Name: _____

CHEMISTRY 3311, Fall 1990
Professor Walba
First Hour Exam
10/4/90

scores:

1)

2)

3)

4)

5)

_____

This is a closed-book exam. You may not use models, notes, or books. Please put all your answers on the test. Use the backs of the pages for scratch.

1) (15 pts) Draw the structure (ignoring Euclidean geometry) of each of the following compounds.

a) *tert*-butylcyclohexane

b) 4-isobutyl-2,5-dimethylheptane

c) 5-sec-butyldecane

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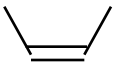
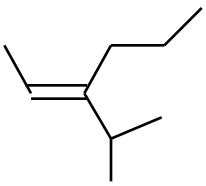
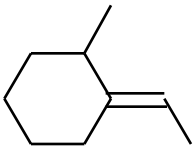
2) (20 pts) a) Carefully draw a picture of a single sp^2 hybridized carbon atom showing and naming all of the orbitals in the valence shell of the atom. In the picture, carefully show Euclidean geometry. That is, indicate the angles between the orbitals by the drawing, and also show with numbers what the angles between the orbitals are.

b) Carefully draw a picture of the structure of propylene (CH_2=CH—CH_3) showing Euclidean geometry using the wedges and dashes formalism where necessary. Show the bond angles on your drawing, and indicate which CC bond is the longer one.

3) (15 pts) Indicate the stereochemistry of each of the following alkenes using the cis/trans or E/Z system. That is, label each structure as cis or trans or E or Z.

a) 

b) 

c) 

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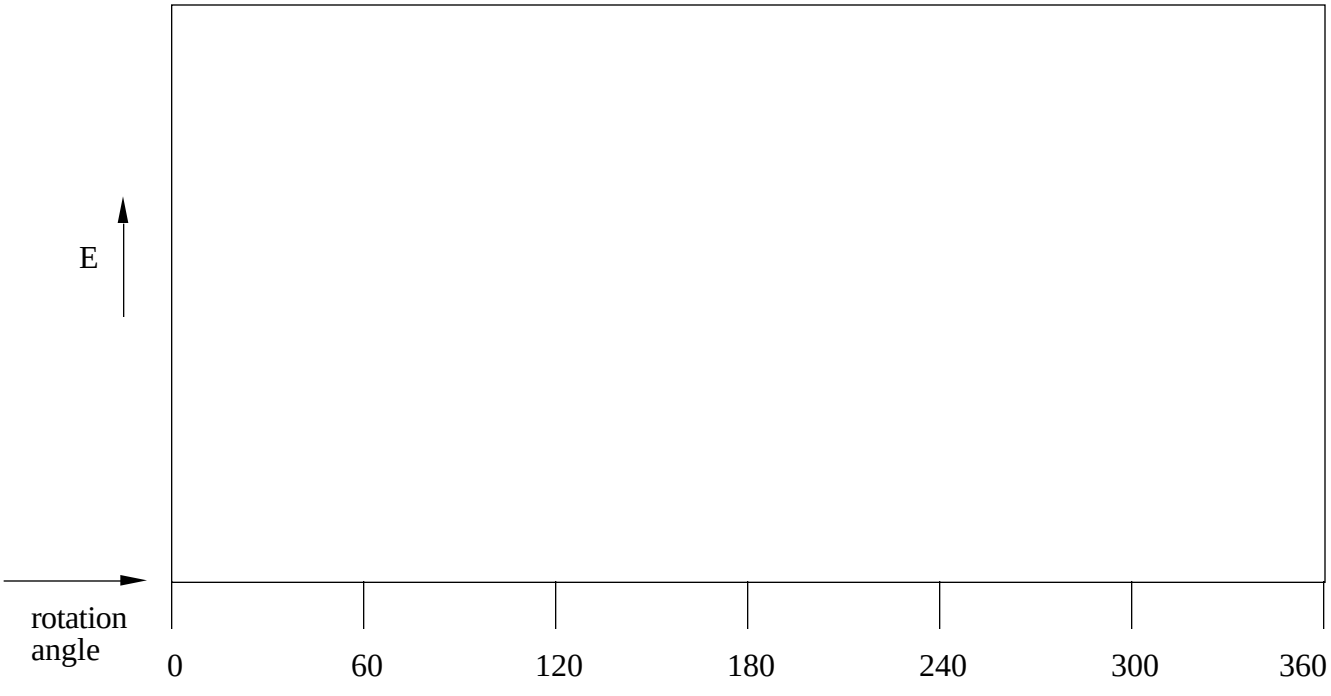
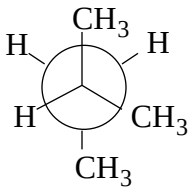
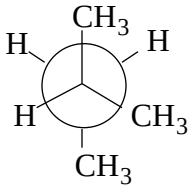
4) (25 pts) a) Draw an energy diagram showing qualitatively (that is with no numbers) the relative energies of all the conformations you get by rotating about the C2-C3 bond of 2-methylbutane, starting with the staggered conformation I've given at 0º = 360º. Draw a Newman projection for each barrier top and each well under the corresponding rotation angle.







b) Carefully draw a "wedges and dashes" structure of the 0º conformation shown. The structure should indicate the Euclidean geometry at the C2-C3 bond. The methyl groups can just be abreviated as CH_3.

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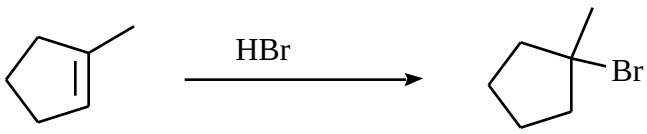
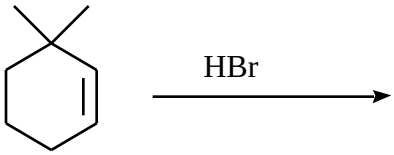
5) (25 pts) a) Give an arrow-pushing mechanism for the following reaction. Be careful to show correct structures, including formal charges, for any intermediates.



b) Predict the major product or products of the following reaction.



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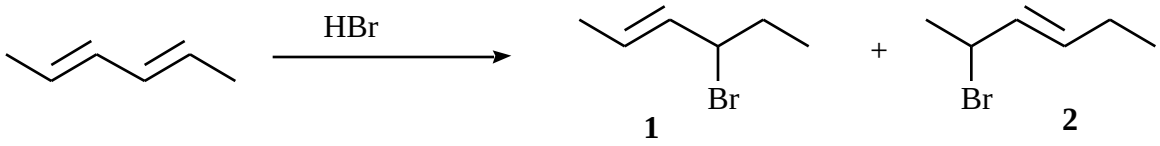
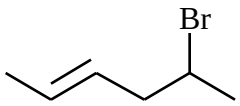
5c) Semi-tough question! In the addition of HBr to 2,4-hexadiene, <u>two</u> major products are formed (compounds **1** and **2**), and almost none of compound **3** is formed. Propose an arrow-pusing mechanism for the formation of compounds **1** and **2**, and give a very short explanation for why no **3** is formed.



1 **2**



3

None of this is formed!