Syllabus for CHM 2440-001<br>Organic Chemistry I<br>Spring Semester, 2010

Course Description: CHM 2440 is the first semester of the year-long course in organic chemistry. After a brief review of some general chemistry, the principles of organic chemistry will be introduced. The structure, physical properties, and nomenclature of alkanes, alkenes, alkynes, and alkyl halides will be covered, along with the reactions of these compounds and the mechanisms necessary to explain the reactions. The theory and application of IR and ${ }^{1} \mathrm{H}$ NMR spectroscopy in organic chemistry will also be discussed. The course is assigned 3 hours of credit.
There is a companion laboratory course (CHM 2445) that is meant to accompany this lecture, and concurrent enrollment is required for Chemistry majors.
Prerequisite: CHM $(1410,1415)$ or $(1510,1515)$.
Course Goals: (1) Learn the basic principles of organic chemistry, and develop critical thinking methods for evaluation of the properties and reactions of organic compounds.
(2) Encourage awareness of the role of organic chemistry in everyday life.
(3) Encourage independent learning and interest in organic chemistry.

Lectures: Monday, Wednesday, Fridays at 10:00-10:50 A.M. in Physical Sciences Building Room 4020
Instructor: Dr. Ed Treadwell Office: Physical Sciences Building Room 4450
Phone: 581-6229 E-mail: emtreadwell@eiu.edu
Office Hours: Monday 1-2 pm, Tuesday noon-1 pm, Wednesday 9-9:50 am, 11 am-noon Other hours as available or by appointment.
Materials: "Organic Chemistry", $6^{\text {th }}$ edition by L. G. Wade, Jr.
"Solutions Manual for Wades's Organic Chemistry" by Jan Simek
Additionally, an organic model set is strongly suggested.

## Blank Exams/Quizzes, Keys, and Daily Problems: Available on WebCT page (CHM2440EMT)

## Course Policies:

(1) Textbook reading assignments and homework problems are listed on page 4 of this syllabus. Although homework will not be collected or graded, the homework is important to your understanding and mastery of the material. Quizzes and exams will contain problems that are similar to homework material.
(2) Attendance is not recorded or evaluated for grading purposes, but you are strongly encouraged to attend all classes. It is expected that while attending you will be respectful and attentive, and that your cell phone is OFF.
(3) You are responsible for all announcements made during class, whether you are present or not.
(4) Absences and Makeup Exams
A. Absences for Medical Reasons

If you are absent for a quiz or exam because you were sick, you may take a makeup quiz or exam if you provide an excuse that is written and signed by a medical official.
B. Absences for Athletic Reasons

If you must be absent for a quiz or exam because of required travel with an university athletic team, contact me in advance and plan to take the quiz or exam at a suitable time.
C. Other Absences - Absences due to emergency reasons only will be judged on a case-by-case basis. Lack of a valid reason for an absence will result in a zero score on the quiz or exam that was missed.
(5) Quizzes will be given roughly every week. Only your best 10 quiz scores will be included in your quiz total for the final grade. Collectively the quizzes count for $15 \%$ of your final grade, or the equivalent of an exam.
(6) There are four 50 minute exams to be given over the semester. On every exam, you are responsible for all material covered previously in the course.
(7) There is a comprehensive final exam that is worth $25 \%$ of the course grade.
(8) If you have a documented disability and need to discuss academic accommodations, please contact Dr. Treadwell as soon as possible.
(9) All aspects of the student conduct code are expected to be followed.

## Possible Points:

| Source | Points |
| :---: | :---: |
| 10 Quizzes @ 10 points each | 100 |
| 4 Exams @ 100 points each | 400 |
| Comprehensive Final Exam | 150 |
| Total Points | 650 |

## Grades:

Initially, the normal grading scale ( $\mathrm{A}=90 \%+$, $\mathrm{B}=80-89 \%$, $\mathrm{C}=70-79 \%$, $\mathrm{D}=60-69 \%, \mathrm{~F}=>60 \%$ ) will be employed. IF necessary, a curve will be applied relative to the overall class performance where the minimum percentage for an A is less than $90 \%$, and the remaining grade percentages are adjusted downward to maintain a $10 \%$ range between each letter grade. Only the total points will be curved, so that individual quizzes and exams will not receive a letter grade. The curve will be recalculated after every exam, and will be posted outside my office. After the fourth exam but before the final exam, the curve will be adjusted for the last time, so that you will know exactly how many points are needed to obtain your desired grade.
By way of example, last year's final curve is given below. Note that the curve in this class may be higher than the one below.

