Course Information

Course Director:
Tom Hummel
7 Chem Annex
333-9111
tjhummel@illinois.edu

Required Materials:

A. Chemistry 104 Lecture/Quiz
   Chemistry by Steven Zumdahl, 8th ed.
   Partial Solutions Guide for Chemistry by Hummel, Zumdahl and Zumdahl
   Calculator

B. Chemistry 105 Lab
   Chemistry 105 Experiments Book, 2011-2012
   Bound Laboratory Notebook with duplicate pages
   Usage Fee Card
   Safety Goggles
   Safety Apron

Grading: 2 Hour Exams 300 points
         Final 300 points
         Quizzes 200 points
         Lab Separate Grade for Chem 105

Raw grades will be scaled to 90-100 = A, 80-89 = B, 70-79 = C, 60-69 = D, < 60 = F. At the end of the semester, scaled grades will be totaled. To receive an A in the course, students must have 720 total scaled points (90%) of the 800 total points. The other grade cut-offs are 640 points (80%) for a B, 560 points (70%) for a C and 480 points (60%) for a D. With the plus/minus grading system, the grade cut-offs will be set so that 100-93.0 = A, 92.9-90.0 = A-, 89.9-87.0 = B+, 86.9-83.0 = B, 82.9-80.0 = B-, 79.9-77.0 = C+, 76.9-73.0 = C, 72.9-70.0 = C-, 69.9-67.0 = D+, 66.9-63.0 = D, 62.9-60.0 = D- and below 60.0 = F. Note: Grading in Chem 105 will be discussed during Check-In, 9 am Tuesday, June 12 in 101 Chem Annex. The lab schedule for Chem 105 is attached.

There will be no make-up exams, quizzes, or labs. The grade for an excused absence will be pro-rated. The grade for an unexcused absence will be zero.
Course Format:

Lecture and quiz sections will meet four times a week. In lecture, material from the text and other resources will be presented and homework problems assigned by Tom Hummel. In quiz sections, a TA will answer questions about lecture material, work homework problems and examples, and give weekly quizzes. Selected homework problems will be collected and graded each week. The quiz TA's will also review material before exams. Chem 105 labs will meet once or twice a week. As in Chem 103, lab reports will be turned in at the end of the lab period.

NOTES:

1. The discipline of chemistry and this course in particular demand that you take responsibility for your own learning. Major learning takes place during study and problem solving; the instructors are here to guide your efforts, but you must supply the initiative and hard work.

2. This is going to be a fast-paced course. Normally the course is fifteen weeks, but we shall be going through roughly the same material in eight weeks.

3. There will be four lectures and four quiz sections each week for Chem 104, and zero, one or two labs (three hours each) per week for Chem 105. The lectures will be at 1 p.m. in 112 Chem Annex (M-Th). The quiz sections will be at noon (M-Th) in either 203 Noyes Lab (section AQ1) or 204 Noyes Lab (section AQ2). The labs will be from 9-11:50 a.m. in 101 Chem Annex on Tu and/or Th.

4. Attendance is very important in all facets of the course. One of the easiest ways to learn is to pay attention in lecture and quiz and take good notes. Also, grades of zero are assigned when labs and/or quizzes are missed without a good excuse. These have a real and adverse effect on semester grades.

5. The daily assignments for the semester are outlined at the end of this introductory information. Most of the assigned homework problems are from the Zumdahl text; some are from separate handouts which will be distributed during the first day of class. In general, the reading assignment for that day should be done before lecture and the problems assigned attempted before quiz section the next morning. Attempt to solve all the assigned problems, as most will emphasize different perspectives on a topic. In quiz, the TA will take questions on the previous night's assignment. Selected assigned homework problems will be collected. The grade on homework will be worth two quizzes. All homework assignments designated as Handouts (H) and all even numbered assigned Zumdahl problems will be the problems collected. The assignments are contained in this handout. The assigned Review Questions in the For Review section at the end of each chapter in the Zumdahl text will not be collected. These assigned Review Questions are for your use to make sure you understand some of the major topics covered in that chapter.
For the first two weeks of class, most of the assigned homework problems are contained in a separate handout. This handout will be distributed in class. Homework problems for the remainder of the course will be mostly from the Zumdahl text. These handout problems will be collected by your TA and graded for part of your overall grade.

