# Honors General Chem 164 – Syllabus – Spring 2016

**Chem 164 Spring 2016**  

<table>
<thead>
<tr>
<th>Class#</th>
<th>DATE</th>
<th>Approx Reading Material</th>
<th>END OF CHAPTER HOMEWORK PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/19</td>
<td>10.1-5 Phys Equil</td>
<td>10:1,2,5,8,9</td>
</tr>
<tr>
<td>2</td>
<td>1/21</td>
<td>10.6-14</td>
<td>10:15,21,25,27,31</td>
</tr>
<tr>
<td>3</td>
<td>1/26</td>
<td>10.15-17; 15.1-5 Kinetics</td>
<td>10:33,39,40,43,45,49,53,63,65,69</td>
</tr>
</tbody>
</table>

*Notify us of any quiz/exam conflict by 1/26*

| 1      | 1/28 | 15.6-9;                 | 15: 1,3,5,9,11,17,19             |
| 2      | 2/02 | 15.10-15;               | 15: 21,25,29,31,35,39,45,47,51,53,55; Q1 in Tues Recit |
| 4      | 2/09 | 11.4-9                  | 11: 1,3,7,9,11,13,19,21,25,33,35,37 |
| 5      | 2/11 | 11.10-13                | 11: 43,48,49,52,54,60,70,72,74    |
| 6      | 2/16 | 12.1-8 Acids Bases      | 12: 1,3,4,5,11,14,15,17,21,29 Q2 in Tues Recit |
| 7      | 2/18 | 12.9-13;                | 12:37a,b,39,41,43,45,51,56,57,59,61,63,69,71,73,77 Q2 in Thurs Recit |
| 8      | 2/23 | Catch-Up; Review        |                                   |
| 9      | 2/25 | Exam I                  | Exam I (Scientific Calculator Only; Cell Phones Off Away from Body) |
| 11     | 3/03 | 13.1-7 Aq Equil Buffers | 13:1,3,5a,b,7a,b,13,15,17,23,24,27,31,33,35,39,41,51 |
| 12     | 3/08 | 13.8-13                 | 13:57,61,63,67,73,75,77,79,81,83,85 Q3 in Tues Recit |
| 13     | 3/10 | 9.1-5 Thermo 2nd & 3rd Laws | 9:4,7,13,39,40 Q3 in Thurs Recit |

**** Spring Break 3/12-3/20

| 16     | 3/29 | 14.1-4 Electrochem      | 14:1,3a,b,5a,b,9                 |
| 17     | 3/31 | 14.5-10                 | 14:11,14a,b,19,25,29,31,37a,b,39a,41a,b,45,49,51 |
| 18     | 4/05 | 14.11-12                | 14:55,57,61,63,65,67 Q4 in Tues Recit |
| 20     | 4/12 | Catch-Up; Review        |                                   |
| 21     | 4/14 | Exam II                 | Exam II (Scientific Calculator Only; Cell Phones Off Away from Body) |
| 22     | 4/19 | 18.1-6 Nuclear Chem     | 18:1,3,5,7,17,19,27 Q5 in Tues Recit |
| 23     | 4/21 | 18.7-12                 | 18:39,43 Q5 in Thurs Recit        |
| 24     | 4/26 | 20.1-10 Org Chem        | 20:3,5,7,9,21                    |
| 25     | 4/28 | 20.11-12                | 20:37a,b,41a,49                  |

**** **FINAL EXAM**  
Final Exam covers the entire semester.  
(Scientific Calculator Only; Cell Phones Off Away from Body)  
Date and Location TBA by University

1 Rev 1/22/2016
# Textbook: CHEMICAL PRINCIPLES THE QUEST FOR INSIGHT, ATKINS ET AL, 6th Ed

## Chapter 9 Thermodynamics: The Second and Third Laws
- 9.1 Spontaneous Change
- 9.2 Entropy and Disorder
- 9.3 Changes in Entropy
- 9.4 Entropy Changes Accompanying Changes in Physical State
- 9.5 A Molecular Interpretation of Entropy
- 9.6 The Equivalence of Statistical and Thermodynamic Entropies
- 9.7 Standard Molar Entropies
- 9.8 Standard Reaction Entropies
- 9.9 The Surroundings
- 9.10 The Overall Change in Entropy
- 9.11 Equilibrium
- 9.12 Focusing on the System
- 9.13 Gibbs Free Energy of Reaction
- 9.14 The Gibbs Free Energy and Nonexpansion Work
- 9.15 The Effect of Temperature
- 9.16 Gibbs Free Energy Changes in Biological Systems

