Topics in General Chemistry
Chemistry 103
Fall 2010

Instructor: Ms. Oertel, N276 Science Center, 775-8989, catherine.oertel@oberlin.edu
Lecture meeting: MWF 11-11:50 am, Science Center A255
Laboratory meeting: M 1:30-4:30 pm, Science Center N284
Office hours: Wednesday 3:30-4:30 pm, Thursday 9:00-10:00 am

Course overview: Chemistry 103 provides an introduction to college chemistry for students who have had strong preparation in high school. The class will be conducted primarily in a lecture format, combined with occasional in-class problem-solving workshops. The primary objectives of the course are for students to:

- understand chemical processes from the perspectives of equilibrium, thermodynamics, kinetics, and chemical bonding
- become skilled at setting up and solving problems in chemistry
- develop competence and confidence in laboratory work

Required textbooks: Zumdahl, S.S.; Zumdahl, S.A. *Chemistry*, 8th ed. Brooks Cole, 2010. You may also use the 7th edition of this textbook (Houghton Mifflin, 2007). The two editions are very similar, and readings in each are provided on this syllabus. For the thermodynamics unit, we will use *Entropy Analysis* by N.C. Craig, which is published locally. It is available for purchase from Ms. Cindi Manning in Science Center A265 between 1:15 and 4:30 pm any afternoon. In addition, please purchase a laboratory notebook and the Chem 103 laboratory manual from Ms. Manning.

Office hours and problem session: I will be available in my office on Wednesday from 3:30-4:30 pm and Thursday from 9:00-10:00 am. In addition, there will be an optional weekly problem session on Thursday evening from 8-9 pm in Science Center A255 (starting during the second week of classes). Please feel free to make an appointment or to drop by my office at other times if these hours do not fit your schedule.

Laboratory: The Chem 103 laboratory will meet on Monday afternoons from 1:30-4:30 pm in Science Center N284. The first laboratory session will be Monday, September 13. Please arrive at 1:15 pm the first week so that you can complete the laboratory check-in before beginning the experiment. The laboratory experiments will complement the material being covered in lecture, and attendance and prompt arrival each week are very important. Make-up laboratories will be possible only in the case of excused absences for illness, religious observance, or emergency circumstances. If you know that you will need to miss a lab for one of these reasons, please let me know as soon as possible so that we can schedule a make-up session. If you miss a laboratory session without making arrangements ahead of time, you will not receive credit for that week's experiment.

Quizzes and exams: In-class exams are scheduled for October 1, and November 5. A take-home exam will be distributed in class on November 22 and due at 11:00 am on November 24.

Twenty-minute in-class quizzes will be given on September 20 and October 15. The two-hour final exam is scheduled for Saturday, December 18 at 9:00 am. Graded quizzes and exams taken during the semester will be returned to you no more than one week later.

Make-up quizzes and exams will be possible only in the case of excused absences for illness, religious observance, or emergency circumstances. If you know that you will need to miss a quiz or exam for one of these reasons, please let me know as soon as you can so that we can schedule a make-up. If you skip a quiz or exam without making arrangements ahead of time, a make-up for full credit will not be possible.

Please see me before the first quiz if you have a documented disability and receive accommodation for testing.

Homework: Problem sets will be handed out most Fridays to be due the following Friday. Completing and understanding the homework problems is one of the most important things that you can do to learn the course material and prepare for examinations. You are encouraged to take advantage of office hours and problem sessions in working through these assignments. You may also find it helpful to work with other members of the class.

Each problem set will be graded for completeness and correctness and will be awarded a √+(3 points), √(2 points), or √-(1 point). These point values will be used in calculating your overall homework grade. Once graded problem sets are returned, solutions will be available on Blackboard.

Homework will be due at the beginning of class on the indicated due date. *Late homework assignments will not be accepted.* However, because I realize that circumstances arise that can make completing an assignment difficult, I will automatically drop your lowest homework grade for the semester in figuring your final grade.

Evaluation: Grades in Chem 103 will be determined based on the following components: two quizzes (5% each), three exams (15% each), final exam (25%), laboratory (15%), homework (5%).

Honor Code: The Honor Code will be observed for all graded work in Chem 103, including quizzes, exams, problem sets, and lab reports. In order to receive credit for work, you must write and sign the Honor Pledge: "I affirm that I have adhered to the Honor Code in this assignment." You are permitted – and in fact encouraged – to work with classmates on problem sets and lab reports, but be aware that copying of another student's assignment or allowing another student to copy yours is an Honor Code violation.

Materials available on Blackboard: In addition to homework, quiz, and exam solutions, copies of all lecture handouts (including this syllabus) will be available on Blackboard.

Materials on library reserve: Copies of the course textbooks are available on reserve.