The Partial Solutions Guide provides detailed answers to the odd numbered questions and exercises from the text. Solutions to the assigned homework problems not solved for you in the Partial Solutions Guide are available in the Learning Center (212 CA) for you to reference.

6. Most topics covered will be introduced in lecture. However, new material will also be covered in quiz section. You are responsible for all material covered in lecture and in quiz section.

7. A typical quiz section will start with a question/answer period on the assigned homework of the previous day and on lecture material. Next, new material will be introduced. Once or twice a week the TA will give a 20 point quiz. The quizzes will cover material gone over in lecture and in quiz section. 10 or 11 quizzes will be given during the summer. The grade in quiz section will consist of the top eight quizzes (two or three quizzes will be dropped) and the homework grade (equivalent to two quizzes).

8. It will be difficult to follow quizzes, lectures and Chem 105 lab if you do not do your assignments regularly.

9. The Chemistry Learning Center, 212 CA, houses the computer terminals for the interactive video labs as well as tutoring facilities. At certain times, Chemistry 104 TAs and Chemistry 105 TAs are "on call" to answer questions and/or assist with problem solving; their office hours will be Monday and Wednesday in 212 CA (specific times to be announced). The Learning Center hours will be announced.

10. If you have difficulty with any part of the course, see me (Tom Hummel) or your TA promptly. My office hours are (in 7 Chem Annex):

    Monday, 11-12 a.m. and Wednesday, 2-3 p.m.

    or by appointment. If I am temporarily unavailable, e-mail me (tjhummel@illinois.edu) or call me (333-9111) and I will get in touch with you.
## COURSE OUTLINE

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week 1</strong></td>
<td></td>
</tr>
<tr>
<td>6/11</td>
<td>Equilibrium and Thermodynamics Review</td>
</tr>
<tr>
<td>6/12</td>
<td>Electrochemistry, Galvanic Cells</td>
</tr>
<tr>
<td>6/13</td>
<td>Electrochemistry, Nernst Equation</td>
</tr>
<tr>
<td>6/14</td>
<td>Electrolytic Cells, Corrosion</td>
</tr>
<tr>
<td><strong>Week 2</strong></td>
<td></td>
</tr>
<tr>
<td>6/18</td>
<td>Introduction to Acids and Bases, pH Scale</td>
</tr>
<tr>
<td>6/19</td>
<td>Calculating the pH of Acids and Bases</td>
</tr>
<tr>
<td>6/20</td>
<td>Salts, Polyprotic Acids, Properties of Oxides</td>
</tr>
<tr>
<td>6/21</td>
<td>Buffers</td>
</tr>
<tr>
<td><strong>Week 3</strong></td>
<td></td>
</tr>
<tr>
<td>6/25</td>
<td>Titrations</td>
</tr>
<tr>
<td>6/26</td>
<td>Titrations</td>
</tr>
<tr>
<td>6/27</td>
<td>Catch-up and Review</td>
</tr>
<tr>
<td>6/28</td>
<td>Hour Exam I (noon in 112 Chem Annex)</td>
</tr>
<tr>
<td><strong>Week 4</strong></td>
<td></td>
</tr>
<tr>
<td>7/2</td>
<td>Kinetics</td>
</tr>
<tr>
<td>7/3</td>
<td>Kinetics</td>
</tr>
<tr>
<td>7/4</td>
<td>No Class</td>
</tr>
<tr>
<td>7/5</td>
<td>No Class</td>
</tr>
<tr>
<td><strong>Week 5</strong></td>
<td></td>
</tr>
<tr>
<td>7/9</td>
<td>Kinetics</td>
</tr>
<tr>
<td>7/10</td>
<td>Bonding Review</td>
</tr>
<tr>
<td>7/11</td>
<td>Intermolecular Forces and Liquids</td>
</tr>
<tr>
<td>7/12</td>
<td>Introduction to Organic Chemistry, Alkanes</td>
</tr>
<tr>
<td><strong>Week 6</strong></td>
<td></td>
</tr>
<tr>
<td>7/16</td>
<td>Alkenes, Alkynes, Isomerism</td>
</tr>
<tr>
<td>7/17</td>
<td>Reactions of Alkenes, Aromatics</td>
</tr>
<tr>
<td>7/18</td>
<td>Alcohols</td>
</tr>
<tr>
<td>7/19</td>
<td>Ethers, Aldehydes, Ketones</td>
</tr>
</tbody>
</table>
Week 7
7/23 Carboxylic Acids, Amines, Carboxylic Acid Derivatives
7/24 Catch-up and Review
7/25 Hour Exam II (noon in 112 Chem Annex)
7/26 Amino Acids

