CHEM6394: Stereochemistry — Final Exam

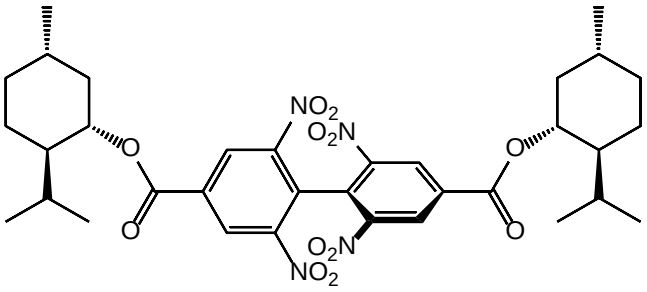
Prof. Ognjen Š. Miljanić — May 6, 2020

Name: _____ Last 4 Digits of Student ID Number: _____

(print legibly) Last First

Read all directions very carefully. Write your answer legibly in the designated spaces. Total number of points is 350. This exam is supposed to have eight (8) pages, with the last page intentionally left blank.

1. Is the molecule below chiral or achiral? Provide a detailed explanation of your answer and refer to symmetry elements (or absence thereof) that justify your answer. *50 points*

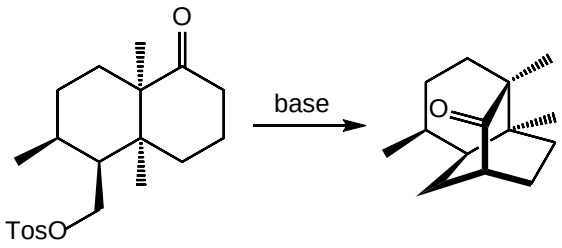


DO NOT WRITE IN THIS SPACE

FINAL SCORE

2. Provide a detailed arrow-pushing mechanism for this reaction which explains the observed stereochemistry.

50 points



3. Draw a qualitative conformational energy diagram of methylcyclohexane, keeping in mind that its two chair conformations (as well as its boat conformations) are not the same in energy. In other words, this diagram will look a bit different than the one for cyclohexane. *45 points*

4. Define, in your own words, the following terms. Be succinct but precise, and feel free to use chemical structures to illustrate your definitions. *8 × 5 = 40 points*

absolute asymmetric synthesis

parity violation

anancomeric

staggered conformation

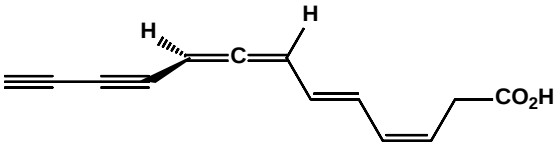
Bürgi-Dunitz trajectory

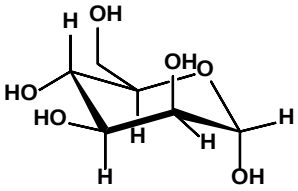
chiral auxiliary

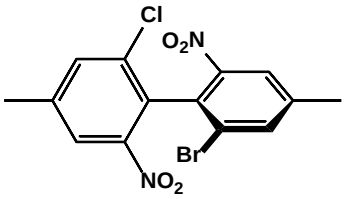
stereospecific reaction

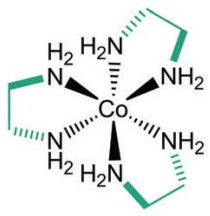
pericyclic reaction

5. Assign the configurations of the following molecules using stereochemical designators: *R*/*S*, *P*/*M*, *A*/*C*, *Δ*/*Λ*, *E*/*Z*, etc. In compounds with multiple stereocenters, assign the configuration of each one. *65 points*



