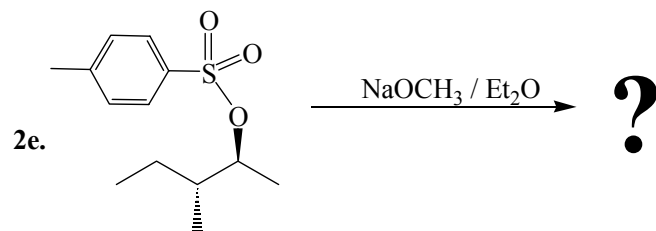
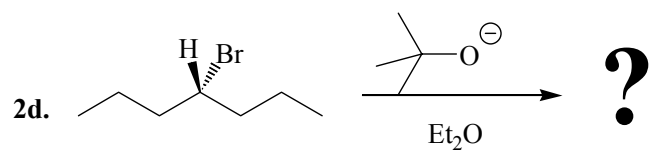
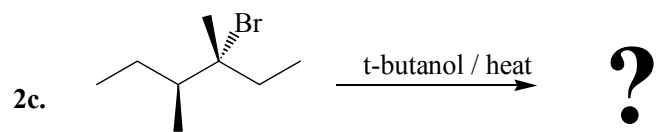
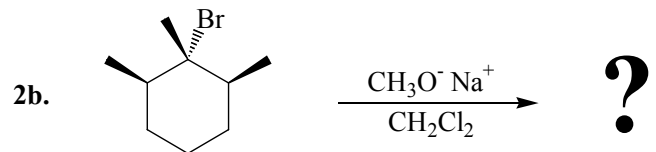
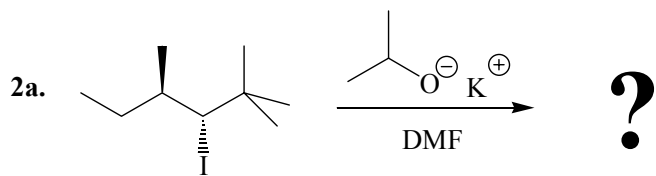


2. Consider the following reactions. Predict one major product for each reaction and explain your rationale: (35 points – 7 points for each)

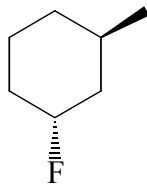


3. Consider the reaction of the stereoisomers of 3-bromo-2,2,4,5-tetramethyl hexane with t-butoxide in diethyl ether: (35 points)
- 3a. How many stereoisomers of 3-bromo-2,2,4,5-tetramethyl hexane exist? (1 point)
- 3b. Draw and name two of the diastereomers (6 points).
- 3c. For each of the two diastereomers, what product(s) is (are) formed? (6 points)
- 3d. Provide a name for each product formed. (2 points)
- 3c. Draw a mechanism for one of the reactions, including a portrayal of any relevant transition states. (8 points)

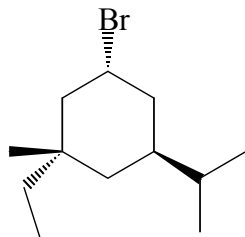
- 3d. One of the diastereomers reacts at a significantly faster rate than the other diastereomer. Predict which diastereomer reacts faster and explain. Use of appropriate energy diagrams and structures is strongly encouraged. (7 points)
- 3e. If any stereoisomer of 3-bromo-2,2,4,5-tetramethyl hexane is mixed with t-butanol and heated, only one product is formed and each stereoisomer reacts at the same rate. What is the one product (draw the structure and name it) and explain these results? Draw a mechanism(s) using an arrow-pushing formalism that helps us understand why the reaction is different than the previous example. (5 points)

4. For each of the following structures, draw the two most stable conformers and state which one is the most stable. Explain *very* briefly. (26 pts total: 4a – 4c = 6 pts; 4d = 8 pts)

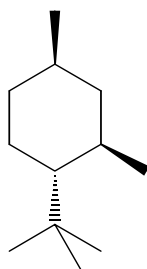
4a.



4b.



4c.



- 4d. The optical rotation of enantiomerically pure (1R, 2R, 3R) 2,4-dimethyl-1-*tert*butylcyclohexane (compound in 5c) is $+78^\circ$. A bottle of the chemical is found in the stockroom. By GC-MSD, only one peak is observed and the molecular ion peak has a mass of 168 m/z. The optical rotation of the bottle is -62° .

4d1. What is the optical purity for the substance? (2 points)

4d2. What is the major stereoisomer present (by name) and what percent of the total bottle is represented by this stereoisomer? Show your work. (6 points)