

Chem. 344

## Heterocyclic Compounds

Spring 09

3 credits

Dr. Griswold

Pre-requisite: one year of organic chemistry

**Class meets:** 12-12:50 MWF, SC 139

**Text:** T.L. Gilchrist, *Heterocyclic Chemistry*, 3<sup>rd</sup>. ed., Longman, 1997

**Grading:** 3 in-class exams, 25% each, net 75% of grade  
(*exams 1 and 2 have an additional take-home part 2*)

Final examination: 25% of grade.

(If the final exam grade exceeds the lowest hr. exam grade, it replaces that grade in addition to counting the usual 25%)

Exam dates: exam 1: Feb. 11 (part 2 due Feb 18)

exam 2: Mar. 20 (part 2 due Mar 27)

exam 3: Apr 24

final exam: scheduled by the Registrar.

### Course description:

A survey of major cyclic compounds containing at least one non-carbon atom. Attention will be given to synthesis, properties and reactions of heterocycles and comparison with their carbocyclic analogs, also their physiological and pharmaceutical implications.

**College outcomes:** enhancement of technical literacy, scientific reasoning, oral and written communication skills, and retrieval and analysis of technical information.

### Course objectives and desired outcomes:

The course is directed at students who plan to enter graduate work in chemistry or into careers involving pharmaceutical discovery and development. The student completing this course will gain an awareness of the major groups of heterocycles, their synthesis and chemical behavior, and their roles in medicinal chemistry. It is hoped that course participants will appreciate the vast scope and potential of heterocyclic systems, particularly as they apply to drug discovery.

**Assessment of outcomes:** through the testing sessions indicated above, and the instructor's awareness of your response to class discussions and questions.

**Attendance** and protocols: In this and all advanced courses, you are expected to attend all classes if possible. Otherwise, your comprehension of course material will be impaired.

**Practice problems:** There will be practice problems for each unit. Some of these will be assigned from the text, and some will be special handouts. Several may be selected from the current research literature. These will not be collected but may appear on quizzes or examinations, or may be the subject of class discussions. It is assumed that all students will do at least a good sampling of these problems.

**Sequence of Topics**, with reference to text pages and chapters.

(This is what we plan to cover, assuming time permits)

**text ref.**

1. **Survey of major hetero ring systems:** naming conventions  
*-a brief overview. Naming will be re-visited with each specific ring system studied.* Ch. 11
2. **Non-aromatic small hetero rings:** oxirane, aziridine, etc. Ch. 3
3. **Aromatic  $\pi$ -excessive and  $\pi$ -deficient systems:** Ch. 2  
N, O, S in 5 and 6-membered rings, fused ring compounds,  
Energies relative to benzene; predicted reactive sites.
4. **Five-membered aromatic rings with one heteroatom:** Ch. 6:  
Thiophene, furan, pyrrole sects. 1-4
5. **fused ring analogs of pyrrole, thiophene, furan:** Ch. 6:  
Indole, indoxyl, isatin, indigo dyes, benzofuran, benzothiophene sects. 5-7  
carbazole; indole alkaloids, neurotransmitters.
6. **Six-membered nitrogen heterocycles:** Ch. 5  
Pyridines, quinolines, isoquinolines, etc.; pyrylium salts.
7. **Two or more heteroatoms in the 5-membered ring:** Ch. 8  
Imidazole, benzimidazole, oxazole, thiazole, etc.
8. **Two or more nitrogens in 6-membered rings:** Ch. 7  
Purines, pyrimidines: the nucleic acid bases  
Quinoxalines, pteridines
9. **other heterocycles of current medicinal interest:** handouts  
*-selections from the chemical literature*