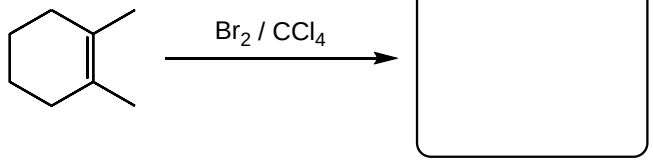


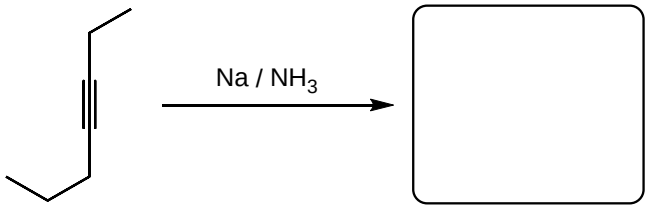


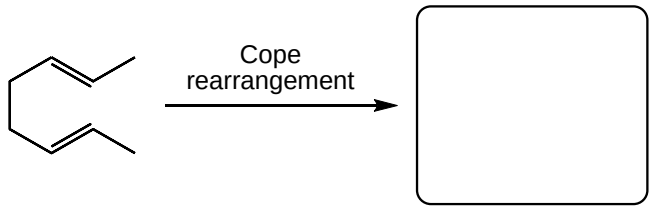


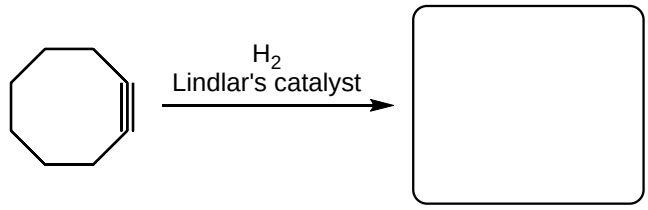
6. Draw the products of the following reactions, including a detailed representation of their stereochemistry.

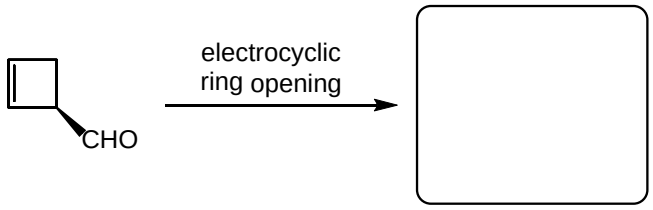
10 × 10 = 100 points

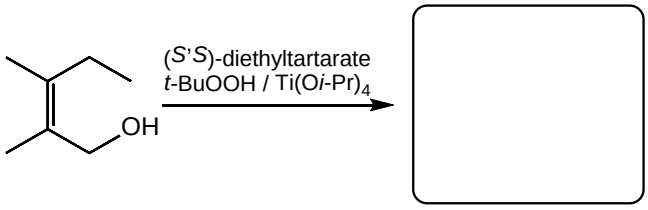


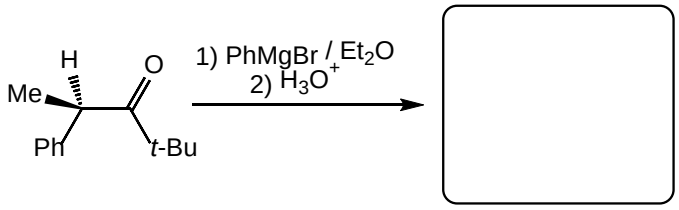


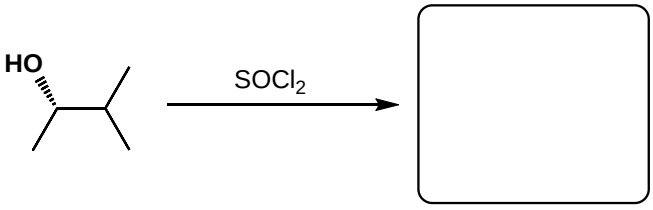


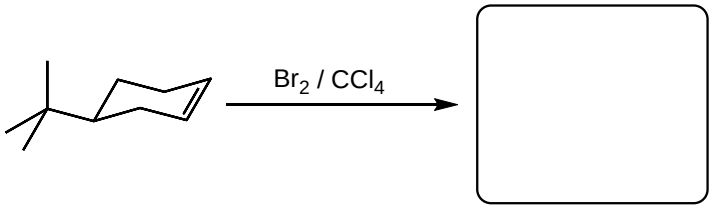












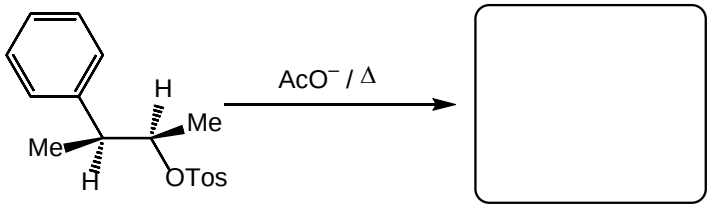


Chart for the Determination of Point Groups