## Chapter 10 Physical Equilibria (ending with 10.17)
- 10.1 Vapor Pressure
- 10.2 Volatility and Intermolecular Forces
- 10.3 The Variation of Vapor Pressure with Temperature
- 10.4 Boiling
- 10.5 Freezing and Melting
- 10.6 Phase Changes
- 10.7 Critical Properties
- 10.8 The Limits of Solubility
- 10.9 The Like-Dissolves-Like Rule
- 10.10 Pressure and Gas Solubility: Henry’s Law
- 10.11 Temperature and Solubility
- 10.12 The Enthalpy of Solution
- 10.13 The Gibbs Free Energy of Solution
- 10.14 Molality
- 10.15 Vapor-Pressure Lowering
- 10.16 Boiling Point Elevation and Freezing Point Depression
- 10.17 Osmosis

## Chapter 11 Chemical Equilibria
- 11.1 The Reversibility of Reactions
- 11.2 Equilibrium and the Law of Mass Action
- 11.3 The Thermodynamic Origin of Equilibrium Constants
- 11.4 The Extent of Reaction
- 11.5 The Direction of Reaction
- 11.6 The Equilibrium Constant in Terms of Molar Concentrations of Gases
- 11.7 Alternative Forms of the Equilibrium Constants
- 11.8 Using Equilibrium Constants
- 11.9 Adding and Removing Reagents
- 11.10 Compressing a Reaction Mixture
- 11.11 Temperature and Equilibrium
- 11.12 Catalysts and Haber’s Achievement
- 11.13 Homeostasis
Chapter 12 Acids and Bases
12.1 Bronsted-Lowry Acids and Bases
12.2 Lewis Acids and Bases
12.3 Acidic, Basic, and Amphoteric Oxides
12.4 Proton Exchange Between Water Molecules
12.5 The pH Scale
12.6 The pOH of Solutions
12.7 Acidity and Basicity Concepts
12.8 The Conjugate Seesaw
12.9 Molecular Structure and Acid Strength
12.10 The Strengths of Oxoucids and Carboxylic Acids
12.11 Solutions of Weak Acids
12.12 Solutions of Weak Bases
12.13 The pH of Salt Solutions
12.14 The pH of a Polyptotic Acid Solution
12.15 Solutions of Salts of Polyprotic Acids
12.16 The Concentration of Solute Species
12.17 Composition and pH
12.18 Very Dilute Solutions of Strong Acids and Bases
12.19 Very Dilute Solutions of Weak Acids

Chapter 13 Aqueous Equilibria (Ending with 13.13)
13.1 Buffer Action
13.2 Designing a Buffer
13.3 Buffer Capacity
13.4 Strong Acid-Strong Base Titrations
13.5 Strong Acid-Weak Base and Weak Acid-Strong Base Titrations
13.6 Acid-Base Indicators
13.7 Stoichiometry of Polyprotic Acid Titrations
13.8 The Solubility Product
13.9 The Common-Ion Effect
13.10 Predicting Precipitation
13.11 Selective Precipitation
13.12 Dissolving Precipitates
13.13 Complex Ion Formation

Chapter 14 Electrochemistry
14.1 Half-Reactions
14.2 Balancing Redox Equations
14.3 The Structure of Galvanic Cells
14.4 Cell Potential and Reactions Gibbs Free Energy
14.5 The Notation for Cells
14.6 Standard Potentials
14.7 The Electrochemical Series
14.8 Standard Potentials and Equilibrium Constants
14.9 The Nernst Equation
14.10 Ion-Selective Electrodes
14.11 Electrolysis
14.12 The Products of Electrolysis
14.13 Applications of Electrolysis
14.14 Corrosion
14.15 Practical Cells

Chapter 15 Chemical Kinetics (Ending with 15.15)
15.1 Concentration and Reaction Rates
15.2 The Instantaneous Rate of Reaction
15.3 Rate Laws and Reaction Order
15.4 First-Order Integrated Rate Laws
15.5 Half-Lives for First-Order Reactions
15.6 Second-Order Integrated Rate Laws
15.7 Elementary Reactions
15.8 The Rate Laws of Elementary Reactions
15.9 Chain Reactions
15.10 Rates and Equilibrium
15.11 The Effect of Temperature
15.12 Collision Theory
15.13 Transition State Theory
15.14 Catalysis
15.15 Industrial Catalysts
Chapter 18 Nuclear Chemistry
18.1 The Evidence for Spontaneous Nuclear Decay
18.2 Nuclear Reactions
18.3 The Pattern of Nuclear Stability
18.4 Predicting the Type of Nuclear Decay
18.5 Nucleosynthesis
18.6 The Biological Effects of Radiation
18.7 Measuring the Rate of Nuclear Decay
18.8 Uses of Radioisotopes
18.9 Mass-Energy Conversion
18.10 Nuclear Fission
18.11 Nuclear Fusion
18.12 The Chemistry of Nuclear Power

