

# CH 2335: General Chemistry I

Plymouth State University, Fall 2014

<u>Section</u>	<u>Lecture room</u>	<u>Lecture Time</u>	<u>Instructor</u>	<u>Lab time</u>	<u>Lab room</u>
CH2335.02	Boyd 239	MWF 10:10 am	Dr. Jeremiah Duncan	Th 9:30am-12:15 pm	Boyd 207
CH2335.04	Boyd 239	MWF 12:20 pm	Dr. Aparna Waghe	M 1:25-4:10 pm	Boyd 207
CH2335.05	Boyd 239	TTh 9:30 am	Dr. Kimberly Duncan	T 2:00-4:45 pm	Boyd 207
CH2335.06	Boyd 239	TTh 11:00 am	Dr. Kimberly Duncan	Th 2:00-4:45 pm	Boyd 207
CH2335.07	Boyd 239	MWF 11:15 pm	Dr. Aparna Waghe	W 1:25-4:10 pm	Boyd 207
CH2335.08	Boyd 239	MWF 9:05 am	Dr. Jeremiah Duncan	T 9:30am-12:15 pm	Boyd 207

**EXAM DATES:** All mid-term exams are “common” (all sections meet together) and will be administered in **Boyd 144, 6:00-9:00 pm on the following Mondays: Sept 29, Oct 27, Nov 24.** IN THE EVENT YOU HAVE A CONFLICT of any reasonable nature, *if you contact your Instructor at least one week before the exam date to request an alternate exam time*, all reasonable efforts will be made to accommodate your request.

## INSTRUCTORS:

### Dr. Jeremiah Duncan

Office: Boyd 122

Phone: 535-2289

E-mail: jsduncan@plymouth.edu

Office Hours: Mon, Thurs 1 – 3 pm

### Dr. Kimberly Duncan

Office: Boyd 118

Phone: 535-3356

E-mail: kaduncan@plymouth.edu

Office Hours: Thurs 12:30 – 1:30 pm  
Fri 11 am – 1 pm

### Dr. Aparna Waghe

Office: Boyd 118A

Phone: 535-3251

E-mail: aawaghe@plymouth.edu

Office hours: Mon, Wed, Fri 10 – 11 am  
Tues 10:30 – 11:30 am

## LAB COORDINATOR:

### Mrs. Marguerite Crowell

Office: Boyd 118B

Phone: 535-2272

E-mail: mcrowell@plymouth.edu

**TUTORS:** Available some evenings in Boyd 138. See Moodle or postings outside of Boyd 138 for schedule.

## I. Introduction

CH 2335 is the first semester of a two-semester sequence in general chemistry. The course sequence CH 2335 and CH 2340 satisfies the general chemistry requirement for science majors. It is assumed that students enrolled in this course have basic quantitative skills that include algebra. Below is the catalog description:

Fundamental principles and theories of chemistry including intermolecular forces, atomic and molecular structure, chemical reactions and thermochemistry. The laboratory component includes basic laboratory techniques and complements and reinforces classroom concepts. Not open to students who have earned credit for (CH 2130 and CH 2230) or CH 2330. Additional course fee required. Falls. (QRCO)

Chemistry is an analytical and quantitative science, requiring problem solving and understanding from a scientific perspective. This includes reasoning by analogy, using models to visualize the atomic world, practice with problem-solving tools such as dimensional analysis, and the use of common sense. In this course, these skills are developed through the introduction of fundamental principles and theories of chemistry, including atomic and molecular structure, chemical reactions and thermochemistry.

The laboratory is an essential component of the curriculum, wherein students learn some of the basic laboratory skills used to understand the physical and chemical properties of matter. Students learn to read and make sense of laboratory procedures, make careful observations and measurements, and organize, record and analyze data in a laboratory notebook and write a laboratory report.

