CHEM6394: Stereochemistry — Second Midterm Exam

Prof. Ognjen Š. Miljanić — April 5, 2022

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

(print legibly) Last First

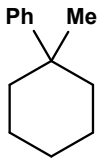
Read all directions very carefully. Write your answer legibly in the designated spaces. Total number of points is 200. This exam is supposed to have six (6) pages, with the last page intentionally left blank.

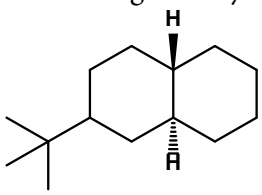
1. Draw the approximate conformational energy diagram for the rotation around the C–C bond in ethylene glycol ($HOCH_2CH_2OH$). Use Newman projection formulas to show the conformations through which the molecule goes during this rotation. *50 points*

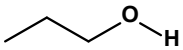
DO NOT WRITE IN THIS SPACE

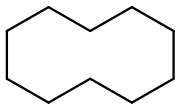
FINAL SCORE

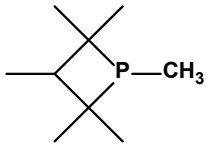
2. Draw the most stable conformations of the molecules and the radical shown below. Be very specific in highlighting the overall geometry of the molecule, bond angles, and torsional angles. *60 points*

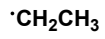












3. Draw the Δ-*mer*-λλλ isomer of $[Co((R)\text{-1,2-diaminopropane})_3]^{3+}$, showing the most stable conformation of the five-membered CoN_2C_2 ring. Be very clear with dashed, wedged, and normal lines in your structure.

30 points

4. How can you experimentally distinguish axial and equatorial hydrogens on a cyclohexane ring? Be very detailed in your explanation.

10 points

5. The *A*-value for methyl group is 1.74 kcal mol^{-1}. What percentage of methylcyclohexane has the methyl group in the axial position at 100 °C? Show your work. *20 points*

6. The barrier for the rotation around the C–N bond in amides is much higher that for the rotation around the C–N bond in amines. Why is this the case? What substituents R_1, R_2, and R_3 would you choose in the hypothetical structure below if you wanted to increase this barrier even further? 3*0 points*

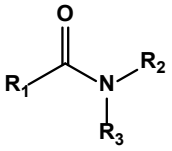


Chart for the Determination of Point Groups