Chapter 20 Organic Chemistry II: Polymers and Biological Compounds (Ending with 20.12)
20.1 Haloalkanes
20.2 Alcohols
20.3 Ethers
20.4 Phenols
20.5 Aldehydes and Ketones
20.6 Carboxylic Acids
20.7 Esters
20.8 Amines, Amion Acids and Amides
20.9 Addition Polymerization
20.10 Condensation Polymerization
20.11 Copolymers
20.12 Physical Properties of Polymers
Exams and Quizzes

EXAM I: Thursday Feb 25 ⇒ 10:20-11:40 AM ARC 107
EXAM II: Thursday April 14 ⇒ 10:20-11:45 AM ARC 107
FINAL EXAM: TBA

RECITATION QUIZZES: Five Quizzes

Materials (Text - W.H. Freeman and Co. – Sixth Edition 2013)

(1)* “Chemical Principles: The Quest for Insight” by Peter Atkins, Loretta Jones, & Leroy Laverman
Amazon: 169/75 or ebook: ~71 Text Web Site
RU Bookstore: 198.95 new/145.00 used ---- Looseleaf 128.00 ---- e-book rental 89.99

(3)* Scientific Calculator (Required for Quizzes and Exams) “Simple” Calculator (~$15)

(4) “Student Study Guide” by John Krenos and Joseph Potenza & “Student Solutions Manual” by
Laurence Lavelle, Yinfa Ma, and Carl Hoeger ($48/$38 Amazon)

* 1&3 Required Items (Text, Study Guide & Solutions Manual on Reserve at the Math and Science
Learning Center (MSLC) Busch Campus ARC 3rd floor

Course Prerequisite PREREQ: 160:163;
COREQ: 640:136 OR 640:138 OR640:152 OR EQUIVALENTCourse

Basis for Course Grade

Exam I (80 min)  100 pts
Exam II (80 min)  100 pts
Rec Quizzes (5 × 20 pts) 100 pts
Homework 46 pts
Final Exam (180 min) 200 pts

Total 546 pts

(Possibility of Additional Bonus Questions or Homework)

Recitation Quiz Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Tuesday Recit Quiz</th>
<th>Thursday Recit Quiz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>Feb 2</td>
<td>Feb 4</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>Feb 16</td>
<td>Feb 18</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>March 8</td>
<td>March 10</td>
</tr>
<tr>
<td>Quiz 4</td>
<td>April 5</td>
<td>April 7</td>
</tr>
<tr>
<td>Quiz 5</td>
<td>April 19</td>
<td>April 21</td>
</tr>
</tbody>
</table>

Lecturer and Recitation Instructor

Dr. Setareh Marvasti, Room 126, Wright-Rieman Labs, Busch Campus,
e-mail: Marvastis@aol.com
Office Hours: TBA and by arrangement

Lecture: Tuesday 12:00 to 1:20 (SEC 203) & Thursday 10:20-11:40 AM (ARC 107)
Tuesday Recitation Section H2: 1:55 to 2:50 PM (SEC 216)
Thursday Recitation Section H1: 12:15 to 1:10 PM (SEC 216)

Course Web Site: Sakai
Text Web Site: http://www.macmillanhighered.com/Catalog/product/chemicalprinciples-sixthedition-atkins
The work on recitation quizzes (20 points each) and exams (100 points each during the semester and 200 points for the final exam) is expected to be entirely an individual effort. No makeup recitation quiz will be given. With valid documentation, a quiz can be excused. The quiz can cover material from the beginning of the semester up to the previous lecture.

Learning Goals Adopted for Chemistry Majors (boldface applies to Chem 164)

Students should demonstrate mastery of a body of knowledge represented by the basic core curriculum at each level. Students at the upper level should be able to integrate and apply a relevant body of basic knowledge to the evaluation of existing scientific studies and to the design of studies to test specific hypotheses. Students should demonstrate an ability to use and apply quantitative methods, especially: interpretation of graphical or tabular data; expression of physical, chemical, or biological process in mathematical form; and solving equations to determine the value of physical, chemical, or biological variables. Students should demonstrate the ability to master key experimental techniques used in the chemical and related physical and life science disciplines. Students should effectively communicate orally and in writing the processes of science and the results of scientific inquiry.

