**CHEMISTRY 452**  
Physical Chemistry  
Fall 2007

MWF 12:20 – 1:10 pm  
117 Osmond

**Instructors:** Dr. B. J. Garrison., 201C Chemistry Bldg., 863-2103, bg@psu.edu  
Dr. Sergei Arzhantsev, 413 Chemistry Bldg., 865-5306, sxa42@psu.edu

**Office Hours:** As announced in class or by appointment

**The Course:** This course consists mainly of an introduction to quantum chemistry, atomic and molecular spectroscopies, and chemical kinetics.

**Prerequisites:** Prerequisite: CHEM 112 and MATH 141 and PHYS 211 or PHYS 212. 
Students with questions about their readiness for this course should consult the instructor.

**Web Site:** [http://courses.chem.psu.edu/chem452/](http://courses.chem.psu.edu/chem452/)

J. P. Lowe, *Chemistry 452 Supplementary Materials, Fall 2007*, optional  
(Sold through the Penn State Book Store.)  
An electronic calculator with logarithm/exponential capability is essential.

**Attendance:** Attendance at lectures will not be monitored. You are responsible for any announcements in class including lecture problems.

**Examinations:** There will be three evening examinations as shown in the course schedule.  
Examination dates and times are listed below. You are required to inform the instructor in writing during the first two weeks of classes of any conflicts you have with this examination schedule. A comprehensive final examination will be given during the final examination period at the time and place scheduled by the University. You must bring your student I.D. card to all exams. Issues such as whether notes and calculators are allowed at exams will be announced later.

Questions about grading of an exam must be submitted in writing to the instructor within one week after the graded exams are returned.

**Problems:** Problem assignments will be made regularly in class. Most (all?) will not be collected (see below). If you cannot solve these problems, seek help from the instructors. Office hours will be announced.

**Lecture Problems:** You are expected to turn in one sheet of paper at the beginning of each lecture. The sheet must be white, 8-1/2” x 11”, (not torn from a spiral-bound pad, please) and should contain three items:

1. Student name at upper left, *printed, last name first*.
2. Date submitted at upper right.
3. A solved problem, present clearly and legibly. The problem will be assigned during the previous lecture. These sheets will not be returned. All problems turned in will be recorded and a random sampling will be graded. It is perfectly OK to consult with others when solving the lecture problem. The point is to get you to think about key points between lectures.
Examination Dates:
I  Wednesday, September 19   6:30 – 7:45 pm
II  Wednesday, October 17   6:30 – 7:45 pm
III Wednesday, November 14  6:30 – 7:45 pm
Final Will be available in early October.

Grading: Each midterm exam will be worth 100 points, the Lecture Problems will be assigned 50 points, and the final exam will count 200 points. The final course grade will be assigned on the basis of 550 points. Nothing will be dropped.

References: The following material is on two-hour reserve for this course in the Physical & Mathematical Sciences Library, 230 Davey:

P. Atkins, Physical Chemistry, 6th, edition
P. Atkins and J. DePaula, Physical Chemistry, 7th and 8th Editions
Daniels, Mathematical Preparation for Physical Chemistry
Avery and Shaw, Basic Physical Chemistry Calculations
Avery and Shaw, Advanced Physical Chemistry Calculations
Metz, Schaum’s Outline: Theory and Problems of Physical Chemistry
Castellan, Physical Chemistry
Levine, Physical Chemistry
Lowe, Quantum Chemistry
Barrow, Physical Chemistry, 6th edition

Academic Ethics: Possession of unauthorized material during exams, alteration of exams prior to submission for regrading, plagiarism, or any other forms of cheating will be regarded as serious violations of academic ethics and may result in a failing grade in the course. Such incidents may also be referred to the University’s disciplinary system. All Penn State policies (http://www.psu.edu/ufs/policies/) regarding ethics and honorable behavior apply to this course.

Study Groups: Many students like to form small study groups. Educational research suggests that active participation in a small study group can be very helpful in mastering course material and improving problem-solving skills.
Course Schedule: Estimated and subject to change

<table>
<thead>
<tr>
<th>Lectures#</th>
<th>Lowe</th>
<th>Text Chapter*</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1-5</td>
<td>B-1</td>
<td>Appendices 2 &amp; 3, Chap 8, page 81</td>
<td>Review of Physics and Math, Introduction to Quantum Theory/ Failure of Classical Physics; Boltzmann distribution</td>
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<tr>
<td>6-10</td>
<td>B-2</td>
<td>9.1-9.5</td>
<td>Quantum Mechanics of Linear and Vibrational Motion; Symmetry</td>
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<tr>
<td>11-15</td>
<td>B-3</td>
<td>9.6-9.8</td>
<td>Circular Motion in Two and Three Dimensions</td>
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<tr>
<td>16-19</td>
<td>B-4</td>
<td>10.1-10.3</td>
<td>The Hydrogen-Like Atom</td>
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<tr>
<td>20-23</td>
<td>B-5</td>
<td>10.4-10.9</td>
<td>The Orbital Model for Many Electron Atoms/ Atomic Spectra/ Intro to Term Symbols</td>
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<tr>
<td>24-27</td>
<td>B-6</td>
<td>11.1-11.5</td>
<td>Electronic Structure of Homonuclear Diatomic Molecules</td>
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<td>34-36</td>
<td>B-10</td>
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<td>Molecular Electronic Spectroscopy</td>
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<td>37-41</td>
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<td>22, 23</td>
<td>Rates and Mechanisms</td>
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<td>42-44</td>
<td>24</td>
<td></td>
<td>Elementary Reactions/ Dynamics</td>
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# The exact lecture when a given topic is covered could vary slightly