$$
100-86 \%=\mathrm{A} \quad 85-76 \%=\mathrm{B} \quad 75-66 \%=\mathrm{C} \quad 65 \%-56 \%=\mathrm{D}
$$

below 56\% = F

## Note Regarding 2840:

CHM 2440 is the first semester of a year-long course in organic chemistry, and the material you learn in this course will carry over into next semester in CHM 2840. In CHM 2840, there will be no formal review of the important concepts learned in CHM 2440, and you will be expected to be able to apply what you learned this semester in CHM 2440 to quiz/exam problems in CHM 2840. Thus it is very essential that you not only pass this course, but learn and understand the material in this course in order to pass CHM 2840.
The Department has adopted the prerequisite of a grade of "C" or better in CHM 2440 in order to take CHM 2840, and this policy will be enforced.

## Succeeding:

This material will most likely seem very strange to you at the beginning (it did to me when I first took organic chemistry), but hopefully as the course progresses you will come to understand and appreciate the material. After the first two weeks, it will be very different from your general chemistry courses - and it will be nearly impossible to do well by "coasting by". The material will change quite a bit from exam to exam, so just because you did well on the first exam does not necessarily mean you will do well on the remaining exams. This course will move at a fairly rapid pace (we will cover over 375 pages of reading material in only 15 weeks), and it is important that you keep up with the material as much as you can. I encourage you not to simply memorize the material, but to understand it and see how it relates to what we've already learned - believe it or not, there are only a few underlying principles you need to understand to do well in organic chemistry. Do not be afraid to ask questions in class or to stop by my office - I enjoy it when visitors come to my office (unless they are with the IRS). Don't get frustrated or stuck over certain points - be sure to ask for help when needed. I want to see all of you do well in this course. GOOD LUCK!!

Top 10 Suggestions for doing well in CHM 2440:

1. Keep up with the material as much as possible. Falling behind can be fatal to your grade. Reading the appropriate portions of the chapter before the lecture will significantly enhance your understanding of the lecture material.
2. Read the chapters with no distractions (TV, radio, noisy roommates, etc..), concentrating on the text and concepts.
3. Try to find ways of organizing the material, looking for common trends and/or using memnonics.
4. Work out the homework problems assigned. If you do not have sufficient time to work all the problems assigned, try one of each type of question.
5. When working the homework problems, first try to solve the problems WITHOUT looking at the solutions guide. If you are absolutely stuck, consult your notes. Then compare your answers to the solution guide, and make sure you understand any mistakes you made. You will not really be helping yourself any by "doing the problems along with the study guide".
6. When a quiz is returned to you, look to see where you lost points and review those items that you missed. Ask if you are unsure of why credit was lost on a question. If you can do well on the quizzes, you will do well on the exams.
7. When studying for an exam, review the quizzes leading up to the exam - including the questions that you did not answer. Print out or copy the blank practice exams and try them, and then compare your answers to the answers posted in the keys. Study the things you did not do well on, and then retake the practice exam.
8. Seek help when you don't understand a concept - this can be from the tutoring service or from me either during office hours or at other arranged times. I want you to do well in this course.
9. For understanding stereochemistry, a molecular model set will be extremely helpful.
10. When we get to discussing reactions, flash cards with the starting materials on the front side and the products on the back side can be helpful.

