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Final Exam - Chemistry 211

Thursday, December 8, 2008 – 6:00 to 8:30 PM

Show all your work to receive partial credit. **Try to use pencil!** Browse over the whole exam and work on the questions that you feel more comfortable with first!

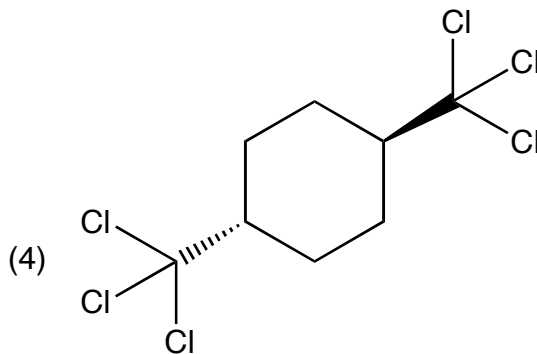
- 1) (20 points) a) Provide IUPAC names for the compounds drawn below, and draw the structures for those whose names are provided using bond-line representation. Make sure to draw the right enantiomer when the stereochemistry is specified, and provide the stereochemistry for all chiral centers on the compounds you name.

(1) (4*S*)-4-ethyl-6-propylnonane

(2)



(3) (2*S*,5*S*)-1-fluoro-2,4,4-trimethyl-5-(fluoromethyl)nonane

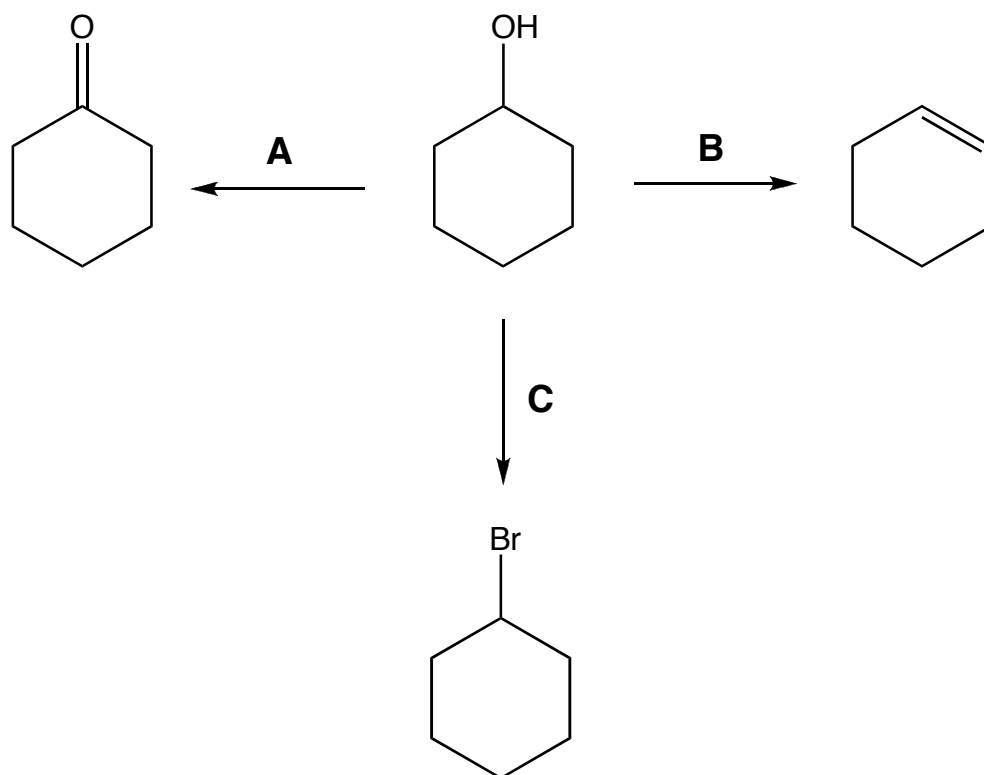


- b) Draw the Fischer projections of compounds **1** and **2**.
- c) Are there any *meso* compounds? If so, mark them clearly.

