Course Information

Course Director:
Tom Hummel
367D Noyes Lab
333-9111
tjhummel@illinois.edu

Required Materials:

A. Chemistry 104 Lecture/Quiz
   Chemistry by Steven Zumdahl, 9th ed.
   Partial Solutions Guide for Chemistry by Hummel, Zumdahl and Zumdahl
   Calculator

B. Chemistry 105 Lab
   Chemistry 105 Experiments Book, 2015-2016
   Spiral Bound Laboratory Notebook with perforated carbon pages
   Safety Goggles
   Lab Coat or 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 (90.0%) of the 800 total points. The other grade cut-offs are 640 points (80.0%) for a B, 560 points (70.0%) for a C and 480 points (60.0%) 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 14 in 467 Noyes Lab. The lab schedule for Chem 105 is attached to the end of this handout.

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. Details regarding Chem 105 will be discussed during check-in.

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 100 Noyes Lab (M-Th). The quiz sections will be at noon (M-Th) in 204 Noyes Lab. The labs will be from 9:00-10:50 a.m. in 467 Noyes Lab 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 at a later date. 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.
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 (230 Davenport Hall) 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, 230 Davenport Hall, houses our tutoring facilities. At certain times, Chemistry 104 and 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 367D Noyes Lab):

    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>
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<tbody>
<tr>
<td></td>
<td><strong>Week 1</strong></td>
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<tr>
<td>6/13</td>
<td>Equilibrium Review</td>
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<tr>
<td>6/14</td>
<td>Introduction to Acids and Bases, pH scale</td>
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<tr>
<td>6/15</td>
<td>Calculating the pH of Acids and Bases</td>
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<tr>
<td>6/16</td>
<td>Salts, Polyprotic Acids, Property of Oxides</td>
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<td></td>
<td><strong>Week 2</strong></td>
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<tr>
<td>6/20</td>
<td>Buffers</td>
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<tr>
<td>6/21</td>
<td>Titrations</td>
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<td>6/22</td>
<td>Titrations</td>
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<td>6/23</td>
<td>Enthalpy Review, Entropy</td>
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<td></td>
<td><strong>Week 3</strong></td>
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<tr>
<td>6/27</td>
<td>Free Energy</td>
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<tr>
<td>6/28</td>
<td>Free Energy and Equilibrium</td>
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<tr>
<td>6/29</td>
<td>Catch up and Review</td>
</tr>
<tr>
<td>6/30</td>
<td>Exam I (noon in 100 Noyes Lab)</td>
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<td></td>
<td><strong>Week 4</strong></td>
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<tr>
<td>7/4</td>
<td>No Class</td>
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<td>7/5</td>
<td>No Class</td>
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<tr>
<td>7/6</td>
<td>Electrochemistry, Galvanic Cells</td>
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<td>7/7</td>
<td>Electrochemistry, Nernst Equation</td>
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<td></td>
<td><strong>Week 5</strong></td>
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<tr>
<td>7/11</td>
<td>Electrolytic Cells, Corrosion</td>
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<tr>
<td>7/12</td>
<td>Bonding Review</td>
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<td>7/13</td>
<td>Intermolecular Forces and Liquids</td>
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<tr>
<td>7/14</td>
<td>Introduction to Organic Chemistry, Alkanes</td>
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<td></td>
<td><strong>Week 6</strong></td>
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<tr>
<td>7/18</td>
<td>Alkenes, Alkynes, Isomerism</td>
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<tr>
<td>7/19</td>
<td>Reactions of Alkenes</td>
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<td>7/20</td>
<td>Aromatics</td>
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<td>7/21</td>
<td>Alcohols</td>
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<td>Week 7</td>
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<tr>
<td>7/25</td>
<td>Catch Up and Review</td>
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<td>7/26</td>
<td>Hour Exam II (noon in 100 Noyes Lab)</td>
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<tr>
<td>7/27</td>
<td>Kinetics</td>
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<th>Week 8</th>
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<tbody>
<tr>
<td>8/1</td>
<td>Kinetics</td>
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<td>8/2</td>
<td>Amino Acids</td>
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<tr>
<td>8/3</td>
<td>Catch-up and Review</td>
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<tr>
<td>8/4</td>
<td>Reading Day</td>
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<tr>
<td>8/5</td>
<td>FINAL EXAM (10:15 a.m. – 12:45 p.m. in 100 Noyes Lab)</td>
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ASSIGNMENTS, SUMMER 2016

