Principles of Chemistry I (CHEM 143)
Course Syllabus
Fall Semester, 2013

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 109
#3 Tuesdays 4:15-5:15, Hall-Atwater 84
#4 Tuesdays 7:00-8:00, Hall-Atwater 84
#5 Mondays 4:15-5:15, Hall-Atwater 53/54

Course TAs:
Elizabeth Alexion, ealexion@wesleyan.edu
Dan Obenchain, dobenchain@wesleyan.edu
Zarek Siegel, zsiegel@wesleyan.edu
Elaine Tsui, etsui@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. 2, classes begin
• Sept. 13, end of drop/add
• Oct. 19-22, fall break
• Nov. 26, last day to withdraw
• Nov. 27-Dec. 1, Thanksgiving break
• Dec. 6, 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 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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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Sept. 2</td>
<td>Course introduction, units, background</td>
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<tr>
<td></td>
<td><strong>Gases: Chapter 9</strong></td>
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<tr>
<td>4</td>
<td>Background (continued), Boyle’s law, Charles’s law</td>
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<tr>
<td>6</td>
<td>The ideal gas equation, mixtures of gases</td>
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<td>9</td>
<td>The kinetic theory of gases</td>
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<td>11</td>
<td>Molecular velocities</td>
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<tr>
<td>13</td>
<td>The distribution of molecular speeds, non-ideal gases</td>
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</table>
16 Molecular collisions, mean free path
18 Intermolecular forces, potential energy diagrams
20 Heat capacities of gases

**Solids: Chapter 21**
23 Crystalline solids, crystal packing, the unit cell
25 Cubic crystals
27 X-ray diffraction

30 Properties of ionic vs. metallic vs. molecular solids

Oct.  2 Exam #1: Chapters 9, 21 (Gases, Crystalline Solids)

**Liquids & Solutions: Chapters 10 and 11**
4 Liquids, phase changes, enthalpy changes (\(\Delta H\))
7 Phase equilibria, phase diagrams
9 Intermolecular forces, solutions
11 Solutions of nonvolatile solutes, Raoult’s law
14 Solutions of volatile solutes, Henry’s law
16 Equilibrium and equilibrium constants (\(K_{eq}\))

**Equilibrium: Chapters 14, 15 & 16**
18 LeChatelier’s principle, manipulating \(K_{eq}\)

21 [Fall Break]
23 Equilibrium example problems
25 Solubility and solubility products (\(K_{sp}\))

28 Acid-base equilibria
30 Weak acids and weak bases

Nov.  1 Buffers

**Thermodynamics: Chapters 12 & 13**
4 Definitions & conventions
6 Exam #2: Chapters 10-11, 14-16 (Liquids, Solutions, Equilibrium)
8 Heat, work, the 1st law, and enthalpy
11 Enthalpy and heat transfer, phase changes, standard states
13 Enthalpy of formation, bond enthalpies
15 Reversible vs irreversible processes, isothermal and adiabatic processes
18 Entropy and the 2nd law
20 Entropy changes, the 3rd law, absolute entropies
22 Spontaneous processes, Gibbs free energy (\(\Delta G\))

25 Relationships between \(\Delta G\) and \(K_{eq}\)
27 [Thanksgiving Break]
29 [Thanksgiving Break]
Kinetics: Chapter 18

Dec.  2  Kinetics vs thermodynamics, 1st and 2nd order rate laws
4  Reaction mechanisms, elementary processes, steady-state approximation
6  Exam #3: Chapters 12-13 (Thermodynamics)

12  Final Exam, 9:00-12:00, Cumulative

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.