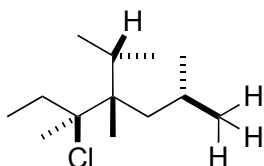


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Chemistry 236 Organic Chemistry I – Fall 2023
Practice Midterm #2

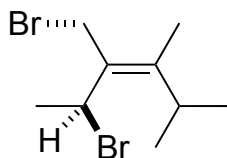
1. What is the IUPAC name for the following compounds?

a)



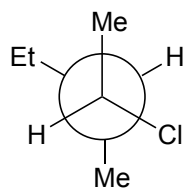
(4*S*,5*S*)-5-chloro-4-isopropyl-2,4,5-trimethylheptane

b)



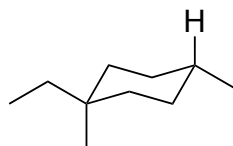
(*S*,*Z*)-2-bromo-3-(bromomethyl)-4,5-dimethylhex-3-ene

c)



(2*S*,3*S*)-2-chloro-3-methylpentane

d)

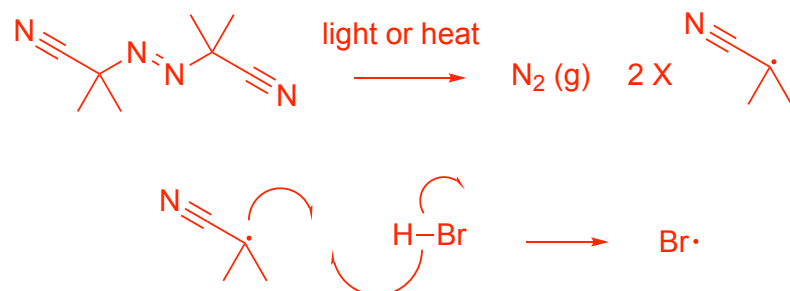


(1*R*,4*R*)-1-ethyl-1,4-dimethylcyclohexane

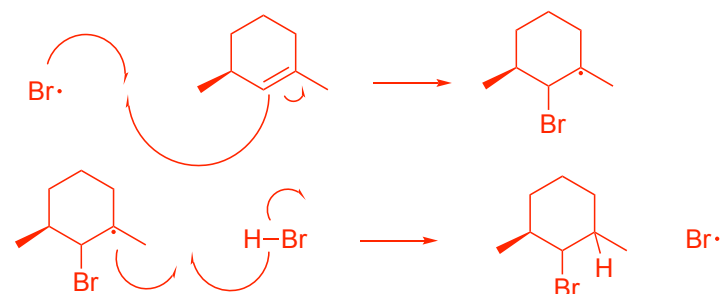
2.

a) Show the entire mechanism including initiation, propagation, and termination step for the free-radical addition of HBr to (S)-1,3-dimethylcyclohex-1-ene. You can use any initiation covered in lecture.

Initiation Step



Propagation Step



Termination Step



* one of many possibilities

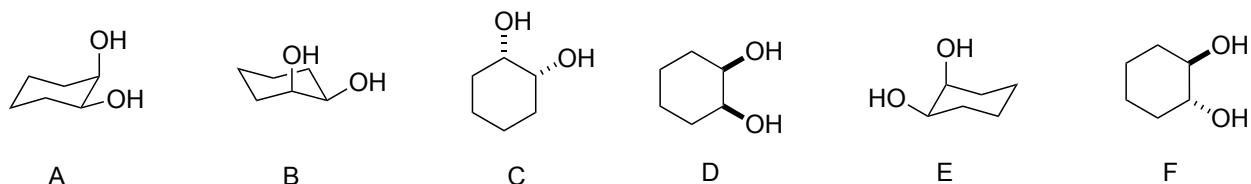
b) Indicate whether the reaction is non-stereoselective, diastereoselective, or enantioselective. Provide an explanation to support your choice.

The stereocenter remains untouched during the reaction since the radical doesn't form at the chiral center. Given that radicals are planar, the addition of bromine occurs non-stereoselectively. As a result, despite starting with a molecule that has a chiral center, the reaction proceeds without stereoselectivity at the site of bromine addition.

c) For any stereocenters that may be present, provide an R / S assignment.

The stereocenter assignment is S → (1S)-2-bromo-1,3-dimethylcyclohexane

3. Determine the relationship between the following compounds.



a) Compound A and B

Same

b) Compound B and D

Same

c) Compound E and F

Diastereomers

d) Compound B and E

Same

4. Answer the following questions using a maximum of two sentences.

a) Explain why the separation of enantiomers is typically a significant challenge.

The separation of enantiomers is challenging because they have identical physical and chemical properties in an achiral environment, making standard methods (e.g., silica gel chromatography) of separation ineffective.

b) Explain why racemic mixtures exhibit different properties compared to optically pure compounds.