Date

6/13  Equilibrium and Review
Reading           Z:  13.1-13.5
Problems          Z:  13:  28, 30, 33, 37, 39, 47, 63, 67
                        R:  13:  3, 5, 6

6/14  Introduction to Acids and Bases, pH Scale
Reading:          Z:  14.1-14.3, 14.6, Appendix A1.2
Problems:         Z:  14: 20, 21, 23, 29, 35, 37, 39-41, 43, 45, 46, 49,
                                53, 54, 144
                        R:  14: 2-4

6/15  Calculating the pH of Acids and Bases
Reading:          Z:  14.4-14.6, 14.12, Appendix A1.4
Problems:         Z:  14: 30, 55, 57, 59, 64, 65, 67, 75-77, 87, 89,
                                93, 94, 97, 99, 103, 104, 143, 152
                        R:  14: 5, 6

6/16  Salts, Polyprotic Acids, Properties of Oxides
Reading:          Z:  14.7, 14.8, 14.10
Problems:         Z:  14: 27, 32, 34, 106, 109, 113, 115-117, 119, 123-125,
                                129, 135, 136, 147, 158, 181
                        R:  14: 7-9

6/20  Buffers
Reading:          Z:  15.1-15.3
Problems:         Z:  15: 10, 11, 17-20, 31-34, 39, 41, 45, 47-50, 87
                        R:  15: 1-4

6/21  Titrations
Reading:          Z:  15.4
                        *For Exercises 15.61 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

6/22  Titrations
Reading:          Z:  15.4
Problems:         Z:  15:14, 15, 56, 60*, 63*, 65, 68
                        *For Exercises 15.60 and 15.63, only calculate the pH at the
                        initial, half-way, and equivalence points, then sketch the
                        titration curve.
                        R:  15: 8

Z = Zumdahl, 9th Edition (only evens collected)         R = Review Questions (not collected)
<table>
<thead>
<tr>
<th>Date</th>
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<tbody>
<tr>
<td></td>
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<td>Z: 17.11, 17, 25, 31-33, 41, 42, 82</td>
<td>R: 6: 8, 9; 17: 1-3</td>
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<td>R: 17: 4-6</td>
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<td>R: 17: 7, 8, 10</td>
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<td>6/30</td>
<td>Hour Exam I – noon in 100 Noyes Lab</td>
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<td>7/6</td>
<td>Redox Review, Galvanic Cells, Standard Cell Potentials</td>
<td>Z: 4.9; 18.1-18.3</td>
<td>Z: 18.15, 17, 21, 22, 36, 41, 43, 45, 46, 57, 58, 61, 63</td>
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<td>R: 18: 2, 3</td>
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<td>7/7</td>
<td>Electrical Work, Nernst Equation, Concentration Cells</td>
<td>Z: 18.4-18.5</td>
<td>Z: 18.23, 24, 51, 52, 56, 67, 69, 70, 78, 81, 82, 87, 89, 92, 117, 118, 123-125, 143</td>
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<td>R: 18: 4, 5, 6, 7</td>
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<td>R: 18: 8, 9, 10</td>
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R = Review Questions (not collected)
Date

7/12 Bonding Review
Reading
S: 1.2
Z: 8.1-8.3, 8.9, 8.10, 8.12, 8.13 (Review)
Z: 9.1 (up to p. 422), 9.5
Problems
H: 1.1: All
Z: 9: 9, 12, 17-22, 37, 39, 67, 68
R: 9: 1-3, 10

