

**CHEM 345 Organic Chemistry I**  
**SUMMER 2015**

**Instructor:** Dr. Cliff Berkman, Fulmer 477

**Prerequisite:** A letter grade of C or better in Chem 102 or 106 or the equivalent course transfer.

**Contacting Instructors and TAs:** We will be using Blackboard Learn as our course website. All instructors and TAs can be contacted via BB Learn email. Please put "chem 345" in the subject field of the email.

**Office Hours:**

- Dr. Berkman: M/T/W/R 10:15-11:15 am.
- TAs office hours are held in Fulmer 401 as well as CUE tutoring center. A schedule will be posted on the course website as well as on the door to Fulmer 401 no later than the first week of class.

**Class Meeting:**

- Lecture: MTWR 9:00-10:15 Fulmer 201
- Lab: W/R 2:00 pm in Fulmer 438 beginning June 10th.

**Course Website:** All course material is on our website at:

- <http://learn.wsu.edu>
- In addition, we have a course Facebook group page at: <http://www.facebook.com/groups/chem.345>

**Required Course Materials:** This term will use Bruice's Organic Chemistry (7<sup>th</sup> edition) with Mastering Chemistry for online homework. There are three options:

- 1) You may purchase the book and Mastering Chemistry access for \$149.00 at Crimson & Gray or \$160.70 at the Bookie.
- 2) Crimson & Gray also provides a textbook rental option with Mastering access code for \$99.00. Be aware of the rental term is for a single semester.
- 3) For those of you with a laptop or third or fourth generation iPad (those with retina displays) you may opt for the eBook and Mastering Chemistry access for \$100.00 at Crimson and Gray or \$109.30 at the Bookie. Please be aware that if you select this option, the only tablet that displays the eBook well is an iPad with retina display. Laptops all work but Android devices shrink the size of the text so it requires magnification and thus is not easy to read.
- 4) You may also purchase Mastering Chemistry with or without the eBook when you register through Blackboard Learn. **Know your Pearson ID**
  - a. The cost is \$90.00 Mastering Chemistry with the eBook or,
  - b. \$66.00 for Mastering Chemistry without the eBook.

*Mastering Chemistry* is necessary for whatever option you select. Mastering Chemistry support can be found at <http://247pearsoned.custhelp.com/>. In addition, WSU is a priority customer so you have access to phone tech support at 855-875-1797. **If you contact support let your agent know you use Modified Mastering that is connected to BlackBoard Learn.**

- 5) You will need an **organic molecular model kit**. These can be very expensive, so be careful. A cheap model kit is [http://www.darlingmodels.com/Individual-Orders-Molecular-Model-Kits/KIT-3-ISBN-978-09648837-4-1-MOLECULAR-VISIONS-Organic-Kit/prod\\_7.html](http://www.darlingmodels.com/Individual-Orders-Molecular-Model-Kits/KIT-3-ISBN-978-09648837-4-1-MOLECULAR-VISIONS-Organic-Kit/prod_7.html) Model kits can also be purchased on eBay or Amazon for a reasonable price. It is essential you have a model kit before the first exam.

**Course Objectives and Description:** Students completing Chem 345 will be able to

- 1) Rationalize molecular reactivity based on functional groups,
- 2) Master the foundational knowledge necessary for success in Chem 348,
- 3) Master simple laboratory methods dealing with compound separation, identification, and synthesis, and
- 4) Safely manipulate chemical compounds and understand chemical hazards in the laboratory.

*Lecture Course Description:* The Chem 345 curriculum is based on the “survey of functional groups” approach to teaching organic reactions and mechanisms. Each week we will be exploring a different type of organic compound. Please consult the lecture topic outline section of the course web site and keep up with reading and homework.

*Lab Course Description:* Chem 345 has a laboratory component that meets once per week for 3 hours. In order to pass the course, you must complete and pass all of the labs. You are not required to purchase any lab manuals as all printed materials are freely available on the course website. You are required to purchase a lab coat as well as goggles.

You must complete and turn in all of the labs in order to pass this course. Failure to turn in a lab report at the end of the term will result in an automatic **failing grade**. Lab attendance is mandatory. If you miss a lab, there will be 1 make-up session at the end of the term; **you may make up a maximum of two labs**. If you miss more than two labs during the semester without an excellent reason, you will automatically **fail the course**. If you cannot attend lab, you must contact your TA before the scheduled lab time.

All labs must be turned in directly to your TA the week following their completion. Your TA will sign the report acknowledging receipt and Andrea or the Organic Stockroom staff will date-stamp them.