Week 8
7/30 Polymers
7/31 Polymers
8/1 Catch-up and Review
8/2 Reading Day

8/3 or 8/4 FINAL EXAM TBA
ASSIGNMENTS, SUMMER 2012

**Date**

6/11  **Equilibrium and Thermodynamic Review**  
Reading:  
Z: 13.1-13.5; 17.1-17.9  
Problems:  
Z: 13: 28, 30, 33, 37, 47, 63, 67  
17: 51, 57, 60, 64, 69  
R: 13: 3, 5, 6; 17: 7, 8

6/12  **Redox Review, Galvanic Cells, Standard Cell Potentials**  
Reading:  
Z: 4.9; 18.1-18.3  
Problems:  
Z: 18: 15, 17, 21, 22, 35, 37, 39, 41, 43, 44, 53, 54, 57, 59  
R: 18: 2, 3

6/13  **Electrical Work, Nernst Equation, Concentration Cells**  
Reading:  
Z: 18.4-18.5  
Problems:  
R: 18: 4, 5, 6, 7

6/14  **Corrosion, Electrolysis**  
Reading:  
Z: 18.7-18.9  
Problems:  
R: 18: 8, 9, 10

6/18  **Introduction to Acids and Bases, pH Scale**  
Reading:  
Z: 14.1-14.3, 14.6, Appendix A1.2  
Problems:  
R: 14: 2-4

6/19  **Calculating the pH of Acids and Bases**  
Reading:  
Z: 14.4-14.6, 14.12, Appendix A1.4  
Problems:  
R: 14: 5, 6

6/20  **Salts, Polyprotic Acids, Properties of Oxides**  
Reading:  
Z: 14.7, 14.8, 14.10  
Problems:  
Z: 14: 25, 30, 32, 104, 107, 111, 113-115, 117, 119-121, 125, 131, 132, 147, 151, 158, 173  
R: 14: 7-9

**Notes:**  
Z = Zumdahl, 8th Edition  
R = Review Questions (not collected)  
(only evens collected)
**Date**

6/20  Salts, Polyprotic Acids, Properties of Oxides
Reading: Z: 14.7, 14.8, 14.10
Problems: Z: 14: 25, 30, 32, 104, 107, 111, 113-115, 117, 119-121, 125, 131, 132, 147, 151, 158, 173
R: 14: 7-9

6/21  Buffers
Reading: Z: 15.1-15.3
R: 15: 1-4

6/25  Titrations
Reading: Z: 15.4
*For Exercises 15.55 and 15.92, only calculate the pH at 0.0, 10.0, 12.5, 20.0, 25.0, and 30.0 mL of NaOH added, then sketch the titration curve.
R: 15: 5-7

6/26  Titrations
Reading: Z: 15.4
Problems: Z: 15: 12, 13, 50, 54*, 57*, 59, 62
*For Exercises 15.54 and 15.57, only calculate the pH at the initial, half-way, and equivalence points, then sketch the titration curves.
R: 15: 8

6/27  Catch-up and Review

6/28  Hour Exam I – noon in 112 Chem Annex

7/2  Introduction to Kinetics, Rate Laws
Reading: Z: 12.1-12.3
Problems: Z: 12: 15, 17, 21, 24, 27, 30, 32, 85, 95
R: 12: 1, 3

7/3  Integrated Rate Laws
Reading: Z: 12.4
Problems: Z: 12: 14, 33-37, 41-43, 48-52
R: 12: 2, 5, 6

7/4  No Class

7/5  No Class

7/9  Collision Model, Activation Energy, Catalysts
Reading: Z: 12.6-12.7
Problems: Z: 12: 12, 13, 19, 57-60, 70, 98
R: 12: 9, 11
Date

7/10     Mechanisms
   (noon)   Reading:   Z:  12.5, lecture handouts
   Problems:   Z:  12:  53-56
              R:  12:  7, 8
              Handout Problems (Due at noon, 7/11)