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- 2) (20 points) Alcohols are versatile precursors in organic synthesis. For example, cyclohexanol can be converted into cyclohexanone, bromocyclohexane, and cyclohexene using simple transformations:



- Provide the reagents and conditions needed to achieve these three transformations (i.e., conditions **A**, **B**, and **C**).
- Give detailed mechanisms for the conversions achieved using conditions **B** and **C** (i.e., push electrons...).

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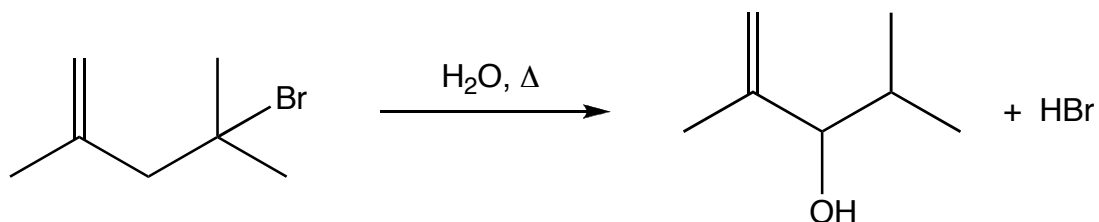
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- 3) (20 points) Nitrous sulfide, **N₂S (NNS)**, is the sulfur analog of “laughing gas.”
- Using bond-line representation, draw two resonant forms that will contribute to the structure of nitrous sulfide, and indicate clearly which one will be the major contributor. Remember to include all non-bonding electrons (i.e., don't forget the lone-pairs...), and account for the movement of electrons properly when going from one resonant form to the other.
 - Draw a detailed orbital diagram for one of resonant forms of nitrous sulfide you proposed in part (a). Make sure to place the bonding and non-bonding electrons in the proper orbitals, to label the hybridization of all the atoms, and to mark the different bonding orbitals as σ or π .

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- 4) (20 points) Aqueous solvolysis of the following tertiary haloalkene yields a secondary alkenol as the major product:

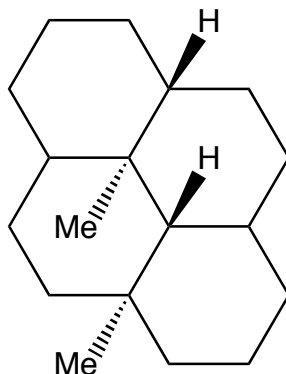


- Provide a detailed mechanism for the formation of the secondary alkenol shown above (i.e., push electrons...).
- Why is this secondary alkenol the major product? In other words, why do you obtain a secondary and not a tertiary alkenol?

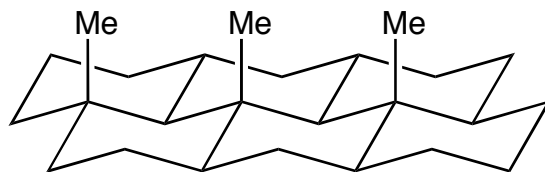
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- 5) (20 points) a) Draw a three-dimensional (3D) representation for the following fused ring system (i.e., draw it as chairs...). Pay attention to *cis/trans* fusions.



- b) For the following fused ring system presented as a 3D structure, draw it in its 2D bond-line representation. Again, pay attention to the *cis/trans* fusions.