## II. Course Objectives / Student Learning Objectives

Chemistry is the study of matter and the changes it undergoes. Chemistry is known as the central science, not only because it is central to the study of other sciences, but also because it is central to our understanding of the natural world. Everything we see, touch, smell and feel is matter, and all of our senses transmit information via chemical interactions. In addition, most of the pressing societal issues involve chemistry. Thus our ability to understand and evaluate these issues demands a basic knowledge of the chemical sciences. Consequently, the objective of this course is to develop in students fundamental chemical understanding, analytical thinking, and problem solving skills in the following areas:

- Atomic structure, including quantum mechanical principles and the interaction between light and matter.
- The periodic repetition of the properties of elements, which underlies the structure of the Periodic Table
- The application of the electromagnetic force (interactions between positive and negative charges) to atomic particles, atoms, and molecules, including how this force holds matter together and is responsible for chemical properties and reactions.
- Structure and bonding in molecules
- The conservation of mass in chemical reactions, and by extension, concepts of stoichiometry and limiting reagents
- Energy considerations in chemical systems and changes. The following two general rules apply universally: (1) Systems are more stable at lower energy, and (2) During change, energy is conserved ( $\Delta E_{\text{net}} = 0$ ).

## III. Required Materials

### Course Materials:

- Required text: *Chemistry and Chemical Reactivity* (8<sup>th</sup> ed) by Kotz, Treichel, and Townsend, Brooks/Cole publishing, (2011). Note: several formats are available including hardbound, softbound, electronic (ISBN 9781111305239) and hybrid (ISBN 9781111574987). You do NOT need access to the publisher's OWL online system, so it is OK to purchase used textbooks or rent textbooks.
- An account with Sapling Learning (<https://www.saplinglearning.com/ibiscms/login/index.php>)
- Highly recommended: Molecular modeling kit
- A **non-programmable** scientific calculator: must be brought to every class and lab period. You should understand how to use various buttons/functions such as parentheses, log, ln,  $e^x$ ,  $10^x$ . Calculator apps on smart phones, tablets, etc. will NOT be allowed on exams.

### Lab Materials:

- Safety glasses (available in Boyd 124 for \$5)
- Lab Notebook: Composition book with sewn binding.

## IV. Format and Procedures

In the practice of chemistry, chemists (and other scientists) work collaboratively to design experiments, evaluate data, and then develop models to explain the results. Molecular level models are developed to both explain the results of the system under study and allow predictions of outcomes of additional experiments. This process is central to the practice of chemistry and is the approach that will be used in this class.

Many students will find the format for this course different from previous science courses. In a typical class, you will perform a simple experiment or will be provided with data, and then will be asked to develop a general concept. You will then be challenged to apply these concepts to answer questions and solve problems, first working in groups in class and later on other homework assignments. You are strongly encouraged to carefully read the text for a more thorough explanation of the various concepts and to see worked problems.

In-class worksheets will be distributed and should be maintained in a notebook, along with observations and notes, to be used as reference for subsequent assignments, quizzes and to study for exams. *Quizzes are given at least once a week to encourage good study habits.*

## V. Expectations

Students are expected to attend class regularly, come prepared, participate in in-class problem solving, ask questions, and take an active role in discussions. Students should regularly login to Moodle to check assignments and posted material and to Sapling Learning to check and work assigned homework. Students

should prepare for class by reading the assigned text material. After class, students are expected to complete any assignments.

Although the amount of study time required to master the material in this course will vary from student to student, STUDENTS SHOULD EXPECT TO SPEND THREE HOURS OUTSIDE OF CLASS FOR EVERY HOUR IN CLASS. This work should be done *on a regular basis*, not saved until a day or two before the exam.

## VI. Grading/Assessment

The grades from the various components of the course will be weighted and combined to determine the overall grade percentage using the following scheme:

<u>Lecture Portion</u>		<u>Lab **</u>	
Hour Exams (3):	30%	Notebook (w/ attendance and protocol)	15%
(lowest of 3 grades may be replaced by Final)		Lab Practical Exam	10%
Final Exam:	15%		25%
(or 25%, if one Hour Exam dropped)			
Online homework (Sapling):	15%		
Quizzes:	<u>15%</u>		
	75%		

The final letter grade will be determined from the overall percentage according to the following\*\*:

A	93%	B-	80%	D+	67%
A-	90%	C+	77%	D	63%
B+	87%	C	73%	D-	60%
B	83%	C-	70%	F	less than 60%

\*\*Note: The lab portion of the course counts 25% toward your final grade. However, you MUST EARN A PASSING GRADE IN THE LABORATORY PORTION IN ORDER TO PASS THE COURSE.

