Principles of Chemistry I (CHEM 143)  
Course Syllabus  
Fall Semester, 2011

Brian H. Northrop  
Office: Hall Atwater 39  
bnorthrop@wesleyan.edu  

Extension: x3987

Lectures:  
Monday, Wednesday, Friday 9:00-9:50, Science Center 58

Textbook:  
Oxtoby, Gilles, and Campion *Principles of Modern Chemistry* (7th edition)  
[note: the 6th edition is also acceptable]

Office Hours:  
Wednesdays 2:00-3:00 pm and by appointment.  
You can also come by my office (or lab, HA 40-42) at any time if I’m there, but Wednesdays from 2-3 is when I guarantee I’ll be in my office.

TA Help Sessions:  
#1 Mondays 7:00-8:00, Hall-Atwater 84  
#2 Mondays 4:15-5:15, SCIE 113  
#3 Tuesdays 4:15-5:15, Hall-Atwater 84  
#4 Tuesdays 7:00-8:00, Hall-Atwater 84

Course TAs:  
Na Le Dang, ldang@wesleyan.edu  
Sinead Keogh, skeogh@wesleyan.edu  
Daniel Obenchain, dobenchain@wesleyan.edu  
Robert Stolz, rstolz@wesleyan.edu

Course Description:  
An introduction to chemistry intended for motivated students with a solid high school chemistry background and some exposure to calculus, this course will emphasize the fundamental principles of chemistry and is recommended for students interested in pursuing majors in science or mathematics. This course will cover the properties of gases, solids, liquids, and solutions; concepts of equilibrium, thermodynamics, and kinetics. This course provides the best basic foundation for further study of chemistry and is strongly recommended for chemistry and MB&B majors. CHEM143, with CHEM144, satisfies premedical general chemistry requirements.

Important Dates:  
• Sept. 5, classes begin  
• Sept. 16, end of drop/add  
• Oct. 22-25, fall break  
• Nov. 23-27, Thanksgiving break  
• Dec. 2, last day to withdraw  
• Dec. 9, last day of classes
Grading:

• Homework (20%)
Weekly homework sets will be given and will be based on material from the lectures and the textbook. They will consist almost entirely of problems from the textbook. Given that time only allows for a few problems to be explicitly worked out during lecture, homework sets will be the best way for you to test how well you are able to apply concepts from the lecture to quantitative problem solving. The best times for questions regarding problems on the homework sets are during my office hours and/or the TA help sessions.

• Exams (80%)
I will be giving three exams over the course of the semester as well as a final exam. The exams will be in class and written to be doable within the class period. All exams will be closed note, closed book. You may use a calculator, scientific or otherwise.
Exam appeals/re-grades: I want to be sure every student receives credit for all correct work done on their exams. If you believe an error was made in the grading of your exam then please bring the exam to me within 1 week of when it was returned. Provide a short (few sentences at most) description of what you believe was marked incorrectly, and let me know how much credit you believe you should’ve received on the problem in question. I’ll then go over it and have it back to you within a week.

“Drop-a-Grade” option
Exams will be graded on a 100-point scale. The total number of points from Homework assignments will be scaled to be worth the equivalent of one 100-point exam. The Final Exam will be graded on a 200-point scale. Students will have the option of dropping either: (i) their lowest Exam grade, (ii) half their Final Exam, or (iii) their cumulative Homework grade. In order to take advantage of this option you MUST take all three Exams and the Final, and hand in at least 8 completed homework assignments.

Tentative Lecture Schedule:
The lectures will be based off material from the textbook (Oxtoby, et al.), however they won’t simply be a summary of different chapters. We will jump around through different sections of the book in order to cover what I believe are the most important concepts to this course. Still, it is important that you also keep up with reading the chapters we cover as the combination of lectures, reading, and problem sets will help you to best become experts in the course material.

It should be noted that this is a “tentative” lecture schedule because we may get ahead and we may fall behind at times. With that in mind, I still hope to stay on track as much as possible.

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<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Sept.</td>
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<tr>
<td>5</td>
<td>Course introduction</td>
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<td>7</td>
<td><strong>Gases: Chapter 9</strong> Boyle's law, Charles's law</td>
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<td>9</td>
<td>The ideal gas equation, mixtures of gases</td>
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<td>12</td>
<td>The kinetic theory of gases</td>
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<td>14</td>
<td>Molecular velocities</td>
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<td>16</td>
<td>The distribution of molecular speeds</td>
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19 Non-ideal gases
21 Molecular collisions, mean free path
23 Intermolecular forces, potential energy diagrams

26 Heat capacities of gases

**Solids: Chapter 21**
28 Crystalline solids, crystal packing, the unit cell
30 Cubic crystals

Oct.  3 X-ray diffraction
5 **Exam #1**
7 Ionic vs. metallic vs. molecular solids

**Liquids: Chapters 10 and 11**
10 Liquids, phase changes, enthalpy changes ($\Delta H$)
12 Phase equilibria, phase diagrams
14 Intermolecular forces, solutions

17 Solutions of nonvolatile solutes, Raoult's law
19 Solutions of volatile solutes, Henry's law
21 Equilibrium constants ($K_{eq}$), LeChatelier's principle

**Equilibrium: Chapters 14, 15 & 16**
24 [Fall Break]
26 The law of mass action
28 Solubility and solubility products ($K_{sp}$)

Nov.  2 **Exam #2**
4 Weak acids and weak bases
7 Buffers

**Thermodynamics: Chapters 12 & 13**
9 Definitions & conventions
11 Heat, work, the 1st law, and enthalpy

14 Heat capacity, temperature dependence of $\Delta H$
16 Standard states, thermochemistry, bond enthalpies
18 Reversible vs irreversible processes, isothermal and adiabatic processes

21 Entropy and the 2nd law
23 [Thanksgiving Break]
25 [Thanksgiving Break]

28 Entropy changes, the 3rd law, absolute entropies
30 Spontaneous processes, Gibbs free energy ($\Delta G$)

Dec.  2 Relationships between $\Delta G$ and $K_{eq}$
Kinetics: Chapter 18
4 Kinetics vs thermodynamics, 1st and 2nd order rate laws
7 Exam #3
9 Reaction mechanisms, elementary processes, steady-state approximation
14 Final Exam, 9:00-12:00

Students with Disabilities:
It is the policy of Wesleyan University to provide reasonable accommodations to students with documented disabilities. Students, however, are responsible for registering with Disabilities Services, in addition to making requests known to me in a timely manner. If you require accommodations in this class, please make an appointment with me as soon as possible [no later than the 3rd week of the semester], so that appropriate arrangements can be made. The procedures for registering with Disabilities Services can be found at http://www.wesleyan.edu/deans/disability-students.html.