| Jan. | Approximate Class Schedule for CHM 2440 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 1.1-1.8 Atomic Structure, Bonding |  | 1.9-1.10 | $\begin{aligned} & \text { Resonance, Structural } \\ & \text { formulae } \end{aligned}$ | 1.11-1.14 | Acid/Base chemistry <br> Quiz 1 | 15 |
|  | NO CLASS |  | 2.1-2.4 M | MO Theory, <br> Hybridization | $\begin{aligned} & 2.52-2.7 \\ & 2.8-2.11 \end{aligned}$ | Bond Rotation, 3D Isomerism, Polarity Quiz 2 | 22 |
|  | 12.2-12.14 Functional Groups 12.1-12.6 IR Spectroscopy |  | $\begin{aligned} & 12.7-12.12 \\ & 3.1-.3 .2 \end{aligned}$ | 2 IR Spectroscopy  <br>  27  <br>  Alkanes  <br>  Quiz 3  | 3.3 Nom | enclature of Alkanes | 29 |
| Feb. | 3.4-3.6 Physical Properties, Reactions Quiz 4 |  | 3.7-3.8 | Conformational <br> Analysis (Newman) | 3.9-3.13 | Cyclic Alkanes Quiz 5 | 5 |
|  | $\begin{gathered} \text { EXAM I } \\ \left(\text { Ch. } 1,2,3^{*}, 12^{*}\right) \end{gathered}$ |  | 3.14-3.16 | Conformational Analysis (Chairs) Quiz 5 | NO CLASS |  |  |
|  | 5.1-5.3 Chirality, <br> R/S Nomenclature |  | 5.4-5.9 Optical Activity <br> Quiz 6 <br>  17 <br>   |  | 5.11-5.13 | Diastereomers, Meso Cpds | 19 |
|  | 5.14-5.16 <br> 5.10 <br> Fischer Projections |  | 4.1-4.7 Free-radical halogenation Quiz 7 |  | 4.6-4.10 | Thermodynamics | 26 |
|  | 4.11-4.14 Kinetics, Transistion States, Reactive Intermediates | 6.1-6.6 Properties and Prepn. of Alkyl Halides Quiz 8 |  |  | $\begin{aligned} & \text { EXAM II } \\ & \text { (Ch. } \left.\mathbf{3}^{*}, 4,5\right) \end{aligned}$ |  |  |
| Mar. | 6.7-6.9 $\mathrm{S}_{\mathrm{N}} 2$ Reactions |  | 6.10-6.14 $\mathrm{S}_{\mathrm{N}} 1$ Reactions <br> Quiz 9 $1^{10}$ |  | 6.15-6.18 $\quad \mathrm{S}_{\mathrm{N}} 1$, E1 Reactions ${ }^{12}$ |  |  |
|  |   22 <br> 6.19-6.21 <br> 7.1-7.5 E2 Reactions  <br> Nomenclature of   <br> Alkenes   |  | 7.6-7.7Stability, Properties of <br> Alkenes <br> Quiz 10 |  | 7.9-7.11 $\quad$ Preparation of Alkenes ${ }^{26}$ |  |  |
|  | 13.1-13.7 NMR Spectroscopy ${ }^{29}$ |  |    <br> 13.8-13.10 Splitting  <br> 13.12-13.14 ${ }^{13} \mathrm{C}$ NMR  <br>  Quiz 11  |  | 8.1-8.3 Addition of HX to Alkenes |  |  |
| Apr. | 8.4-8.7 Addition of $\mathrm{H}_{2} \mathrm{O}$ to Alkenes |  | 8.8-8.11Addition of $\mathrm{X}_{2}$ and $\mathrm{H}_{2}{ }^{7}$ <br> to Alkenes <br> Quiz 12 |  | $\underset{(C h . ~ 6,7,13)}{\text { EXAM III }}$ |  |  |
|  | 8.12-8.14 Epoxidation and Hydroxylation of Alkenes |  | 8.15 Cleavage of alkenesQuiz 13 |  | $8.16 \quad \begin{gathered}\text { Polymerization of } \\ \text { Alkenes }\end{gathered}$ |  | 16 |
|  | 9.1-9.6 Structure and Properties of Alkynes |  | 9.7-9.8 Acetylides, Prepn of Alkynes Quiz 14 |  | 9.9-9.10 Addition to Alkynes ${ }^{23}$ |  |  |
|  | 12.13-12.15 Mass Spectrometry Quiz 15 |  | EXAM IV <br> (Ch. 8,9,12*) |  | Review 30 |  |  |

[^0]Final Exam is Tuesday May $4^{\text {th }}$ at $10: 15$ a.m. (sharp)

# Reading and Suggested Homework Problems from Wade's "Organic Chemistry" <br> CHM 2440 <br> Organic Chemistry I <br> Spring 2010 

