Principles of Chemistry II
Spring 2020 (3150:153-002/801)

Course Syllabus

Instructor: Dr. Bill Donovan, KNCL 403A, 330-972-6064, wdonovan@uakron.edu
Learning Assistant: Mr. Adi Rajiv, ar150@zips.uakron.edu, Study sessions at LIB 68 (times on Brightspace)
Lectures: TR 10:15-11:30am OR 5:45–7:00pm in MGH 111
https://zipschem.wordpress.com/@ZipsChem

As a student in 3150:153-002/801, you are responsible for knowing the policies and procedures for the course contained in this document.

Textbook and Supplementary Materials

Materials from 3150:151 in Fall 2019 will carry over.

  ➢ Connect/LearnSmart (included with new text, possible to purchase alone)
  ➢ homework is graded unless you opt out of it. Connect first used in Fall 2019 should work through Spring 2022 but must be set up again.
• OpenStax College Chemistry
  https://openstaxcollege.org/textbooks/chemistry
• A scientific calculator. (Calculators used in math courses through 3450:223 should be fine.)
• Optional
  • Preparing for Your ACS Examination in General Chemistry and online practice exam (details provided on class web site)
  • Student Solutions Manual and Study Guide for Silberberg Text
  Copies of the textbook are on reserve in the Science Library (ASEC 104), the Chemistry Learning Center (KNCL 314), and Tutorial Services (LIB 68).

Exam Dates

(You must take exams in your scheduled section.)

Exam I: Thursday, February 20 in class
Exam II: Thursday, March 19 in class
Exam III: Thursday, April 30 in class
Final Exam: Thursday, May 7
12:15pm (for AM class) or 5:15pm (for PM class).

Important Dates for Spring 2020

January 26: Last day to drop a course without it appearing on your record or to add a course. (Note that this is effectively a Friday, January 24 deadline to process adds, as the official deadline is a Sunday.)
March 1 at 11:59pm:
Deadline to process withdrawals online.

Preparation for this Course

Prerequisite: 3150:151 Principles of Chemistry I
Recommendation: 3450:149 Precalculus Mathematics

Is UA closed due to weather/emergency?
• Call (330) 972-SNOW (7669)
• Sign up for Z-Alert to receive text alerts

Classroom Courtesy

• Arriving late/leaving early? Please use the back doors and sit near the back of the class.
• Turn off sounds on cell phones in class and keep them put away.
• Do not have conversations with classmates during class. That is disrespectful and distracting.
• Laptops/tablets are allowed in class for note-taking and class-related uses that do not distract other students. Abuse of this privilege jeopardizes continued allowance of laptops and tablets in class. Examples of abuse would include (but are not limited to) watching movies, Skype, YouTube, Facebook, Twitter, etc. that are distracting in class. Turn off sound on your computer. Do not wear earbuds in class or at exams. We may limit computer use to certain rows of the classroom.
• Do not bring noisy or smelly snacks or meals to class. If others can hear your meal being opened or get sick smelling it, then it doesn’t belong in class. Food and drink are not allowed during exams.

Communication

• Your UA email account is essential in this course. If you do not use this account, you must set it up to forward messages to an account you do use.
• Allow at least 48 hours for Dr. Donovan to reply to your email message—if you don’t get a reply by then, feel free to try sending again in case it didn’t get through or was missed. (Re-sending only hours after the first try is not appreciated.)
• All email messages to Dr. Donovan must be signed by you at the bottom. We will not reply to or acknowledge receipt of unsigned messages.
• Emails that are rude or formatted as txt msgs may not receive replies. Please write emails to your instructors and TAs that are professional and courteous.

Asking Questions

• Do not request extra credit papers or projects beyond what is in the syllabus. All of the points that you can earn are described in this document.
• Don’t wait until it’s too late to ask for help.
• Ask for help or information now rather than asking for forgiveness later.
• Questions in class are welcome. Please raise your hand or otherwise signal and wait to be called—please don’t just yell out.
It is possible (likely, definite) that I may (will) deviate from the above APPROXIMATE schedule. Any changes will be announced in class.