- **Early Policy:** You will receive 0.25 points **EXTRA CREDIT** for each day you turn in your lab prior to the due date (maximum of 1 point per lab). If you wish to turn in a lab early, give it to your TA directly or Andrea/Organic Stockroom staff in 435 from 10-4 pm, Monday-Thursday (closed Fridays).
- **Late Policy:** There is none. It has been superseded by the *Early Policy* (see above). Labs turned in after the due date will be scored as a 0 (zero) and counted as a completed lab and **cannot be made up**. If no stockroom personnel are present to accept your lab, drop it through the mail slot on the door to Fulmer 435A.

#### **Student Learning Outcomes:**

- Use chemical acid/base reactivity to predict chemical equilibrium.
- Describe chemical reactivity in terms of organic functional group chemistry, including functional group transformation.
- Interpret structural changes within a chemical framework considering bond making and bond breaking.
- Propose reasonable mechanisms that convert starting materials to product
- Interpret stereochemical data that informs a mechanistic hypothesis.
- Plan an organic synthesis using a retrosynthetic approach based on known chemical reactions.
- Develop skill in safe chemical handling, measurements, experimental technique, and simple synthesis.

**Assignments & Grading Policy:** This course will be graded on the basis of homework, 3 midterm exams, a comprehensive final exam, and lab.

*Homework:* We will be using Mastering Chemistry for online homework this term. All assignments will be accessible through Blackboard Learn and count at 10% of your grade.

*Midterm exams:* Three hourly exams will be administered to assess subject mastery. Prior semester exams are provided on the course website. Exams are cumulatively comprehensive but will focus on most recent material. Each midterm exam is 15% of your grade. If you miss a midterm exam, your final will count at 40%

*Final exam:* A two-hour mandatory final exam will be administered at the end of the course. The final exam is worth 25% of your grade.

*Lab:* Completing all labs is required to pass this course and will count at 20% of your grade.

**Assessment:** Student Learning Outcomes 1 and 2 will be assessed entirely using hand-graded exams. We do not use multiple choice exams so we can assign partial credit for reasonable answers. Any chemical separations theory necessary to Student Learning Outcome 3 will also be assessed using exams. The remainder of outcomes 3 and 4 will be assessed by graded lab reports.

**Grade Scale:** This course will use the following grade scale. This scale may change slightly from year-to-year.

		B+	86-88	C+	77-79	D	61-68
A	92-100	B	83-85	C	72-76	F	<60
A-	89-91	B-	80-82	C-	69-71		

**Grade Summary:** The breakdown for each of graded component is show below, along with their weight in percentage. A **sample calculation** is also provided.

		<b>sample calculation</b>					
<i>graded components</i>	<i>weight</i>	score	x	weight	=	weighted score	
homework	10%	70	x	0.10	=	7	
test 1	15%	67	x	0.15	=	10.1	
test 2	15%	72	x	0.15	=	10.8	
test 3	15%	62	x	0.15	=	9.3	
final	25%	75	x	0.25	=	18.8	
lab	20%	92	x	0.20	=	18.4	
	100%	sum					<b>74.4</b>

In the sample calculation above, the composite score of **74.4** would round to 74 and correspond to a **letter grade of C** according to the grade scale.

We do not give make-up exams. If you miss one hourly exam, the final exam will increase to 40% of your course grade. To pass this course, you must complete all of the labs. If you miss a lab, there will be make-up times available.

**Test Schedule:** All tests are held during regularly schedule lab times. Early and late exams are not possible, however, if you are off campus due to a university sponsored event, you may arrange for an academic counselor to proctor the exam. You must make these arrangements within the week of the semester. If you miss an hourly exam, the final exam will count at 45%. All exams are held in Fulmer 438 at 12:00 pm.

- Test 1: Thursday June 18
- Test 2: Thursday July 2
- Test 3: Thursday July 16
- Comprehensive Final Exam: Thursday July 30

**Test Policy & Regrades:** Bring only your **student ID, a molecular model kit, and pencils** to the exams. You will be provided scratch paper. You may not bring any electronic or internet connected device to the exam. Doing so will not only waste your valuable exam time, but will result in a **failing grade** and be interpreted as a **breach of academic integrity** and will be reported.

Once exams have been graded, you may **pick them up from the stockroom**. Look over the exam carefully and make sure the points have been added correctly.

If you find an error or have a question about the grading of the exam, return it to the stockroom attendant with a regrade request form attached (you can get these from the stockroom or on the course website) – we will not re-grade an exam once you remove it from the stockroom. Be very clear when completing the regrade form. For example, “there is an error in my total points” or “on question 2, I drew the correct intermediate structure....” Avoid requests that include “I feel as if I deserve more points.”