In their coursework, students should demonstrate mastery of the body of knowledge specified by the core curriculum. Students at the upper level should be able to apply what they have learned to problems that require the evaluation of the scientific literature and the design of studies to test hypotheses. Students should demonstrate an ability to use quantitative methods, both analytical and statistical, for modeling and interpreting the behavior of chemical systems. Students should be familiar with the basic experimental methods of organic, inorganic, analytical, and physical chemistry. Students should be able to communicate clearly, both orally and in writing, the methods used in chemical scholarship and research and the results obtained with them.

Successful completion of this course satisfies goals e and f in the Natural Sciences section of the SAS Core Curriculum. Specifically, upon successful completion of this course, a student will be able to (i) understand and apply basic principles in chemistry (Core goal e), and (ii) explain and assess the relationship between assumptions, methods, evidence, arguments and theory, in the analysis of chemistry and chemical systems (Core goal f).

Student achievement of the Core learning goals, e and f, will be assessed through a mixture of written and multiple choice exam questions during both lecture and recitation meetings aimed specifically at each of these learning goals as they related to the general chemistry course material presented.
Details of Grading

- Attendance will be taken in class. Attendance is optional, but a good attendance record may influence borderline scores positively.

- You will receive **two points** for **each homework assignment completed**: see the Syllabus for the homework assigned for each of 23 lectures. The total points for homework assignment is 46 points. You can solve the homework problems by hand and scan and upload them to Sakai under Assignments, labeled Class 0, Class 1, Class 2…Class 27. Tuesday Homework will be due by the following Friday 5:00 PM. Thursday Homework will be due by the following Monday 5:00 PM. Please use your own work; do not copy any other student’s homework, and do not copy from a solutions manual any violation will be considered a violation of academic integrity.

- **Grade lines for scores on exams and recitation quizzes will be determined based on class performance.** These lines, however, will be no higher than 90% for an A, 80% for a B, and 70% for a C. At the end of the semester, all numerical scores (exams and quizzes) will be totaled and compared to the **sum of all grade lines** to determine your course grade (A, B+, B, C+, C, D, or F). The work on recitation quizzes (20 points each) and an exam (100 points each during the semester and 200 points for the final exam) **is expected to be entirely an individual effort.** No makeup recitation quiz will be given. If you miss two quizzes with excused absences, the four quizzes taken will be scaled to 80 points.

- A “simple” calculator is required for use on all exams, preferably one with no text or equation memory. Useful constants, equations, and relationships are given on exam Information Pages.

- You can receive additional bonus questions if time permits.

**Any student who fails the final exam may fail the course regardless of the total number of points.**

There is no minimum passing score on the final exam, however anyone who scores low on the final may end up with a grade lower than his or her points might otherwise have earned. For example, a student in the C+ point range and low on the final might be given a grade of C or D (or lower). Further, we might assign a failing grade to anyone who scores very low on the final, regardless of the grade indicated by the points, depending on the circumstances.

The exams are not curved individually. At the end of the semester, a grade will be assigned based on the total score. However, a tentative and rough letter grade solely based on the exam may be given during the semester as a very rough guide as how you performed on that exam.

We will not discuss the grades and performance of other students with you.

Please understand we can only communicate with you about your issues. We cannot discuss your grades and related matters with others or with your parents.

**EXAMS (Scientific Calculators Only)**

There will be two 80-minute exams plus a 180-minute final exam.

You must take the exam at your assigned location. Locations for all exams will generally be announced in Lecture. You need to attend lecture and take notes to receive any changes to the syllabus. Do not rely on Sakai only. A periodic table and a formula sheet will be provided.

**EXAM (AND QUIZ) RULES AND REQUEST FOR CONFLICT EXAM**

(Provide documentation by the end of the second week of the course if you have a conflict)

1. For all examinations, be at your assigned location **15 minutes before** the starting time. Bring #2 pencils or pens, erasers, **and a non-graphing, non-programmable, calculator (no memory)** with spare batteries and official photo ID. Some students bring an extra scientific calculator as a back-up. Calculators may **not** be shared, and covers must be removed from all calculators. Earphones and
headphones may not be used, and hats should not be worn. Cell phones cannot be used as calculators and will be considered as a violation of the academic integrity.

2. Cell phones, ipods, and other electronic devices are not permitted, not even for use as a calculator or a watch. If you need to know the time, you can wear a watch.