Please note that some chapters are covered out of sequential order or in parts; this is so as to cover topics in time for those taking 3150:154 lab "reserved" on your schedule every week to get help with course material. Chemistry TAs work in the room which is equipped from use of the recitation room.

You are not required to attend the 3150:153 recitation section on your schedule, held in KNCL 314. However, that time is “reserved” on your schedule every week to get help with course material. Chemistry TAs work in the room which is equipped with computers where you can work on online homework. A copy of the full textbook solutions manual is available there as well. The schedule of open hours for the room will be posted; you can visit at any time the room is open to get help.

Attendance at the recitation section will not be recorded or considered in grading, but you may find that your grade benefits from use of the recitation room.

### Lecture Schedule (Approximate)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Day</th>
<th>Introduction: Solutions (Concentration)</th>
<th>Silberberg Text Chapter/Sections</th>
<th>OpenStax Text/Sections</th>
<th>related QUAL experiment(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January 14</td>
<td>T</td>
<td>Introduction: Solutions (Concentration)</td>
<td>13.5</td>
<td>11.3-4</td>
<td>2, 3</td>
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<tr>
<td></td>
<td>16</td>
<td>R</td>
<td>Solutions (Concentration, Saturation)</td>
<td>13.4-5</td>
<td>11.3-4</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Chemical Equilibrium</td>
<td>17</td>
<td>13</td>
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<tr>
<td>2</td>
<td>21</td>
<td>T</td>
<td>Chemical Equilibrium</td>
<td>17</td>
<td>13</td>
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<td></td>
<td>23</td>
<td>R</td>
<td>Solubility Equilibria</td>
<td>19.3-4</td>
<td>15.1</td>
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<tr>
<td>3</td>
<td>28</td>
<td>T</td>
<td>Acid-Base Equilibria</td>
<td>18</td>
<td>14</td>
<td>6</td>
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<tr>
<td></td>
<td>30</td>
<td>R</td>
<td>Acid-Base Equilibria</td>
<td>18</td>
<td>14</td>
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<tr>
<td>4</td>
<td>February 4</td>
<td>T</td>
<td>Acid-Base Equilibria</td>
<td>18</td>
<td>14:15.2</td>
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<td>19.1-2</td>
<td>14:15.2</td>
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<tr>
<td>5</td>
<td>11</td>
<td>T</td>
<td>Phase Changes, Intermolecular Forces</td>
<td>12.1-3</td>
<td>10.1-4</td>
<td>13</td>
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<td></td>
<td>13</td>
<td>R</td>
<td>Chemical Kinetics</td>
<td>16</td>
<td>12</td>
<td>4</td>
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<tr>
<td>6</td>
<td>18</td>
<td>T</td>
<td>NO CLASS: UA Presidents Day Observance.</td>
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<tr>
<td></td>
<td>20</td>
<td>R</td>
<td>EXAM I</td>
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<td>7</td>
<td>25</td>
<td>T</td>
<td>Chemical Kinetics</td>
<td>16</td>
<td>12</td>
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<td>**26 W Deadline to opt out of online homework (11:59pm, Brightspace)</td>
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<td></td>
<td>27</td>
<td>R</td>
<td>Chemical Kinetics</td>
<td>16</td>
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<td>8</td>
<td>March 1</td>
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<td>Deadline to withdraw from 15-week classes (11:59pm, MyAkron)</td>
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<tr>
<td></td>
<td>3</td>
<td>T</td>
<td>Chemical Thermodynamics</td>
<td>20</td>
<td>16</td>
<td>8</td>
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<tr>
<td></td>
<td>5</td>
<td>R</td>
<td>Chemical Thermodynamics</td>
<td>20</td>
<td>16</td>
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<tr>
<td>9</td>
<td>10</td>
<td>T</td>
<td>Electrochemistry</td>
<td>21</td>
<td>17</td>
<td>11</td>
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<tr>
<td></td>
<td>12</td>
<td>R</td>
<td>Electrochemistry</td>
<td>21</td>
<td>17</td>
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<tr>
<td>10</td>
<td>17</td>
<td>T</td>
<td>Electrochemistry</td>
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<tr>
<td></td>
<td>19</td>
<td>R</td>
<td>EXAM II</td>
<td></td>
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<tr>
<td>11</td>
<td>31</td>
<td>T</td>
<td>Structures &amp; Isomerism of Coordination Compounds &amp; Complex ions</td>
<td>23: 15.2; 19.4</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>April 2</td>
<td>R</td>
<td>Structures &amp; Isomerism of Coordination Compounds &amp; Complex ions</td>
<td>23: 15.2</td>
<td>19</td>
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<tr>
<td>12</td>
<td>7</td>
<td>T</td>
<td>Properties of Water; Solutions (Formation Process and Factors)</td>
<td>12.4-5</td>
<td>13.1-3.7</td>
<td>10.2; 11.1-3.5</td>
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<tr>
<td></td>
<td>9</td>
<td>R</td>
<td>Solutions (Formation Process; Factors; Colligative Properties)</td>
<td>13.1-3.6-7</td>
<td>11.1-5</td>
<td></td>
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<tr>
<td>13</td>
<td>14</td>
<td>T</td>
<td>Attend Knight Lecture (Dr. Marcy Towns. Purdue, at SU Theatre) today and/or 4/15.</td>
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<tr>
<td></td>
<td>16</td>
<td>R</td>
<td>Nuclear Reactions &amp; Radioactivity</td>
<td>24</td>
<td>21:12.4</td>
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<td></td>
<td>14</td>
<td>T</td>
<td>Nuclear Reactions &amp; Radioactivity</td>
<td>24</td>
<td>21:12.4</td>
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<td></td>
<td>23</td>
<td>R</td>
<td>Descriptive Chemistry of Selected Main-Group Elements</td>
<td>14</td>
<td>18</td>
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<td>15</td>
<td>28</td>
<td>T</td>
<td>ACS Conceptual Exam Trial Test 40/20 points possible</td>
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<td></td>
<td>30</td>
<td>R</td>
<td>EXAM III</td>
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<td>FINAL EXAM for 3150:153-801 (5:45 class): 5:15-7:15pm in MGH 111.</td>
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</tbody>
</table>