7/13 Intermolecular Forces and Liquids
Reading
Z: 10.1, 10.2, 10.8, 10.9
Problems
Z: 10: 5, 20, 21, 23, 24, 27, 34, 37, 39-41,
95, 103-108, 111, 120, 135
R: 10: 1, 2, 3, 9, 10, 11

7/14 Introduction to Organic Chemistry, Alkanes
Reading
S: 3, 4, Appendix A
Z: 22.1
Problems
H: 1.2: All
Z: 22: 1, 5, 15, 16, 45
R: 22: 1

7/18 Alkenes, Alkynes, Isomerism
Reading
S: 5, 6, 9
Z: 22.2
Problems
H: 1.3: All
Z: 22: 33, 34, 41, 42, 104, 158
R: 22: 2, 6

7/19 Reactions of Alkenes, Alkynes
Reading
S: 5
Z: 22.2
Problems
H: 1.4: 1-8
Z: 22: 61, 62, 64

7/20 Aromatics
Reading
Z: 22.3
H: 1.4: 9-11
Problems
Z: 22: 46, 63
R: 22: 3, 4

7/21 Alcohols
Reading
S: 7
Z: 22.4
Problems
H: 2.1: All
Z: 22: 3, 8, 65, 67, 115, 117, 121, 151
R: 22: 8

S = Syllabus Lessons
H = Extra Problems Handout (all are collected)
Z = Zumdahl-9th edition (only evens collected)
R = Review Questions in Zumdahl (not collected)
Date

7/25  Catch-up and Review

7/26  Hour Exam II – noon in 100 Noyes Lab

7/27  Introduction to Kinetics, Rate Laws
      Reading: Z: 12.1-12.3
      Problems: Z: 12: 15, 17, 23, 26, 29, 31, 34, 36, 103
              R: 12: 1, 3

7/28  Integrated Rate Laws
      Reading: Z: 12.4
              R: 12: 2, 5, 6

8/1   Collision Model, Activation Energy, Catalysts
      Reading: Z: 12.6-12.7
      Problems: Z: 12: 12, 13, 18-20, 63-66, 76, 106
              R: 12: 9, 11

8/2   Mechanisms
      (noon) Reading: Z: 12.5, Lecture handouts
      Problems: H: Homework Exercise (Due at noon, 8/3)
              Z: 12: 59-62
              R: 7, 8

8/2   Amino Acids and Proteins
      (1 pm) Reading S: 13
      Z: 15.4 (Review)
      Z: 22.6 (pp 1052-1054)
      Problems S: pp. 126-127: 7(a-c), 8(a-c)
      Z: 15: 113
      H: 2.4: Problem 1 only
      Z: 22: 85, 87, 89, 93, 135

8/3   Catch-up and Review

8/4   Reading Day

8/5   Final Exam (10:15-12:45 p.m. in 100 Noyes Lab

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Z = Zumdahl-9th edition (only evens collected)
H = Extra Problems Handout (all are collected)
R = Review Questions in Zumdahl (not collected)
LABORATORY SCHEDULE
CHEMISTRY 105
SUMMER 2016

Date

6/14  CHECK-IN  (The lab room is 467 Noyes Lab.)
6/16  Lab 1:  Beer’s Law and Mixtures
6/21  Lab 2:  Citric Acid and Ascorbic Acid Content is Lemon-Lime Kool-Aid
6/23  Lab 3:  Determination of the Value of pKₐ for Bromothymol Blue
6/28  NO LAB
6/30  NO LAB
7/5   NO LAB
7/7   Lab 4:  Synthesis and Qualitative Analysis of Aspirin
7/12  Lab 7:  Electrochemistry
7/14  Lab 5:  Spectrophotometric Analysis of Aspirin
7/19  Lab 10:  The Geometry of Hydrocarbons
7/21  Lab 6:  Determination of Acetylsalicylic Acid in Aspirin
7/26  NO LAB
7/28  Lab 8:  Chemical Kinetics: Differential Rate Laws
8/2   Lab 9:  Chemical Kinetics: Integrated Rate Laws;  CHECK-OUT