Name:_____

Organic Chemistry: CHEM 331

Fall 2000 - Whittier College

Test #4

September 6, 2001

CHOOSE 3 OF 4 PROBLEMS

If you do not identify which problems you want graded you will lose 15 points automatically.

1. When racemic Z-3,5-dimethyl-4-hepten-1-ol is reacted first with Mercury Acetate in water and then with Sodium Borohydride and sodium hydroxide in water, two products are observed by NMR.

1a. Draw the reaction that is occurring. What is(are) the starting material(s) and what is (are) the reagent(s)?

1b. What type of reaction is this?

1c. What is the mechanism for this reaction?

1d. What are the products? Explain why two products are observed by NMR.

1e. If water is replaced with CH_2Cl_2 as solvent, two different products, as observed by NMR, are formed. Draw structures for these products.

2. When achiral 3,5-dimethylcyclopentene is reacted first, with diisoamylborane in tetrahydrofuran and second, with hydrogen peroxide and sodium hydroxide in water, one major product is observed by NMR.

2a. Draw the reaction(s) that is(are) occurring. What is(are) the starting material(s) and what is (are) the reagent(s)?

2b. What type of reaction is this?

2c. What is the mechanism for the first reaction? Include a drawing of any important transition states.

2d. What is(are) the major product(s) for both reactions? If you predict more than one product being formed, explain why only one product is observed by NMR.

2e. If borane is used in place of diisoamylborane, two products, one major (the same as observed above) and one minor are observed by NMR. What are the products?

2f. Explain the difference between the two reaction conditions.

3. Consider two isomers, compounds **A & B**, with molecular formula $C_{10}H_{18}$. When compounds **A & B** react with Hydrogen gas in the presence of Pd/C, 5-methylnonane is formed. When compound **A** is reacted with either hydrogen and Lindlar's Catalyst or Sodium metal in liquid ammonia, one compound, **C**, is formed with molecular formula $C_{10}H_{20}$. When compound **B** is reacted with hydrogen and Lindlar's Catalyst, one compound, **D**, is formed. When compound **B** is reacted with Sodium metal in liquid ammonia, a different compound with molecular formula $C_{10}H_{20}$, **E**, is formed. When compound **A** is reacted with diisoamylborane in tetrahydrofuran followed with hydrogen peroxide and sodium hydroxide in water, one compound, **F**, with molecular formula $C_{10}H_{20}O$ is formed. When compound **A** is reacted with mercury acetate in water, followed by reaction with sodium borohydride in water, one compound, **G**, with molecular formula $C_{10}H_{20}O$ is formed. When compound **B** is reacted with either (1) diisoamylborane in tetrahydrofuran followed with hydrogen peroxide and sodium hydroxide in water or (2), mercury acetate in water, followed by reaction with sodium borohydride in water two compounds, **G & H**, with molecular formula $C_{10}H_{20}O$ are formed.

OVERALL QUESTION: What are the structures for all lettered compounds?

Helpful Hints (no need to answer them, but you will get partial credit for showing your thoughts):

3a. What does the molecular formula of A & B tell you?
3b. Draw (represent, show, whatever will help you) each reaction that is occurring.
3c. What does each reaction of A & B tell you?

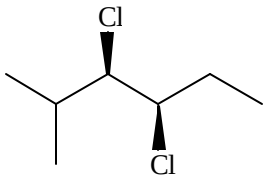
OVERALL QUESTION: What are the structures of:

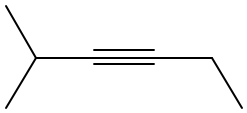
A: **B:** **C:**

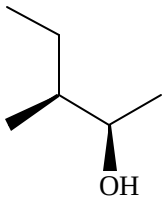
D: **E:** **F:**

G: **H:**

4. How would you make the following desired molecules from the provided starting material in the most efficient manner? Provide the important reagents. Mechanisms are not required. More than one step may be required for the given transformation. Explain whether your reaction yields any other products.

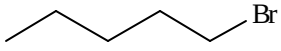
4a. 

from 

4b. 

from any alkene

4c. Achiral 1,3 dimethylcyclopentane from any alkene

4d. 

from any alkyne