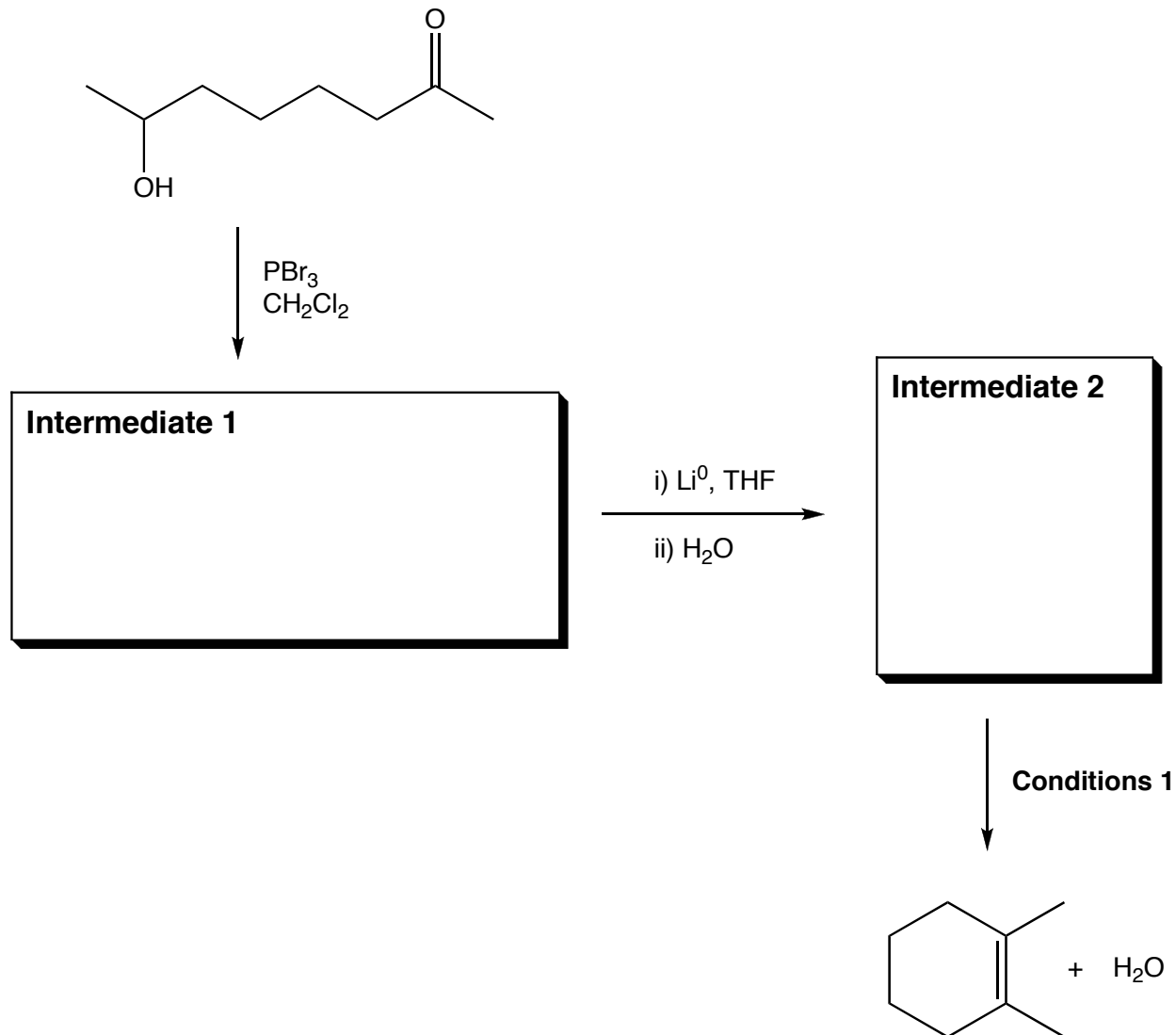


Hint: Although there are similarities between parts (a) and (b), the two molecules are not the same compound...

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6) (20 points) For the following reaction scheme:



- a) Provide the structure of all the missing intermediates and reactions conditions (reagents and/or solvents). No reaction mechanisms, just the structures and conditions. Use additional space to draw the structures if the space in the boxes is not enough.
- b) To what type of reaction do the *conditions* that you provided above correspond?

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