3. You should not bring books, notes, backpacks, cell phones, ipods, ipads, pagers, electronic devices, laptops or any other unnecessary items into the exam room. If you do, they must be placed out of sight during the exam: at the front, back, or sides of the exam room. We are not responsible for lost or stolen items. When you leave the room, check that you have not forgotten anything, such as a photo ID card, textbook, electronic device or notebook.

4. You may NOT use scratch paper; all work will be done in the question booklet. There is plenty of room, especially if you use both sides of the paper. If you need additional scratch paper, you can let us know.

Exams take precedence over most university events; however, situations that may constitute an official exam conflict follow: 1. Student is registered for another course that meets at the same time as the scheduled final exam. 2. Another exam is scheduled for the student at the same time. 3. Athletic practice is required by a coach. 4. Religious observance. 5. Verifiable medical reasons.

If you think that you have a conflict with the final exam, be sure to read carefully about this matter in the schedule of classes.

To request permission to take any conflict exam, please e mail your lecturer at Marvastis@aol.com by the end of the second week of the course. Be sure to include the following documentation: 1. A copy of your course schedule as sent to you by the university. 2. Supporting documents to verify that a conflict exists: a note signed by a course professor or by a coach; for religious observances, attach a note verified by your Dean. All documents have to be on original letterhead with original signatures and contact telephone number for verification purposes.

If you miss an exam for unforeseen and verifiable medical reasons, you must notify the course lecturer (by e-mail) when you are capable with an explanation. Always follow the instructions of your health care professionals. Later, you must provide the lecturer with a written explanation and supporting documents. We reserve the right to verify all documentation. Make sure the documentation contains the proper letterhead and contact information. We reserve the right to verify all documentation. There are no make-up exams for the common hour exams. For students who are excused from Exam I or from Exam II, the total points will be adjusted in a way to account for the missing exam.

**ACADEMIC INTEGRITY**

All University polices on academic integrity will be strictly enforced. Any involvement with cheating, the fabrication or invention of information used in an academic exercise, or facilitating academic dishonesty of others will result in serious consequences ranging from reprimand to expulsion. Bringing information into an exam, whether stored electronically or on paper, shall be considered cheating. Having a cell phone or pager at hand during a test shall be considered *prima facia* evidence of cheating. All electronic devices, other than a scientific calculator must be completely turned off (Vibrate and standby modes are not accepted) and out of sight during testing. No gadgets (cell phones or other devices) are allowed with the ability to communicate with others during the exam (text or any other form). Cell phones and gadgets cannot be carried on you or in your pockets during the exam, as such texting is not allowed during the exam. Use of a calculator with the ability to communicate with other calculators, that are programmable, that have any permanent alphanumeric memories (“graphing” calculators) is expressly forbidden. Use of such calculators may result in a score of zero on the quiz or exam during which it was discovered and the involvement of the Office of Student Conduct and appropriate personnel. Signing for another student (for example on an attendance sheet) is considered to be a violation of academic integrity. Homework should be your individual work.
The University’s policy on Academic integrity can be found at:

http://academicintegrity.rutgers.edu/policy-on-academic-integrity

We cannot see everything that occurs in the course. If you observe any violations of the rules, you owe it to yourself and your fellow students to report it. If you do not report, you are also hurting your own grade. This will affect the overall curve. You can report it to the proctor during the exam if you would like to remain anonymous. We will treat these reports in the strictest confidence.

**CHAIN OF COMMAND**

In general, routine questions regarding course material, homework problems, quizzes, quiz absences, exam scores, etc. should be directed to your lecturer. Please do not call the chemistry department.

**WEATHER AND OTHER EMERGENCIES**

Check the Rutgers website for any information concerning campus operations due to weather conditions or other emergencies. The “Campus Operating Status” can be found at


or by going to the main New Brunswick webpage at

http://nb.rutgers.edu

Changes in schedule and other adjustments will be announced on Sakai or by email. Students are still responsible for all the material even if a particular lab is cancelled due to weather emergency.

When announcements are made, campus status information will also be available through:

- Rutgers University Facebook page
- Rutgers University Twitter (@RutgersU)
- RU-info Channel on RU-tv 23.2
- RU-info Call Center at 732-445-INFO (4636)

For more information about the university's policy concerning adverse weather conditions, please visit http://emergency.rutgers.edu/weather.shtml.

Campus status information will also be available through these media stations and their websites:

- News-12 New Jersey
- New Jersey 101.5 (FM)
- WCTC Radio (1450 AM)
- WCBS Radio (880 AM)
- The Breeze Radio (107.1 and 99.7 FM)
- WRNJ Radio (1510 AM, 104.7 and 92.7 FM)
- WRSU Radio (88.7 FM)