**OpenStax Chapter references are to OpenStax College Chemistry ([https://openstaxcollege.org/textbooks/chemistry](https://openstaxcollege.org/textbooks/chemistry)).**

‡OpenStax Chapter references are to 3150:154 experiment numbers. This column DOES NOT list the 3150:154 lab schedule—consult that syllabus for that schedule. Note that some chapters are covered out of sequential order or in parts, this is so as to cover topics in time for those taking 3150:154 lab as well as to organize material by overarching topic. A goal will be to cover material from a couple of the lab reports in our lecture class.

**The HARD deadline to opt out of graded homework is February 26 at 11:59pm. A form will be posted on Brightspace to submit your opt-out. If you do not opt out, 16% of your course total points will come from online homework. If you do opt out, Exams I-III and the Final Exam will each be worth more by 4% of the course total points. It is NOT POSSIBLE to make individual exceptions to the opt-out deadline. Again, if you do not opt out of graded homework by the deadline, 16% of your grade will be from online homework whether you do it or not! It is possible (likely, definite) that I may (will) deviate from the above APPROXIMATE schedule. Any changes will be announced in class.**
Evaluation of Your Learning

Homework (160/0 pts) End-of-chapter problem assignments will be posted on the course web site. The purpose of the homework assignments is to give you, the learner, first-hand experience in solving problems and thinking about chemistry, as well as to help you find trouble spots before exams. Online homework assignments using Connect/LearnSmart will also be posted. By default, the homework assignments will be worth 16% of your grade (160 pts). If you choose, you may opt out of graded homework and have each of the exams (including the final) worth 40 pts more by giving notice by 11:59pm on February 26, 2020 on Brightspace on the form provided.

NOTE: any “Quizzes” on our class Brightspace site are NOT those that count for a score. Technical problems with Connect/LearnSmart must be addressed to Connect tech support; no one on the UA campus (including TAs or Dr. Donovan) is capable of helping with such issues.