**Lecture Schedule:** Slides are posted on the course website that will guide you through the material. **Test 1** will cover chapters 1-4; **Test 2** will cover chapters 5-8; **Test 3** will cover chapters 9-12; and the **Final Exam** will cover all prior chapters in addition to chapters 16-19.

**Lecture Topics:** Given that we will only cover selected sections in the required textbook, the following map is provided. It is extremely important that you follow this map when studying for this course. Sections that we will not cover will be explicitly listed below. In addition, we will not cover all reactions listed in each section, therefore a reactions list will be provided by chapter to help you focus on the necessary functional group transformations. Lecture slides will be available for download on the course website.

**Chapter 1 – Remembering General Chemistry: Electronic Structure & Bonding.** This chapter should be review from general chemistry.

Section 1.1 Pay attention to the definition of isotopes.

Section 1.3 is a particularly important review

Section 1.4 reviews how to draw Lewis structures and determine formal charge. This task is required throughout the semester on both homework and exams.

Section 1.6-1.15 will be thoroughly reviewed in lecture

**Chapter 2 – Acids & Bases: Central to Understanding Organic Chemistry.** Much of the information in this chapter is a review of concepts presented in general chemistry. It is essential that you develop a command of acid/base chemistry.

Section 2.10 will be covered in a worksheet lab

Section 2.11 may be ignored

**Chapter 3 – An Introduction to Organic Compounds: Nomenclature, Physical Properties, & Representation of Structure**

Section 3.15 may be ignored

**Chapter 4 – Isomers – The Arrangement of Atoms in Space.** This chapter is made difficult because of the need to recognize three dimensional arrangements of atoms. On every exam, you will be allowed to use your model kit.

Sections 4.10, 4.15, & 4.16 may be ignored

**Chapter 5 – Alkenes: Structure, Nomenclature, & an Introduction to Reactivity.** We will deal very qualitatively with the concepts presented in this chapter. You will not be required to perform any calculations.

**Chapter 6 – The Reactions of Alkenes: The Stereochemistry of Addition Reactions**

Sections 3 6.3, 6.7, 6.8, 6.14, 6.16, & 6.17 may be ignored

**Chapter 7 – The Reactions of Alkynes: An Introduction to Multistep Synthesis**

Sections 7.5, 7.6, 7.7, 7.8, & 7.12 may be ignored

**Chapter 8 – Delocalized Electrons & Their Effect on Stability, pKa, & the Products of a Reaction**

Sections 8.11, 8.12, 8.14, 8.18, 8.19, 8.20, & 8.21 may be ignored

**Chapter 9 – Substitution Reactions of Alkyl Halides**

Sections 9.7 & 9.9 may be ignored

**Chapter 10 – Elimination Reactions of Alkyl Halides: Competition Between Substitution & Elimination**

**Chapter 11 – Reactions of Alcohols, Ethers, Epoxides, Amines, & Thiols**

Sections 11.8, 11.10, & 11.12 may be ignored

**Chapter 12 – Organometallic Compounds**

Only Section 12.1 will be covered. Sections 12.2-12.5 may be ignored.

**Chapter 16 – Reactions of Carboxylic Acids & Carboxylic Derivatives**

Sections 16.18, 16.22, & 16.23 may be ignored

**Chapter 17 – Reactions of Aldehydes & Ketones: More Reactions of Carboxylic Acid Derivatives. Reactions of  $\alpha,\beta$ -Unsaturated Compounds**

Sections 17.5, 17.6, 17.8, 17.9, 17.11, 17.14, 17.15, 17.16, & 17.17 may be ignored

**Chapter 18 – Reactions at the  $\alpha$ -Carbon of Carbonyl Compounds**

Sections 18.5, 18.7, 18.8, 18.21, & 18.22 may be ignored

**Chapter 19 – Reactions of Benzene & Substituted Benzenes**

Sections 19.10, 19.11, 19.17, 19.18, 19.20, 19.21, 19.22, 19.23, 19.24, & 19.25 may be ignored

**Students with Disabilities:** Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations **MUST** be approved through the Access Center. For more information contact a Disability Specialist

**Academic Integrity:** You are encouraged you to work with classmates on assignments, however, **each student must turn in original work**. No copying will be accepted. Falsified lab data is also a violation of academic integrity. **Students who violate WSU's Standards of Conduct for Students will receive an F as a final grade in this course**, will not have the option to withdraw from the course, and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions. In addition, if during an exam you use an internet connected or other electronic devices, you will fail the exam and be reported as described above.

**Safety Statement:** Washington State University is committed to enhancing the safety of the students, faculty, staff, and visitors. It is highly recommended that you review the Campus Safety Plan (<http://safetyplan.wsu.edu/>) and visit the Office of Emergency Management web site (<http://oem.wsu.edu/>) for a comprehensive listing of university policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community.