7/10     Bonding Review
   (1pm)   Reading   S:  1,2
   Problems   Z:  8.1-8.3, 8.9, 8.10, 8.12, 8.13 (Review)
              Z:  9.1 to p. 410, 9.5
              H:  1.1:  All
              Z:  9:  9, 12, 17-22, 37, 59, 61, 68
              R:  9:  1-3, 10

7/11     Intermolecular Forces and Liquids
   Reading   Z:  10.1, 10.2, 10.8, 10.9
   Problems   Z:  10:  5, 20, 21, 25, 32, 35, 37, 38, 39,
                   93, 101-107, 111, 113, 117, 126
                   R:  10:  1, 2, 3, 9, 10, 11

7/12     Introduction to Organic Chemistry, Alkanes
   Reading   S:  3, 4, Appendix A
   Problems   Z:  22.1
              H:  1.2:  All
              Z:  22:  1, 5, 15, 16, 45
              R:  22:  1

7/16     Alkenes, Alkynes, Isomerism
   Reading   S:  5, 6, 9
   Problems   Z:  22.2
              H:  1.3:  All
              Z:  22:  33, 34, 41, 42, 104, 153
              R:  22:  2, 6

7/17     Reactions of Alkenes, Alkynes, Aromatics
   Reading   S:  5
   Problems   Z:  22.2-22.3
              H:  1.4:  All
              Z:  22:  46, 61-64
              R:  22:  3, 4

7/18     Alcohols
   Reading   S:  7
   Problems   Z:  22.4
              H:  2.1:  All
              R:  22:  8

S = 104 Summer Syllabus Lessons
Z = Zumdahl–8th Edition
   (only evens are collected)
H = Extra Problems handout (all are collected)
R = Review Questions in Zumdahl (not collected)
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/19</td>
<td>Ethers, Aldehydes, Ketones</td>
<td>S: 8</td>
<td>Z: 22.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 2.2: All</td>
<td>Z: 22: 114, 150</td>
</tr>
<tr>
<td>7/23</td>
<td>Carboxylic Acids, Amines, Esters</td>
<td>S: 8</td>
<td>Z: 22.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 2.3: All</td>
<td>Z: 22: 4, 6, 9, 67-70, 118-120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R: 22: 5, 7</td>
</tr>
<tr>
<td>7/24</td>
<td>Catch-up and Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/25</td>
<td>Hour Exam II (noon in 112 Chem Annex)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/26</td>
<td>Amino Acids and Proteins</td>
<td>S: 13</td>
<td>Z: 15.4 (Review)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z: 22.6 (pp 1033-1035)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S: pp. 126-127: 7(a-c), 8(a-c)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z: 15: 49, 103</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H: 2.4: All</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z: 22: 85, 87, 89, 93, 135</td>
<td></td>
</tr>
<tr>
<td>7/30</td>
<td>Polymers</td>
<td>S: 9</td>
<td>Z: 22.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z: 22: 11, 71-74, 76-78, 124-128</td>
<td></td>
</tr>
<tr>
<td>7/31</td>
<td>Polymers, Properties</td>
<td>S: 10</td>
<td>Z: 22.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z: 22: 7, 10, 79-81, 130</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>R: 22: 9</td>
<td></td>
</tr>
<tr>
<td>8/1</td>
<td>Catch-up and Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/2</td>
<td>Reading Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/3 or 8/4</td>
<td>Final Exam (TBA)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LABORATORY SCHEDULE
CHEMISTRY 105
SUMMER 2012

Week

6/12  CHECK-IN  (The lab room is 101 Chem Annex.)

6/14  Experiment:  Reversible Reactions and Chemical Equilibria

6/19  Experiment:  Electrochemical Cells

6/21  NO LAB

6/26  Experiment:  Determination of Percent Acetylsalicylic Acid in Aspirin

6/28  NO LAB

7/3   NO LAB

7/5   NO LAB

7/10  Experiment:  Kinetics of Chemical Reactions

7/12  NO LAB

7/17  Experiment:  Geometry of Hydrocarbons

7/19  NO LAB

7/24  Experiment:  Reactions of Organic Functional Groups

7/26  Check-out

Don’t forget to do the Interactive Video Lessons. The deadline for all IVLs to be completed is noon, July 31.