Class Conduct/Attendance (20 points) You are responsible for all information, including assignments, policy changes, schedule changes, etc., announced in class whether you are present in class or not. I make every effort to start class on time. Everyone gets a day of grace, including me, for tardiness and early departure. Class is over when I say it’s over. Laser pointers in the hands of anyone other than the instructor are PROHIBITED in our class. Possession or use of a laser pointer will result in immediate university-level disciplinary action.

Should extensive illness or other problems require that you miss a number of classes, you should drop the course and take it when you are feeling better. UA does NOT close for religious holidays. If you must miss for religious holidays, you must catch up on material with a classmate.

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Consult the front page of this syllabus for guidelines for classroom conduct and courtesy. You can LOSE the 20 points for classroom conduct by not following these guidelines (e.g., disrupting class with conversations, excessive tardy entrances) or not following instructions (e.g., destroying property such as final exam booklets by writing all over them). Extreme instances of disruption or discourtesy will result in the offender being asked to leave the room after showing identification so we know who to deduct points from.

Hour Exams (200/240 points each) Three hour exams will be given in class. Each of these exams will be given starting at the beginning of our regular class period. Management reserves the right to arrange alternate exams in advance as needed for legitimate, verifiable, and excusable reasons, but it is generally nearly impossible to make up an exam anytime later than the day the class takes the exam. You should not count on making up a missed exam, no matter the reason! If a make-up exam is possible, it will certainly be different/harder than the exam of the class took. Do not arrive more than 20 minutes late to an hour exam. No one will be allowed to leave during the first 20 minutes of the exam. No one will be allowed to enter and begin the exam more than 20 minutes after the exam has begun. Bring pencils, eraser, calculator, and ID to each exam. You may be required to erase the memory register of your calculator at any time before or during exams. iPods, tablets, Palm devices, cell phones, and devices with a QWERTY keyboard are not acceptable for use during exams or quizzes. Each student is responsible for bringing his/her own calculator to each exam. Sharing of calculators by students is not allowed during exams. Spare calculators will NOT be available for loan. At some exams, the use of calculators may be prohibited. The only materials you are allowed to have at your desk during exams are pencils, calculator (unless prohibited), eraser, Zip Card, exam paper, and scan sheet. No identification means no exam! The only acceptable form of ID at an exam is your Zip Card. A driver’s license or passport is not acceptable because it does not identify you as a student and does not include your student ID number. (You are required to carry your Zip Card on campus at all times anyway.) You will not be allowed to use the restroom during exams, including the final exam. If you think you may need to “go” during the test, then you should “go” before the test starts.

ACS Trial Test (20/20 points) An American Chemical Society 40-question trial test consisting of conceptual questions on course material will be given in class on April 28. You will earn 1 point per correct answer.

Final Exam (200/240 points) An American Chemical Society Division of Chemical Education standard exam over all course material will be given at the date and time scheduled by UA. If your score on the final exam is higher than your score on your lowest hour exam, then the lowest hour exam score will be replaced by your final exam score. Just as for other exams in our course, you MUST have your Zip Card in order to take the final exam.

Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight (pts)</th>
<th>Maximum (pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour Exams</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>Online Homework (SmartWork)</td>
<td>16</td>
<td>160</td>
</tr>
<tr>
<td>Conduct/Attendance</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>ACS Conceptual Trial Test</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Comprehensive Final Exam</td>
<td>200</td>
<td>240</td>
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<tr>
<td>TOTAL</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

Your course grade will be determined based on the following guaranteed grade cutoffs. Lower cutoff ranges may be used if the deemed appropriate.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Cutoffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>850-1000</td>
</tr>
<tr>
<td>B</td>
<td>750-849</td>
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<tr>
<td>C</td>
<td>650-749</td>
</tr>
</tbody>
</table>

In the event of a major campus emergency, course requirements/deadlines/grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Such changes would be communicated by email and on the course web site.

Disabling Conditions

The University seeks to fully comply with the Americans with Disabilities Act. To respect the needs of those whose disabilities may not be outwardly apparent, please allow us to “reserve” certain seating locations in the classroom to accommodate special needs.

