Exam 3  Summer 2009

Name_______________________________________________  Seat Number_______

Student ID____________________________________________

The exam consists of 8 questions on a total of 8 pages. It will be graded out of 100 points.

1. ____/12
2. ____/20
3. ____/10
4. ____/8
5. ____/10  (plus bonus)
6. ____/20
7. ____/12
8. ____/8

Regrading: This exam must have been completed in ink to be regarded. All requests for regrades must be submitted in writing within 48 hours of the return of the exam. You must explicitly state what has been misgraded and why it is an error. The entire exam will be regraded, which could result in points being added or deducted overall.
1. (12pts) Provide a mechanism to account for the observed product.

In one sentence, describe how this mechanism explains the stereochemistry of the reaction:

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2. (20pts) Predict the major product(s) of 4 of the following 5 reactions. Include stereochemistry where important. Clearly mark the reaction you do not want graded or else the first four will be graded.

- Phenyl ether with excess HCl
- (R)-butan-2-ol with 1. NaH, 2. CH₃CH₂Br
- 2,3-dimethylcyclopentanol with Br₂, H₂O
- 2,3-dimethylcyclopentanol with POCl₃, pyr
- 3-methylpent-1-yne with excess HCl
3. (10pts) Provide a mechanism for this reaction including all arrows and intermediates.

\[ \text{OH} \quad \xrightarrow{\text{H}_2\text{SO}_4} \quad \text{CH} \]

4. (8pts) Provide reagents for this multistep synthesis.

\[ \text{HC} = \text{CH} \quad \xrightarrow{} \quad \text{Br} \quad \text{Br} \]
5. (10pts) Is the following alkene (E) or (Z)? Explain how you arrived at this conclusion.

![Alkene structure](image)

This compound can be converted to the following ethers. Provide the necessary reagents.

![Conversion](image)

Bonus: (3pts) What reagents are necessary to make this cyclic ether?

![Cyclic ether](image)
6. (20pts) Provide reagents necessary for 4 of the following 5 problems. Clearly mark the one you do not want graded or else the first four will be graded.

A.

B.

C.

D.

E.

3-methylbut-1-yne 2-methylhex-3-yne
7. (12pts) Provide reagents for these multistep syntheses.

A. \(\text{HC} \equiv \text{CH} \rightarrow \text{CH}_3\text{CH}_2\text{C} \equiv \text{C} \text{H}_3\)

B. \(\text{Cyclohexanol} \rightarrow \text{Cyclohexane with \text{Br} groups}\)

C. \(\text{Propan-1-ol} \rightarrow \text{Propyne}\)
8. (8pts) Predict the intermediates and product of this multistep synthesis.

\[ \text{HC} \equiv \text{CH} \]

1. NaNH$_2$
2. O
3. H$^+$
4. NaH
5. CH$_3$Br
6. BH$_3$ THF
7. H$_2$O$_2$, HO$^-$