

## Course Information

**Course Director:**

Tom Hummel  
3016 Chem Annex  
333-9111  
tjhummel@illinois.edu

**Required Materials:**

Chemistry 104 Lecture/Quiz

Chemistry: An Atoms First Approach by Zumdahl and Zumdahl, 3rd ed.  
Partial Solutions Guide for Chemistry: Atoms First by Hummel, Zumdahl  
Calculator

**Website:** <https://chemistry.illinois.edu/clc/courses/chem-104-hummel>

**Grading:**

2 Hour Exams	300 points
Final	300 points
Quizzes	200 points

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.

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 emailed to the Chem 105 students.

**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 one or two labs (two hours each) per week for Chem 105. The lectures will be at 1 p.m. in 100 NL (M-Th). The quiz sections will be at noon (M-Th) in 2012 Chem Annex. The labs will be from 9:00-10:50 a.m. in 2006 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 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 (40 points). 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 will be available on our website.

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 (usually on Mondays and/or Wednesdays). The quizzes will cover material gone over in lecture and in quiz section. 10 or 11 quizzes will be given during the summer. The 200 pt grade in quiz section will consist of the top eight quizzes (two or three quizzes will be dropped) plus the homework grade (equivalent to two quizzes, 40 pts).
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, 2021 Chem Annex, houses our tutoring facilities. At certain times, Chemistry 104 and 105 TAs are "on call" to answer questions and/or assist with problem solving (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 3016 Chem Annex):

Monday, 10-11 am and Wednesday, 11-noon

or by appointment. If I am unavailable, e-mail me ([tjhummel@illinois.edu](mailto:tjhummel@illinois.edu)) and I will get in touch with you.

**COURSE OUTLINE**

<b>Date</b>	<b>Topic</b>
Week 1	
6/12	Equilibrium Review
6/13	Introduction to Acids and Bases, pH scale
6/14	Calculating the pH of Acids and Bases
6/15	Salts, Polyprotic Acids, Property of Oxides
Week 2	
6/19	Buffers
6/20	Titrations
6/21	Titrations
6/22	Enthalpy Review, Entropy
Week 3	
6/26	Free Energy
6/27	Free Energy and Equilibrium
6/28	Catch up and Review
6/29	Exam I (noon; location TBA)
Week 4	
7/3	No Class
7/4	No Class
7/5	Electrochemistry, Galvanic Cells
7/6	Electrochemistry, Nernst Equation
Week 5	
7/10	Electrolytic Cells, Corrosion
7/11	Bonding Review
7/12	Molecular Orbital Model
7/13	Intermolecular Forces and Liquids
Week 6	
7/17	Introduction to Organic Chemistry, Alkanes
7/18	Alkenes, Alkynes, Isomerism
7/19	Reactions of Alkenes
7/20	Aromatics

## Week 7

7/24 Catch Up and Review  
7/25 Hour Exam II (noon in 2012 Chem Annex)  
7/26 Kinetics  
7/27 Kinetics

## Week 8

7/31 Kinetics  
8/1 Amino Acids  
8/2 Catch-up and Review  
8/3 Reading Day  
  
8/5 FINAL EXAM (10:15 a.m. – 12:45 p.m.)

**SUMMER 2023 ASSIGNMENTS for 3rd Edition Chemistry: Atoms First, Zumdahl****Date**

6/12	Equilibrium and Review	
	Reading	Z: 12.1-12.5, 12.7
	Problems	Z: 12: 28, 30, 33, 37, 39, 47, 63, 68 R: 12: 3, 5, 6
6/13	Introduction to Acids and Bases, pH Scale	
	Reading:	Z: 13.1-13.3, 13.6, Appendix A1.2
	Problems:	Z: 13: 20, 21, 23, 29, 35, 37, 39-41, 43, 45, 46, 53, 54, 83, 144 R: 13: 2-4
6/14	Calculating the pH of Acids and Bases	
	Reading:	Z: 13.4-13.6, 13.12, Appendix A1.4
	Problems:	Z: 13: 30, 55, 57, 59, 64, 65, 67, 76, 77, 87, 89, 93, 94, 97, 99, 103, 104, 143, 161 R: 13: 5, 6
6/15	Salts, Polyprotic Acids, Properties of Oxides	
	Reading:	Z: 13.7, 13.8, 13.10
	Problems:	Z: 13: 27, 32, 34, 106, 109, 113, 115-117, 119, 123-125, 129, 135, 136, 155, 167, 183 R: 13: 7-9
6/19	Buffers	
	Reading:	Z: 14.1-14.3
	Problems:	Z: 14: 10, 11, 17-20, 31-34, 39, 40, 47-50, 90 R: 14: 1-4
6/20	Titrations	
	Reading:	Z: 14.4
	Problems:	Z: 14: 12, 13, 55, 57-59, 61*, 94, 95, 97, 106 *For Exercise 14.61, 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: 14: 5-7
6/21	Titrations	
	Reading:	Z: 14.4
	Problems:	Z: 14: 14, 15, 56, 60*, 63*, 65, 68 *For Exercises 14.60 and 14.63, only calculate the pH at the initial, half-way, and equivalence points, then sketch the titration curve. R: 14: 8

Z = Zumdahl, 3rd Edition (only evens collected)      R = Review Questions (not collected)