Fair Grading Policy. A primary goal of every General Chemistry Instructor is the grading of all students in the most objective, fair, and equitable way possible, both within a given course section and across all sections. In accordance with the Fair Grading Policy at Plymouth State University, the overall grading scheme and descriptions of its individual components are given here in this syllabus, with the intention that students should know the criteria used to assign grades to all in the course. Students should be aware that it is a violation of the Policy for a particular student or group of students to be allowed to substitute or perform additional work in an attempt to alter a final grade, when such an option is not offered to all students in the course. Students have the right to challenge grades or practices appearing to be inequitable between students. If any student is concerned about a potential violation of the Fair Grading Policy, he or she must first raise the issue with the instructor of the course. If the concern remains unresolved, it may then be raised with the chair of the instructor's department, then with the Associate Vice President for Undergraduate Studies, and finally with the Faculty Academic Affairs Committee. If students have any questions about the Fair Grading Policy, particularly regarding raising concerns about potential violations, they are urged to read the policy, which can be found at <https://www.plymouth.edu/undergraduate/files/2010/11/Fair-Grading-Policy.pdf>.

Attendance to Lecture is *not* required and does not directly factor into your grade. However, **you are responsible** for any and all material covered and announcements made in lectures that you miss. Furthermore, quizzes will be given during lectures, and **no accommodations will be made to make up missed quizzes**. IT IS STRONGLY RECOMMENDED that you make all efforts to attend every lecture. For the university policy on class attendance, see <https://www.plymouth.edu/undergraduate/files/2010/11/Class-Attendance-Policy.pdf>

Hour Exams and Final Exam are designed to evaluate the descriptive, conceptual and problem-solving goals of the course. Three "Hour Exams" and the Final Exam will be given on the dates indicated in the course schedule below. **The Final Exam is cumulative.** The Final Exam may be double-counted and the lowest hour exam grade dropped, if this will improve your final grade. ALL HOUR EXAMS WILL BE GIVEN 6-8 PM ON THE DATE OF THE EXAM (see *Schedule* below). Arrive on time! Late admissions will not be allowed without

prior consent. Make-up exam times will be scheduled for students who have conflicts with these evening times. Times for make-up exams will be announced in class and posted on Moodle. *If you have a conflict and wish to take the exam at one of the make-up times, you must notify your instructor one week in advance of the exam.*

Online Problem Sets by Sapling. An online homework system provided by Sapling Learning ([www.saplinglearning.com](http://www.saplinglearning.com)) will be used to assign weekly problem sets. At the discretion of your instructor, the lowest score on problem sets may be dropped. **Students are required to have an active account with Sapling Learning.** Details about the registration, access, and use of the system will be provided in class and on the Moodle Meta site. Note that you will be given the option of paying for one or two semesters. If you intend to continue into CH 2340: Gen Chem II in the Spring, you may purchase two semesters and receive a discount. Also note that Sapling will grant students free access for approximately the first two weeks of the semester, if you are unable to pay right away or are uncertain you will remain in the course.

OWL online system. New and electronic versions of the textbook come with a code granting access to the OWL online system provided by Cengage Learning ([www.cengage.com/owl/](http://www.cengage.com/owl/)). **Students are NOT required to have an OWL account.** However, if you do purchase a book with an access code, you may find an array of helpful tutorials on the OWL system.

Quizzes are designed to promote good study habits and to indicate areas of strength and weakness for student and instructor; quizzes assess both conceptual and problem-solving goals. Short quizzes will be given once or twice weekly. At the discretion of your instructor, at least one quiz score will be dropped. **Note that it is NOT possible to make up a quiz due to absence unless you miss class due to official University business (such as an athlete attending a scheduled event), and you notified your Instructor of the planned absence in advance.** The dropped quiz(zes) will otherwise allow students to miss at least one quiz without penalty, regardless of whether the absence was excused.

Reading and Homework Assignments: Readings from the textbook are given in the *Schedule* and the Worksheets. It is highly recommended that you keep up with the reading and try to read the appropriate sections before coming to class! Suggested end-of-chapter problems from the book will be noted in the Worksheets. These are provided to help you solidify your understanding of concepts and to prepare for quizzes/exams. These problems will NOT be collected or graded. Note however that variations of many of these problems will appear on the subsequent quizzes and Hour Exams. Also note that the hybrid version of the text does not include these problems, but they are available on OWL and will be otherwise made available for students who do not have them in their textbook.

