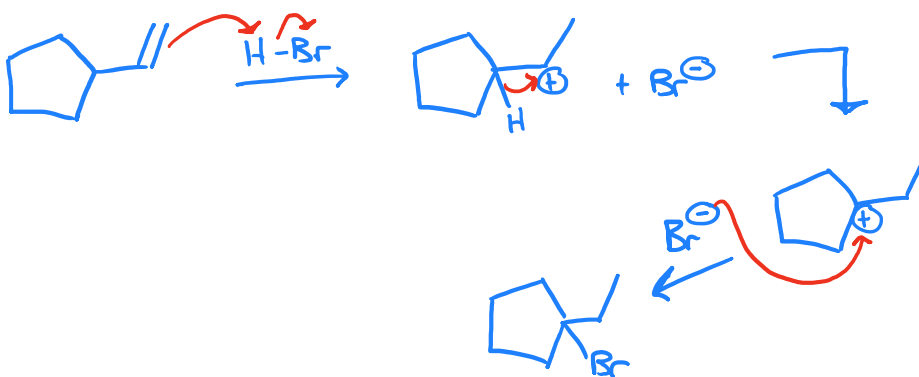
25. Draw the Newman Projection (viewing along the indicated bond) for the highest energy and lowest energy conformation of the molecule shown below. Calculate the relative energy for each conformation. (4 points)



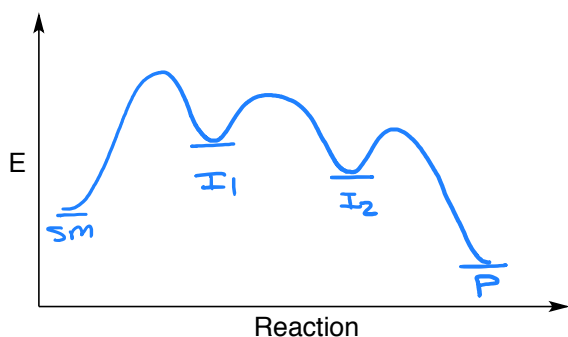
26. Predict the major product for the reaction shown below. (3 points each)



27. Provide the full electron pushing mechanism for the reaction in question 26. (5 points)

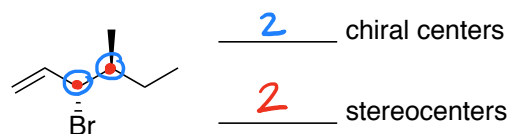
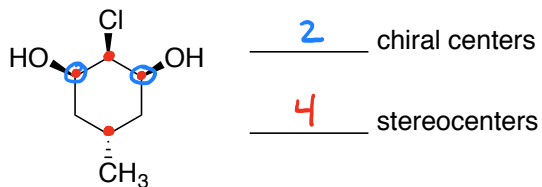


28. Draw a reaction coordinate (energy diagram) for the reaction in question 26. Label the starting material (SM), product (P), and Intermediates (I) on the coordinate. (4 points)

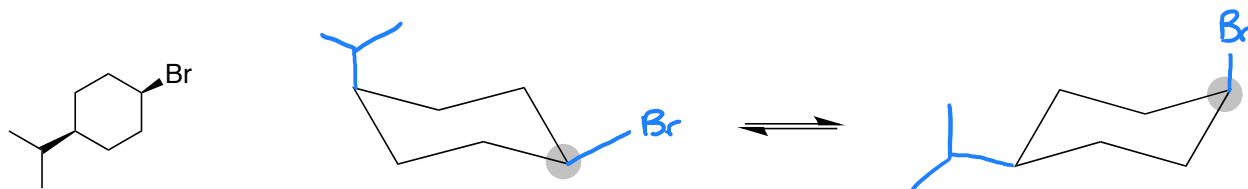


- P must be lowest E
- I_1 & I_2 must be higher E than SM
- I_2 must be lower E than I_1
- 1st step must have highest energy barrier.

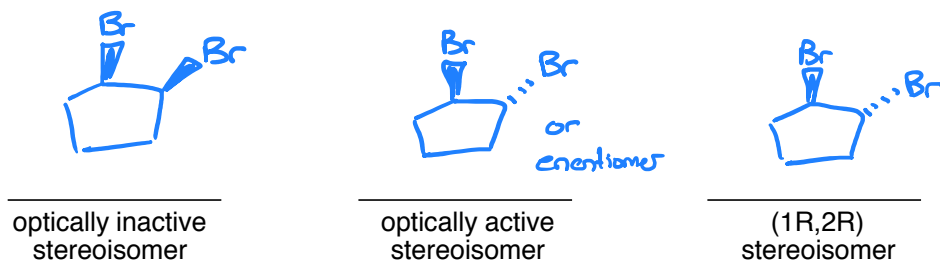
29. Determine the number of chiral centers and stereocenters in each molecule below. (4 points)



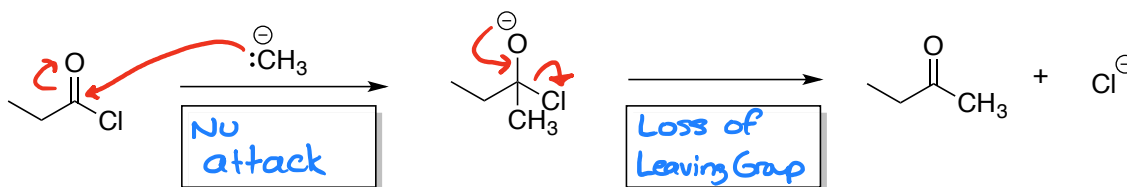
30. Draw both chair conformations for the compound shown below using the templates provided. Put the Br on the carbon highlighted with the gray circle and orient your other group based on that reference point. Circle the chair conformation that is lowest in energy. (5 points)



31. Draw the following representations of 1,2-dibromocyclopentane. (2 points each)

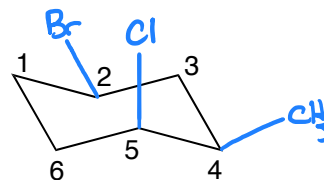


32. For the reaction mechanism shown below: 1. Draw in curved arrows to show electron flow. 2. Identify the pattern of electron flow (Nu Attack, Loss of Leaving Group, Proton Transfer, or Carbocation Rearrangement). (4 points)



33. Draw a chair conformation that meets the following criteria. (3 points)

- Axial chlorine at C5
- Equatorial methyl at C4
- Bromine on C2 that is cis to the chlorine



34. **Bonus:** The compound shown below is chiral despite having no chiral centers. This allene functional group has a central carbon with perpendicular pi-bonds. Explain why this molecule is chiral. *Hint: Don't overthink it, just think about the definition of a chiral molecule.* (2 points)