Racemic mixtures differ from optically pure compounds in properties because they contain equal amounts of two enantiomers that can cancel out each other's optical activities, resulting in different interactions and behaviors in chiral environments.

c) Explain what causes an ion-induced dipole interaction.

An ion-induced dipole interaction occurs when a charged ion induces a temporary partial charge in a neighboring nonpolar molecule by distorting its electron cloud.

d) Explain how an A-value is calculated.

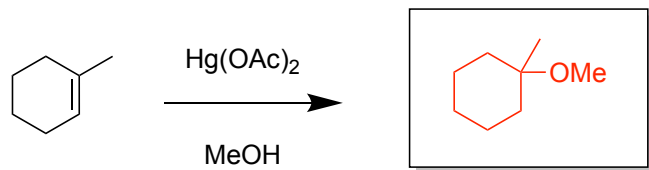
An A-value is calculated by comparing the energy difference between two conformers of a substituted cyclohexane, specifically between the axial and equatorial positions of the substituent.

e) Under what circumstance will a reaction be diastereoselective?

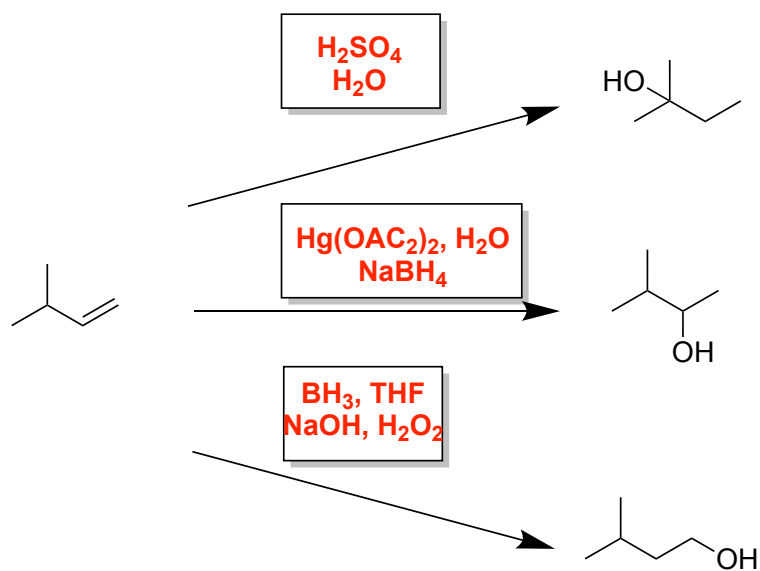
A reaction will be diastereoselective when it forms one diastereomer preferentially over another from a given starting material. This occurs when there are multiple stereocenters involved and the formation of one relative spatial arrangement of atoms (diastereomer) is energetically more favorable.

5) Predict the major product for the following reactions.

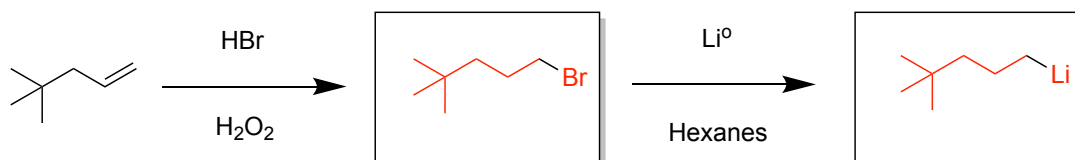
a)



b)

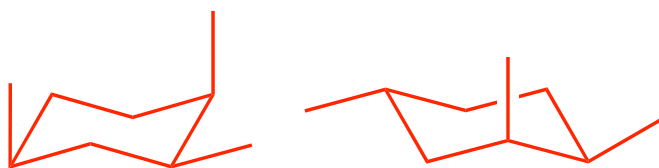
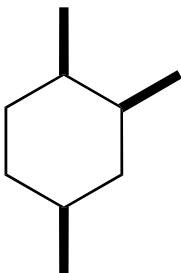


c)



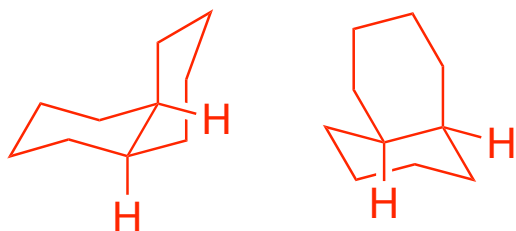
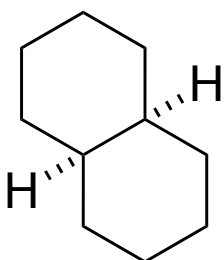
6) Convert each of the following compounds into chair form, perform a ring flip, and indicate a most stable chair.

a)



The chair on the right would be most stable because there is only one 1,3-diaxial interaction.

b)



The chair on the left is more favorable because it places more of the second cyclohexane ring into the equatorial position.