Schedule of Topics and Assignments

Most reading assigments are from Zumdahl and Zumdahl *Chemistry*, 7th Edition or 8th Edition. Readings for the thermodynamics unit come from Craig *Entropy Analysis* (*EA*). You may do the reading assignments either before or after the associated lectures. Topics are divided into four main units: equilibrium (EQ), thermodynamics (TH), kinetics (KN), and atomic structure and chemical bonding (AS).

Lecture	Dates	Unit	Main Topics	Associated Reading		Due
				***ZZ* 7th edition**	***ZZ* 8th edition**	
1	W 9/8	EQ	reaction types, equilibrium	4.4-4.6, 13.1-13.2	4.4-4.6, 13.1-13.2	
2	F 9/10	EQ	equilibrium constants, reaction quotients	13.3-13.4, 13.5 through middle of pg. 594	13.3-13.4, 13.5 through top of pg. 610	
3	M 9/13	EQ	LeChâtelier's principle	13.7	13.7	
4	W 9/15	EQ	equilibrium calculations	finish 13.5, 13.6	finish 13.5, 13.6	
5	F 9/17	EQ	acids and bases, pH calculations	14.1-14.5 (skim sections 14.1-14.3 if this is review for you)	14.1-14.5 (skim sections 14.1-14.3 if this is review for you)	PS 1
6	M 9/20	EQ	pH in basic solutions, polyprotic acids, **Quiz 1**	14.6-14.7 through pg. 651	14.6-14.7 through top of pg. 668	
7	W 9/22	EQ	polyprotic acids (con'd), common ion effect, buffers	finish 14.7, 15.1-15.2	finish 14.7, 15.1-15.2	
8	F 9/24	EQ	buffers (con'd), indicators, titrations	15.3-15.5	15.3-15.5	PS 2
9	M 9/27	EQ	titrations (con'd), K_{sp}	15.6, 15.8	16.1, 16.3	
10	W 9/29	TH	energy transactions, first law of thermodynamics	*EA* pgs. 1-13		
	F 10/1		**Exam 1** (covers lectures 1-9)			
11	M 10/4	TH	enthalpy, calorimetry	*EA* pgs. 15-24		
12	W 10/6	TH	enthalpy (con'd), Hess's Law	*EA* pgs. 30-32		
13	F 10/8	TH	enthalpy approximations, entropy, second law of thermodynamics	*EA* pgs. 24-29, 37-42		PS 3
14	M 10/11	TH	third law of thermodynamics, molar entropies	*EA* pgs. 42-49		

15	W 10/13	TH	entropy diagrams, applications	*EA* pgs. 49-51		
16	F 10/15	TH	microscopic view of entropy, **Quiz 2**	*EA* pgs. 67-75		
17	M 10/18	TH	microscopic view (con'd)	*EA* pgs. 75-81		
18	W 10/20	TH	entropy of mixing	*EA* pgs. 86-94		
19	F 10/22	TH	Gibbs energy function	*EA* pgs. 99-110		PS 4
	10/25-10/29		**No classes – Fall Break**			
20	M 11/1	TH	$\Delta_r G^o$ and K, review redox chemistry	*EA* pgs. 116-121		
21	W 11/3	TH	electrochemical cells	*ZZ* sections 4.10, 17.1-17.2	*ZZ* sections 18.1-18.3	
	F 11/5		**Exam 2** (covers lectures 10-20)			
22	M 11/8	TH	the Nernst equation, applications	17.4-17.5, 17.7	18.5-18.6, 18.8	
23	W 11/10	KN	reaction rates, rate laws	12.1-12.3	12.1-12.3	
24	F 11/12	KN	integrated rate laws	12.4, 12.5	12.4	PS 5
25	M 11/15	KN	the Arrhenius equation	12.7	12.6	
26	W 11/17	KN	reaction mechanisms	12.6	12.5	
27	F 11/19	KN	reaction mechanisms (con'd), catalysis	12.8	12.7	PS 6
28	M 11/22	AS	electromagnetic spectrum, atomic energy levels	7.1-7.4	7.1-7.4	
29	W 11/24	AS	**Exam 3 due** (covers lectures 21-27), wavefunctions, orbitals	7.5	7.5	
	F 11/26	AS	**No class – Thanksgiving Break**			
30	M 11/29	AS	quantum numbers, nodes	7.6-7.8	7.6-7.8	
31	W 12/1	AS	electron configurations	7.9-7.11	7.9-7.11	
32	F 12/3	AS	bonding types, molecular structures	8.1-8.3, 8.7	8.1-8.3, 8.7	PS 7
33	M 12/6	AS	Lewis structures	8.9-8.11	8.9-8.11	
34	W 12/8	AS	resonance, VSEPR model	8.12-8.13	8.12-8.13	
35	F 12/10	AS	hybridization	9.1	9.1	PS 8
36	M 12/13	AS	molecular orbital model	9.2-9.4	9.2-9.4	
FINAL EXAM, Saturday, December 18, 9 am (lectures 28-36 and cumulative)						