

# CHEMISTRY 446

## SPRING 2009 SYLLABUS

**Instructor:** Dr. Holly D. Bendorf  
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**Course Schedule:**      Lecture:    MWF 8:00 - 8:50 pm in Heim 215  
   Lab:        T 1:00 - 4:50 pm in Heim 239

### Office Hours:

I am on campus all day, Monday through Friday. If I'm not in class or at a meeting, I'll probably be in my office - feel free to drop by or send me an e-mail to make an appointment.

### Course Description:

CHEM 446, Organometallic Chemistry, explores the chemistry of compounds containing metal-carbon bonds. This course will cover the structure and bonding of organometallic compounds, reactions and reaction mechanisms, spectroscopy, and the use of organometallics in industrial processes and organic synthesis.

### Text and Materials:

- "Organometallic Chemistry" by Spessard and Miessler, Prentice-Hall, 1997.
- Bound laboratory notebook (Freeman).
- Safety glasses or goggles.

### Course Objectives:

Upon completion of this course, the student should be able to:

1. Describe the structure and bonding of organometallic compounds.
2. Characterize organometallic compounds using modern spectroscopic techniques.
3. Describe the fundamental reaction types.
4. Have an appreciation for the use of organo-transition metal chemistry in industry and in organic synthesis.

<b>Grading Criteria:</b>	Exams	200 points
	Quizzes	85 points
	Homework Assignments	60 points
	Literature Project	90 points
	Laboratory	115 points
	Final Exam	<u>150 points</u>
		700 points

Final grades are assigned based on the following scale: A 93-100%, A- 90-93%, B+ 87-90%, B 83-87%, B- 80-83%, C+ 77-80%, C 73-77%, C- 70-73%, D+ 67-70%, D 63-67%, D- 60-63%, F <60%.

Passing grades must be earned in the lab and lecture portion in order to receive a passing grade for the course.

### Exams and Quizzes:

There will be five 15-point quizzes (dates TBA) and one 10-point quiz on the transition metal region of the periodic table. Two mid-semester exams will be administered during the lab period on **Tuesday, February 17** and **Tuesday, March 31**. The final exam (cumulative) is scheduled for: **Friday, May 1 at 8:30 am**.

**Assignments:**

A portion of your grade is based on homework assignments. All assignments are due at the beginning of the class period. Late homework will not be accepted.

**Reading Assignments:**

Readings from the text and chemical literature will be assigned on a regular basis. You should complete these assignments in a timely manner as they will form the basis of our in-class discussions.

**Literature Project:**

This project is intended to help you develop your skills with respect to searching the literature, evaluating sources, synthesizing information, and giving oral presentations. For this project, you will research an organometallic reaction of synthetic or industrial importance (one that we will not cover in class), prepare an annotated bibliography of your sources, and give an oral presentation on the reaction. Additional details on the project will be given in class.

**Due dates:**

List of articles chosen	Friday, February 13
Annotated bibliography	Friday, February 27
Outline of presentation	Wednesday, March 18
Draft of PowerPoint slides and list of questions	Monday, April 6
Formal presentation	Tuesday, April 14

**Extra Credit:**

Extra credit points can be used to increase the final grade in the course by  $\frac{1}{2}$  of a grade (i.e. from a B+ to an A-). Extra credit is capped at 15 points and can be earned by attending departmental colloquia (three points per colloquium). If you have a work or school conflict that prevents you from attending colloquium, please see me to discuss other extra credit options.

**Attendance:**

Regular attendance at lecture and laboratory sections is required and expected. Missing more than three lectures for any reason will result in a 3-point deduction per absence. Attendance at quizzes, exams and laboratory meetings is mandatory. Make-ups are not permitted unless the absence is due to a significant illness or family emergency that can be documented (such as by notification from the Dean's office).

**Academic Honesty:**

Be aware that in accordance with the College's policy on academic honesty, any work you turn in must be your own. Significant penalties will be applied to any instances of plagiarism. Plagiarism includes, but it not limited to:

- copying or allowing another student to copy homework assignments
- copying or allowing another student to copy responses on a quiz or an exam
- misrepresenting the ideas or words of another as your own (this includes failing to cite a source *or* closely paraphrasing a cited source).

**Laboratory:**

The laboratory grade is worth a total of 115 points and is comprised of four lab write-ups, the ferrocene prelab assignment and a lab technique evaluation (10 points). The lab technique grade is based on the following criteria: preparation for lab, safety in the laboratory, ability to work efficiently in the laboratory, ability to successfully complete experiments, and laboratory hygiene.

Lab Schedule: Please note that the lab schedule is tentative and subject to change.

Date	Experiment	Assignments/Reports Due:
Jan. 13	Check-In	
Jan. 20	Synthesis of Metal Nitrosyls, IR	Preparation for Ferrocene Lab (10 pts)
Jan. 27	Synthesis of Ferrocene	
Feb. 3	Ferrocene IR, NMR Jacobsen's Catalyst Part 1: Preparation of a Diastereomeric Salt	Nitrosyl (R&D, 15 pts)
Feb. 10	Literature Search (meet at library classroom - 3:00 pm)	
Feb. 17	<b>Exam 1</b>	
Feb. 24	Part 2: Synthesis of Jacobsen's Ligand	Ferrocene (R&D, experimental, 25 pts)
Mar. 3	Spring Break!	
Mar. 10	Part 3: Synthesis of Jacobsen's Catalyst IR, mp, $[\alpha]_D$ of ligand	
Mar. 17	Part 4: Enantioselective Epoxidation	
Mar. 24	Chromatography of Epoxide Product	Jacobsen Parts 1-3 (R&D, exptl., 25 pts)
Mar. 31	<b>Exam 2</b>	
Apr. 7	Characterization of Epoxide Product: IR, $[\alpha]_D$ , NMR and NMR with Chiral Shift Reagent by appointment	
Apr. 14	Oral Presentations	
Apr. 21	Check out	<b>Due Friday, April 24:</b> Jacobsen Pt. 4 (Intro., R&D, exptl., 30 pts)
	Final Exam: <b>Friday, May 1. 8:30 am</b>	

Lab Safety: Unsafe behavior in the lab will not be tolerated and violations will be penalized. Keep in mind that lab safety includes laboratory hygiene. In the event that common areas are left dirty, (rotovaps, balances, melting point apparatus, reagent hood) points may be deducted from the entire class. If you have any questions regarding lab safety, please do not hesitate to ask.