## **VII. Laboratory**

The laboratory component of General Chemistry I is fully integrated into the course and accounts for 25% of your final grade. The lab manual is available on Moodle.

### Aims and Objectives of the Laboratory

Your active involvement in scientific inquiry in lab will allow you to:

1. Be introduced to various processes and techniques used in chemical investigations.
2. Gain a better understanding of topics and concepts introduced in class by the collection and analysis of data related to those concepts.
3. Parallel the manner in which scientists really study the natural world

## Laboratory Policies

- **Safety** is the number one most important consideration in the laboratory. You are required to review and agree to the Safety Policies for the lab by taking the "Safety Quiz" on Moodle. As instructed in the Safety Quiz, **you MUST print out and bring the final page stating you completed the quiz before being admitted to the first lab period.** Any unsafe behavior in lab may result in your expulsion from that lab and a zero for the day.
- You should arrive at lab prepared to conduct the work, having done the pre-lab work assigned. Generally this includes reading the lab procedure and writing a "Purpose" and summarized "Procedure" in your lab Notebook. At the discretion of your Instructor, you may not be admitted to lab if your pre-lab work is not completed before lab.
- You must have your lab Notebook initialed by the instructor upon entering and before leaving the lab.
- **Attendance is mandatory.** Students work cooperatively, and absences affect the success of the group. Attendance is noted in your Notebook, and unexcused absences will result in a zero for the labs missed, when your Notebook is graded (Notebook grade is worth 10% of your overall grade). Students who seek an excused absence (e.g. for a sports event) should see their instructor prior to their planned absence to try to arrange a make-up lab in another section.
- Late arrivals will not be tolerated. If you are late to lab, your tardiness will be noted in your Notebook and will negatively affect your Notebook grade. At the discretion of your Instructor, you may not be admitted.
- All data, observations, calculations, graphs, and conclusions are to be recorded in the lab Notebook.
- Although students work cooperatively in collecting data, each student is responsible for his/her own analysis and write-up.
- You are responsible for maintaining a clean lab station. Points will be lost if the lab station is not clean.

## The Laboratory Notebook

An important part of experimental work is the maintenance of a lab Notebook. The overriding principle of a lab Notebook is that another person, who is reasonably familiar with the field, should be able to read your Notebook and 1) understand what you did, 2) draw similar conclusions from your results, and 3) repeat the experiment. Thus, the Notebook should:

- be an accurate record of your work in the lab;
- be brief and concise, but contain enough information so that another person could repeat the experiment. In other words, if an error occurs, there should be enough detail so the mistake can be traced.

You are expected to keep a good laboratory Notebook and will be graded on your ability to do so. Your Notebook will be collected and graded twice during the semester. For guidelines on keeping your Notebook, see the document "Keeping a Laboratory Notebook" on the Moodle Meta site. It will be assumed that you have read and understood this document when your Notebook is graded.

## The Laboratory Practical Exam

One Practical Exam will be given the last week of regular classes during the laboratory period. The Exam will be modeled after the techniques and calculations learned during Lab 10 the week previous. Students will be expected to work individually to perform an experiment and complete the required calculations in the allotted time. The exam is designed to test understanding of theoretical background of the experiment, lab techniques, the ability to gather accurate data, and the ability analyze results and draw proper conclusions from them. Further details about the Exam will be provided in lab in advance and also posted on Moodle Meta site.

### **VIII. Student Support**

Many students find General Chemistry among their most challenging courses. Students are encouraged to work with each other on assignments, to study together for quizzes and exams, and to take advantage of faculty office hours and tutoring. Working with peers is among the most successful way to improve problem-solving skills and address misconceptions. The Chemistry Resource Center (Boyd 138) is a place where students may work together and attend scheduled tutoring sessions. Tutoring sessions are staffed by students who were successful in General Chemistry and are interested in helping other students learn chemistry. The sessions are held during the week in the late afternoon and early evening (see Moodle Meta site for schedule).