Students who may require classroom or testing accommodations must discuss this matter with the instructor as soon as possible. Appropriate documentation must be provided before accommodations can be made. Contact the Office of Accessibility (SI 105, access@uakron.edu) for further information.

If you set up exams at the Access Office or the Testing Center, you MUST email me to let me know that you set up your test and the date, time, and place you set up.

Such tests must be taken no later than the class takes them (no tests the next day). Except for the final exam, tests taken at the Access Office or Testing Center must be returned to me in a sealed envelope at our class time in order to be graded with the rest of the class.
University Policies

All applicable UA policies are in force in this course. This includes, but is not limited to:
• Civility Statement
• Tobacco Policy
• Student Code of Conduct

The University of Akron is committed to providing an environment free of all forms of discrimination, including sexual violence and sexual harassment. This includes instances of attempted and/or completed sexual assault, domestic and dating violence, gender-based stalking, and sexual harassment. Additional information, resources, support and the University of Akron protocols for responding to sexual violence are available at uakron.edu/Title-IX.

Progress Report Forms

If you require paper progress reports to be completed during the semester, you will be asked to provide the progress report form(s) by announced deadlines. Forms not submitted in a timely manner or by students who do not identify themselves on time may be delayed in processing.

Academic Integrity/Cheating

https://www.uakron.edu/studentconduct/academic-misconduct-procedure.dot

Cheating is a problem that I hope I will not have to deal with in this course. Violations of the academic integrity code include plagiarism, cheating, and other forms of academic dishonesty. The minimum penalty for violations of this policy is a grade of “F” in the course and referral to Student Judicial Affairs procedures.

Some Sources of Help for Principles of Chemistry II

✓ Tutorial Services
  o LIB 68, (330) 972-6552, www.uakron.edu/tutoring/subject-tutoring/
  o Adi’s study sessions will be held here.
✓ Chemistry Learning Center, KNCL 314 (Your recitation section is scheduled in this room.) TAs in chemistry are available there during posted hours.
✓ Dr. Donovan
  o best to make an appointment (email is easiest).
  o hours will be posted weekly and may have to change week to week—check web site.
✓ Private tutors: see Chemistry Department office (KNCL 103) for list

A University is like a Health and Fitness Center for your Brain.

When you pay tuition to an academic institution such as UA, it is like paying fees to join a Health and Fitness Center. UA is a place to exercise and develop your brain "muscle": health clubs or fitness centers focus on exercising other muscles of your body. Your membership in a "mental exercise club" such as UA gives you the opportunity to take advantage of the resources UA makes available to exercise your brain just as joining a health club gives you the opportunity to take advantage of the health club’s equipment and resources. Simply being a member of either "club" does not guarantee success. As with a health club, the benefit you gain from a "mental exercise club" depends on the amount, and more importantly, the quality of effort you exert.

Strategies That Can Help Improve Your Performance

• Assume that pleading ignorance or begging forgiveness will "get you off the hook".
• Reject the idea that you need to explore different ways of learning.
• Rely on student folklore and rumors as your main sources of information.
• Underestimate the amount of time and effort required to master content material.
• Assume you understand a topic simply by recognizing or recalling a word or phrase.
• Think that plugging-and-chugging through the math shows you understand the concepts.
• "Psych yourself out": Convince yourself that you just aren't "the type" to learn chemistry.
• Believe that your learning depends on "liking" the instructor or the instructor "liking" you or that you can't understand or learn from those who speak with an "accent" (refer to the first item on this list).

Strategies That Can Help Improve Your Performance

- It is normal to feel a bit frustrated when learning something new. Only time, patience and practice will allow you to work through the frustration and to learn new things.

Attend Lectures: Listen and Participate

- "True" learning usually does not occur by seeing something once or watching someone else do the work. Learning something well requires repeated exposure and practice.
- Read the sections in your textbook that are relevant to lectures before and after lectures are given.

Read Differently

- Read technical material (like your chemistry textbook) differently than you would read a novel. Read in short "chunks" and give yourself time to reflect and interpret the information presented. With technical material, it is often difficult to pick up the "story" in the second paragraph if you do not process the first paragraph.
- Read technical material in a "distraction free" environment. Processing technical information will be more effective in the absence of TVs, radios, headsets, etc.
• Read and interpret subheadings. With technical material, the subheadings often carry important information. This is different from the chapter titles in a novel, which usually contain no information.
• Use the textbook as a reference when you study your lecture notes or lab materials. Fill in any gaps and correct any incorrect information.

