

**Chem 0310, Winter/Spring, 2009**  
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**Exam 2, Monday, March 2, 10-10:55am**  
**Study Summary**

Numbers in parentheses are suggested problems from the text.

**Chapter 4: Cyclic Alkanes**

Naming and drawing cyclic alkane compounds (17-19)

Ring strain. Which ring sizes are strained? Why? (What are angle & torsional strain?)

Conformations of cyclohexane. What is chair? What is boat? Can you draw them? Energy difference between them. Consequences of chair/chair flipping. Axial/equatorial hydrogens. (22-28)

Axial and equatorial substituents. Which is favored? Why? If you are given a di- or trisubstituted cyclohexane ring, can you predict the best conformation?

Can you work comfortably with “double” Newman projections?

Stereoisomerism in rings. Cis/trans isomerism.

**Chapter 5: Stereoisomers**

What is chirality? What are stereoisomers? What is configuration?

Difference between enantiomers, diastereomers (two kinds of stereoisomers) and constitutional isomers (28-33, 46, 47)

Chiral molecules bearing one stereocenter. Can you tell if molecules are chiral or not? (Are they superimposable on their mirror images? Do they have a plane of symmetry?)

Naming chiral molecules with the R-S system (34-39, 49)

Features of enantiomers. Optical activity, specific rotation (dextro- and levorotatory), enantiomeric excess, racemic mixtures, reactions with chiral reagents, reactions with achiral reagents

Cyclic and acyclic molecules with more than one stereocenter. How many stereoisomers are possible? Can you draw the all stereoisomers for simple molecules? Can you identify meso compounds? (NOTE: We will *not* use Fischer projections this term.)

**Chapters 6: Substitution Reactions**

Names and structures of alkyl halides (27-31, 37)

Examples of S<sub>N</sub>2 reactions

Can you identify the nucleophile, electrophile, leaving group, solvent? (32)

Can you predict products from starting materials or the reverse? (34, 36, 39-41)

Features of S<sub>N</sub>2 reactions (49, 50, 52):

What makes good nucleophiles? Leaving groups?

What kinds of halides are reactive in S<sub>N</sub>2? Unreactive?

Kinetics and mechanism of S<sub>N</sub>2 (38, 51). Can you draw an energy diagram? A transition state? What are the stereochemical consequences of S<sub>N</sub>2?

Solvent effects. Polar protic and aprotic solvents.

## Chapter 7: Elimination Reactions

Features of  $S_N1$  Reactions (22-32):

Kinetics and mechanism, energy diagram, rate determining step, stereochemistry.

What makes halides reactive/unreactive in  $S_N1$ ?

Why are carbocations important in  $S_N1$ ? Structure and relative stability of carbocations

Solvent effects

Features of the E2 reaction (34-38):

Kinetics and mechanism of E2. When is E2 favored? Effects of base/halide.

Synthesis of alkenes by E2 elimination (conditions, products, mechanism).

Stereochemistry of the E2 rxn.

Factors effecting the competition between  $S_N2$  and E2 reactions. (40-44)