### **IX. Academic Integrity**

All PSU policies regarding ethics and honorable behavior apply to this course. Academic dishonesty, including any form of cheating, is regarded as a very serious offense and will result in severe consequences, including zeros on assignments, labs, and exams, and/or a failing grade in the course (including a note in your transcript). Although students are encouraged to study together, **EVERY ASSIGNMENT YOU HAND IN MUST BE YOUR OWN WORK**. Students are expected to abide by the PSU Code of Academic Integrity. See: <https://www.plymouth.edu/undergraduate/files/2010/11/Academic-Integrity-Policy.pdf>

### **X. Special Accommodations**

Plymouth State University is committed to providing students with documented disabilities equal access to all university programs and facilities. If you think you have a disability requiring accommodations, you should immediately contact the PASS Office in Lamson Library (535-2270) to determine whether you are eligible for such accommodations. Academic accommodations will only be considered for students who have registered with the PASS Office. If you have a Letter of Accommodation for this course from the PASS Office, please provide the instructor with that information privately so that you and the instructor can review those accommodations.

### **XI. Electronic Resources**

Students registered for the course will have access to two Moodle sections:

1. A Section Specific site containing:
  - a) Gradebook
  - b) Section specific content: any specific content your instructor has for your section
2. The Meta site containing:
  - a) Course Content: this syllabus, tutoring schedule, exam review material, etc.
  - b) Calendar: weekly assignments, Lab schedule, exam dates etc.
  - c) Announcements: information on any changes in assignments, tutoring schedule, etc..
  - d) Web Links. Useful sites on the Web.
  - e) Lab Materials: The Lab Manual, Safety Quiz

Students **MUST** register an account with the online system provided by Sapling Learning ([www.saplinglearning.com](http://www.saplinglearning.com)) and regularly check/utilize this account to access and work on online graded problem sets.

E-mail is the primary avenue for communication between students and instructors outside of class. You should regularly check your [plymouth.edu](http://plymouth.edu) email account for course announcements, etc.

### **XII. Course Schedule and Inclement weather policy.**

Please see the following page for the Course *Schedule*. All efforts will be made to stick to this schedule, but changes may be made throughout the semester and with limited notice. We will follow the University's lead on class cancellation during inclement weather. However, students are urged to use their best judgment when assessing road conditions and their ability to safely get to campus. Please be flexible as we work to make up for the missed class time. Significant changes will be announced on Moodle and via email.

## Tentative Course Schedule

The following is a rough schedule of the semester. Lab procedures will be posted on the Moodle Meta site and given in class. Although the coverage of topics may be altered slightly over the course of the semester, the hour exam schedule will not change. All efforts will be made to stick to this schedule, but changes may be made throughout the semester and with limited notice.

Week	Date	Topic	Reading	Lab
1	Sep 3	<b>Classes meet Wed – Fri</b> Basic Concepts of Chemistry Tools of Quantitative Chemistry	Ch 1.1-1.8 Let's Review 1-6	<b>NO LABS</b>
2	Sep 8	The Nature of Light and Matter.	Ch 6.1-6.4 <i>Mon: PS 1 due 11:59pm</i>	Lab 1(M-F): Chemical Calculations
3	Sep 15	The Quantum Mechanical Model of Atoms	Ch 6.5-6.7 <i>Mon: PS 2 due 11:59pm</i>	Lab 2(M-F): Spectroscopy and the Bohr Atom
4	Sep 22	Electron Energies and Configurations  The Periodic Table and Periodic Trends	Ch 7.1-7.6, Ch 2.5 <i>Mon: PS 3 due 11:59pm</i>	Lab 3(M-F): Stoichiometry in compounds, Part A
5	Sep 29	<b>EXAM 1: Mon, Sept 29, 6pm, Boyd 144</b> Atom Number, Mass, and Weight	Ch 2.1-2.4	Lab 4(M-F): Stoichiometry in compounds, Part B
6	Oct 6	Molecules and Compounds	Ch 2.6-2.11 <i>Mon: PS 4 due 11:59pm</i>	Lab 5(M-F): Lewis Structures
7	Oct 13	<b>Mon: NO CLASS; Fall Holiday</b> Molecular Bonds and Structure	Ch 8.1-8.9 <i>Tues: PS 5 due 11:59pm</i>	<b>NO LABS</b>
8	Oct 20	Bonding and Hybridized Orbitals	Ch 9.1-9.2 <i>Mon: PS 6 due 11:59pm</i>	Lab 6(M-F): VSEPR and Molecular Structure
9	Oct 27	<b>EXAM 2: Mon, Oct 27, 6pm, Boyd 144</b> Chemical Equations and Types of Chemical Reactions	Ch 3.1-3.6, 3.8	Lab 7(M-F): Solubility and Net Ionic Reactions