Review Lecture Information:
Rewrite Lecture Notes, Review Notes with Your Study Group
• Use these techniques to provide yourself with repeated exposure to the topics.

Practice, Practice, Practice
• For some students, the material in 3150:153 will seem like a review of what you studied in high school. However, you may not remember the information well enough to be able to work quickly and accurately during a timed exam.
• Work problems on previous exams without the answers. (You will not have the safety net of answers during an exam.) Check your answers only after you have completed all of the problems you plan to work. Work as many problems as you can. Work additional problems at the end of each chapter that were not assigned as homework.
• Look for similarities and differences in problems (homework, lab problems, previous exams). Classify problems by the type of knowledge that is needed to solve the problem rather than by section number in the text.

Ask Questions
• Take advantage of the fact that we want to see you do well and are happy to answer any of your questions. However, we cannot read your minds—if you need help, you need to let us know!

Don't Procrastinate!!
• Learning new things and being able to work with those ideas quickly will take time and practice. Work several problems each day but don't spend hours trying to work a problem if you are getting nowhere. Make a note and seek help with the problem within the next day or two during office hours.
• Do not try to master several weeks of technical material like chemistry the night before the exam - despite what you might hear from other students, this simply does not work. Even if you have the information in your short-term memory, you will only forget the material and have to relearn it for later exams.
• Get sufficient rest to help maintain your physical and mental health. Staying up all night before an exam actually produces lower exam scores than studying the course material regularly and getting a good night's sleep before an exam.

Credits: Dr. Thomas Dukes, Dr. Susan Nurrenbern

Learning Outcomes (OBR/TAGs)
This course addresses the learning outcome guidelines of the Ohio Board of Regents’ Transfer Assurance Guidelines for the lecture portion of the second semester of General Chemistry. These guidelines are quoted below for your information.

OSC 009–GENERAL CHEMISTRY II (w/lab)  4-5 semester hours
Text Topics: Lecture to include a standard modern general chemistry text designed for a full year sequence of general chemistry for science majors.
Prerequisites: General Chemistry I
General Course Description: A continuation of the study of the principles of chemistry, including solution properties; acids and bases; chemical equilibrium; thermodynamics; reaction kinetics; and electrochemistry.
Note: These outcomes were aligned with the American Chemical Society (ACS) recommendations in mind.
Learning Outcomes: Students must be proficient in all of the following core competencies:

1. Intermolecular forces and phase changes
2. Solutions and colligative properties
3. Chemical kinetics
4. Chemical equilibrium
5. Acid-base and solubility equilibria
6. Thermodynamics (including entropy and free energy)
7. Electrochemistry
8. Descriptive chemistry, including chemical properties and periodic patterns of reactivity
9. Societal applications of chemistry
10. Chemical problem solving using algebraic methods

Learning Outcomes 11-13 pertain to 3150:154, Qualitative Analysis Laboratory.

Source: Ohio Board of Regents  http://regents.ohio.gov/transfer/tags/course_descriptions/

Learning Outcomes (UA/HLC)
At completion of the course, students in 3150:153-002/801 should be able to
1. predict the extent of chemical processes under various conditions given pertinent thermodynamic information.
2. describe the qualitative contents of aqueous solutions of acids, bases, buffers, and salts at equilibrium and the effects of variation of quantities of components of these solutions.
3. predict and calculate the quantitative contents of aqueous solutions of acids, bases, buffers, and salts at equilibrium.
4. relate energy changes in chemical processes to spontaneity and work.
5. describe the components of galvanic and electrolytic cells, and calculate cell potentials and electrolysis quantities.
6. calculate, describe, and compare factors that affect the rates of chemical reactions.
7. identify how molecular, atomic, and subatomic structure influence observed properties of substances.
8. describe the relationships between molecular structure and solubility and calculate colligative properties of solutions.