| Chapter | Reading* | Suggested Homework Problems** |
| :---: | :---: | :---: |
| , | 1.1-1.14 |  |
| 2 | 2.1-2.11 | $\begin{array}{\|l} \hline \text { 2.2a; 2.3; 2.5a,b,d,e,g; 2.7; 2.8; 2.10; 2.11; 2.14a,b,c,g,h,m; 2.15; 2.16- } 2.18 ; 2.22 \\ \text { 2.24; 2.26; 2.28; 2.29; 2.32; 2.35; 2.37; 2.39; 2.40; } 2.41 ; 2.42 ; 2.44 \\ \hline \end{array}$ |
| 12 | 12.1-12.2 | $\begin{aligned} & 12.1-12.6 \\ & 12.14-12.16,12.25-12.28 \end{aligned}$ |
| 3 | 3.1-3.8 | $\begin{array}{\|l\|} \hline \text { 3.2; 3.3; 3.4; 3.5b; 3.6; 3.9; 3.9; 3.11; 3.12 } \\ \text { 3.33a,b,d; 3.34a-e; 3.37a-d; 3.39a-d; 3.40; } 3.42 \end{array}$ |
|  |  |  |
| 3 | 3.9-3.16 | $\begin{array}{\|l\|} \hline \text { 3.14; 3.15; 3.16; 3.18; 3.19; 3.22; 3.25; 3.27; 3.28; } 3.30 \\ \text { 3.33c,e; 3.34f-1; 3.37e-h; 3.39e-f; 3.44; 3.46 } \\ \hline \end{array}$ |
| 5 | 5.1-5.16 | $\begin{aligned} & \hline \text { 5.1; 5.2; 5.5; 5.6; 5.7; 5.9; 5.13; 5.16; 5.17; 5.20; 5.22; } 5.23 \\ & \text { 5.26; 5.27; 5.28a,c,d; 5.30; 5.34; 5.37; } \\ & \hline \end{aligned}$ |
| 4 | 4.1-4.14 | $\begin{aligned} & 4.2 ; 4.5 ; 4.74 .10 ; 4.13 ; 4.15 ; 4.16 ; 4.19 ; 4.21 ; 4.22 ; 4.28 ; 4.29 ; 4.30 ; 4.32 \\ & 4.35 ; 4.38 ; 4.40 ; 4.41 ; 4.43 ; 4.45 ; 4.46 ; 4.48 ; 4.50 ; 4.54 ; 4.55 ; 4.56 \end{aligned}$ |
|  |  |  |
| 6 | 6.1-6.21 | $\begin{array}{\|l} \hline 6.2 ; 6.3 ; 6.4 ; 6.5 ; 6.6 ; 6.7 ; 6.9 ; 6.12 ; 6.14 ; 6.15 ; 6.16 ; 6.17 ; 6.19 ; 6.21 ; 6.23 ; 6.24 ; \\ \text { 6.25; 6.26; 6.27; 6.33; 6.37; 6.38; 6.40 } \\ \text { 6.42; 6.43; 6.44; 6.45; 6.46; 6.47; 6.49; 6.51; 6.53; 6.54; 6.56; 6.58; 6.60; 6.62a; 6.66; } \\ \text { 6.72 } \end{array}$ |
| 7 | 7.1-7.11 | $\begin{aligned} & \hline 7.2 ; 7.4 ; 7.5 ; 7.6 ; 7.7 ; 7.8 ; 7.10 ; 7.12 ; 7.13 ; 7.15 ; 7.16 ; 7.19 ; 7.23 ; 7.24 b ; 7.25 b ; 7.27 \\ & 7.31 ; 7.32 ; 7.33 ; 7.37 ; 7.38 ; 7.41 ; 7.43 ; 7.46 ; 7.47 ; 7.48 ; 7.51 ; 7.53 \\ & \hline \end{aligned}$ |
| 13 | 13.1-13.14 | ```13.1; 13.2; 13.3; 13.5; 13.6; 13.7; 13.9; 13.11; 13.18; 13.23; 13.24; 13.25; 13.29; 13.30 13.33; 13.34; 13.35; 13.36; 13.37; 13.39; 13.40; 13.45; 13.47; 13.48``` |
| 8 | 8.1-8.16 | 8.1; 8.2; 8.3a; 8.4; 8.6; 8.8; 8.9; 8.10; 8.14; 8.15; 8.16; 8.17; 8.18; 8.21; 8.23; 8.26; 8.28; 8.29; 8.32; 8.34; 8.35; 8.36; 8.37; 8.39; 8.42; 8.43 8.47; 8.48a-е; 8.49; 8.51; 8.52; 8.55; 8.58; 8.59; 8.60; 8.61; 8.63; 8.64; 8.65; 8.67 |
| 9 | 9.1-9.10 | 9.2; 9.4; 9.5; 9.7; 9.8; 9.10; 9.13; 9.14; 9.16; 9.18; 9.20; 9.21 9.27; 9.29; 9.31; 9.32; 9.33; 9.34; 9.35; 9.36; $9.37 ; 9.42$ |
| 12 | 12.13-12.15 | $\begin{aligned} & 12.9 ; 12.10 ; 12.11 \\ & 12.17 ; 12.18 ; 12.20 ; 12.22 ; 12.23 \end{aligned}$ |

* refers to the section numbers as given in the text.
** the problems in italics are found in the chapter text, the problems in plain text are at the end of the chapter


[^0]:    * denotes the entire chapter will not be covered on the exam.