Week	Date	Topic	Reading	Lab
10	Nov 3	Stoichiometry, Limiting reagents, percent yield, concentrations	Ch 4.1-4.3 <i>Mon: PS 7 due 11:59pm</i>	Lab 8(M-F): Limiting Reagents
11	Nov 10	<b>Tues, NO CLASS; Veteran's Day</b> Stoichiometry in Solution	<i>Mon: PS 8 due 11:59pm</i> Ch 4.5-4.7	<b>NO LABS</b>
12	Nov 17	Intermolecular Forces	Ch 12.1-12.5 <i>Mon: PS 9 due 11:59pm</i>	Lab 9 (M-F): Boiling Points of Liquids
13	Nov 24	<b>EXAM 3: Mon, Nov 24, 6pm, Boyd 144</b> Specific Heat <b>Wed-Fri: NO CLASS; Thanksgiving</b>	Ch 5.1-5.2	<b>NO LABS</b>
14	Dec 1	Energy and Chemical Reactions	Ch 5.3-5.8 <i>Mon: PS 10 due 11:59pm</i>	Lab 10(M-F): Determining the Enthalpy of a Chemical Reaction
15	Dec 8	Ideal Gases	Ch 11.1-11.7 <i>Mon: PS 11 due 11:59pm</i>	<b>Lab Practical Exam</b>

**FINAL EXAMS (Boyd 239):**

<u>Section</u>	<u>Lecture Time</u>	<u>Instructor</u>	<u>Exam time</u>	<u>Exam Location</u>
CH2335.02	MWF 10:10 am	Dr. Jeremiah Duncan	Fri, Dec 19, 8-10:30am	Boyd 239
CH2335.04	MWF 12:20 pm	Dr. Aparna Waghe	Wed, Dec 17, 11am-1:30pm	Boyd 239
CH2335.05	TTh 9:30 am	Dr. Kimberly Duncan	Tues, Dec 16, 8-10:30am	Boyd 239
CH2335.06	TTh 11:00 am	Dr. Kimberly Duncan	Thurs, Dec 18, 11am-1:30pm	Boyd 239
CH2335.07	MWF 11:15 pm	Dr. Aparna Waghe	Mon, Dec 15, 11am-1:30pm	Boyd 239
CH2335.08	MWF 9:05 am	Dr. Jeremiah Duncan	Wed, Dec 17, 8-10:30am	Boyd 239



### **XIII. Fulfillment of General Education Requirements**

CH 2335 "General Chemistry I" fulfills the Quantitative Reasoning in the Disciplines Connection (QRCO) requirement of the General Education Program at Plymouth State University.

Description: *Quantitative Reasoning in the Disciplines*\*\* (3 credits within the major): Mathematics finds application in all fields of scholarship. All disciplines make use of quantitative reasoning in some way and to some extent. Students take a three-credit Quantitative Reasoning (Q) course specified as required for their major. This course may be taught within the major discipline or not. It might teach quantitative techniques used as primary or secondary tools within the discipline or might be a course in which students of less quantitative disciplines come to deepen their appreciation of the relevance of quantitative reasoning to us all.

Skills to be developed / enhanced: A firm understanding of Chemistry requires the use of quantitative mathematical skills applied to theoretical analyses and real-life problem solving. Students will use fundamental algebra skills including:

- Solving equations for unknowns
- Using functions (e.g. log and natural log) and their inverses
- Deriving equations from first principles

In addition, quantitative skills related directly to chemical and more broadly scientific principles will be developed, including:

- Balancing energy, mass, and charge
- Converting units (dimensional analysis) and quantities
- Examining graphed data
- Identifying and explaining trends in data
- Relating real-life experiences with theoretical models, including justifying observations of energy, mass, chemical, color, etc changes with calculations
- Using the metric system, scientific notation, and significant figures
- Verifying that calculated answers "make sense" (e.g., should the answer be positive or negative; large or small?)