**Date**

6/22	Enthalpy Review, Entropy Reading: Problems:	Z: 7.2-7.5, 16.1-16.3 Z: 7: 15, 19, 69, 73, 75, 81, 83, 126 Z: 16: 11, 17, 25, 31-33, 41, 42, 83 R: 7: 8, 9; 16: 1-3
6/26	Free Energy Reading: Problems:	Z: 16.4-16.6 Z: 16: 34-36, 38-40, 43-45, 48-51, 54, 57, 59, 62, 63, 82 R: 16: 4-6
6/27	Free Energy and Equilibrium Reading: Problems:	Z: 16.7-16.9 Z: 16: 22, 66, 67, 70, 71, 73, 76-78, 93, 97, 99, 119 R: 16: 7, 8, 10
6/28	Catch-up and Review	
6/29	Hour Exam I: noon-1:50	
7/3	No Class	
7/4	No Class	
7/5	Redox Review, Galvanic Cells, Standard Cell Potentials Reading: Problems:	Z: 6.9; 17.1-17.3 Z: 17: 15, 17, 21, 22, 38, 43, 45, 48, 59, 60, 63, 65 R: 17: 2, 3
7/6	Electrical Work, Nernst Equation, Concentration Cells Reading: Problems:	Z: 17.4-17.5 Z: 17: 23, 24, 54, 58, 69, 72, 80, 83, 84, 89, 91, 94, 120, 125, 130, 131, 147 R: 17: 4, 5, 6, 7
7/10	Corrosion, Electrolysis Reading: Problems:	Z: 17.7-17.9 Z: 17: 19, 27-29, 95, 98, 99, 105, 107, 109, 112, 114, 129, 142 R: 17: 8, 9, 10

Z = Zumdahl, 3rd Edition (only evens collected)      R = Review Questions (not collected)

**Date**

7/11	Bonding Review Reading	S: 1, 2 Z: 3.1-3.2, 3.6, 3.7, 3.9 (Review) Z: 4.1-4.3 (up through p. 166), 4.7 (Review)
	Problems	H: 1.1: All Z: 4: 11, 16, 39-44, 57, 59, 97, 101 R: 4: 4, 5, 12
7/12	Molecular Orbital Model Reading	Z: 4.4-4.6
	Problems	Z: 4: 18, 61, 62, 65-68, 70, 71, 74, 76 R: 4: 7-10
7/13	Intermolecular Forces and Liquids Reading	Z: 9.1-9.4
	Problems	Z: 9: 5, 20, 21, 23, 24, 27, 34, 37, 39-41, 53, 61-66, 112, 130, 135 R: 9: 1, 2c-e, 3, 9-11
7/17	Introduction to Organic Chemistry, Alkanes Reading	S: 3, 4, Appendix A Z: 21.1
	Problems	H: 1.2: All Z: 21: 5, 15, 16, 45 R: 21: 1
7/18	Alkenes, Alkynes, Isomerism Reading	S: 5, 6, 9 Z: 21.2
	Problems	H: 1.3: All Z: 21: 33, 34, 41, 42, 104, 154 R: 21: 2, 6
7/19	Reactions of Alkenes, Alkynes Reading	S: 5 Z: 21.2
	Problems	H: 1.4: 1-8 Z: 21: 61, 62, 64
7/20	Aromatics Reading	Z: 21.3 H: 1.4: 9-11
	Problems	Z: 21: 46, 63 R: 21: 3, 4

S = Syllabus Lessons

Z = Zumdahl, 3rd edition (only evens collected)

H = Extra Problems Handout (all are collected)

R = Review Questions in Zumdahl (not collected)

**Date**

7/24	Catch-up and Review	
7/25	Hour Exam II – noon-1:50 pm	
7/26	Introduction to Kinetics, Rate Laws	
	Reading:	Z: 11.1-11.3
	Problems:	Z: 11: 17, 23, 26, 29, 31, 34, 36, 105
		R: 11: 1, 3
7/27	Integrated Rate Laws	
	Reading:	Z: 11.4
	Problems:	Z: 11: 37-41, 45-47, 51, 53-55, 57, 58
		R: 11: 2, 5, 6
7/31	Collision Model, Activation Energy, Catalysts	
	Reading:	Z: 11.6-11.7
	Problems:	Z: 11: 13, 18-20, 63-66, 76, 108
		R: 11: 9, 11
8/1 (noon)	Mechanisms	
	Reading:	Z: 11.5, Lecture handouts
	Problems:	H: Homework Exercise (Due at noon, 8/2)
		Z: 11: 59-62, 98
		R: 11: 7, 8
8/1 (1 pm)	Amino Acids and Proteins	
	Reading	S: 13
		Z: 14.4 (Review)
		Z: 21.6 (pp 871-873)
	Problems	S: pp. 126-127: 7(a-c), 8(a-c)
		Z: 14: 115
		H: 2.4: Problem 1 only
		Z: 21: 85, 87, 89, 93, 137
8/2	Catch-up and Review	
8/3	Reading Day	
8/5	Final Exam (10:15-12:45 p.m.)	

S = Syllabus Lessons

Z = Zumdahl, 3rd edition (only evens collected)

H = Extra Problems Handout (all are collected)

R = Review Questions in Zumdahl (not collected)