CHEM 1A PO, Section 1: General Chemistry

Instructor
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Class
MWF, 9 – 9:50 am
Seaver Commons 103

Office Hours
Mondays 10 am -12 pm; Tuesdays, 9-11 am; or by appointment
Review Sessions: Wednesdays, 7-8:30 pm, SN 202 (see page 3 for more information)

Welcome to General Chemistry! I am so glad that you are here. This first foray into the field will provide a foundation for advanced study in the chemical sciences and related fields. I hope that through this course you will also gain a general appreciation for the molecular nature of our world. A major objective of this course is to learn about the general types of chemical reactions and how to understand these reactions both qualitatively and quantitatively. At the same time, true to the liberal arts mission of Pomona College, I want to humanize the subject (chemists are, after all, people too!) and I want you to be able to use what you experience in this course to be successful in other classes and endeavors – so not everything you will learn will be about chemistry! At the end of the day, I want to foster an environment that produces a cohort of active learners who are intentional about their educational choices. Along these lines: this course will aim to address the following two questions and twelve intended learning outcomes:

- **What is chemistry?**
- **Who are chemists?**

After successfully completing this course, students will be able to:

- Identify, from chemical equations or experimental observations, four main types of chemical reactions: precipitations, acid-base, complexation and reduction-oxidation (redox)
- Apply knowledge of the periodic table (i.e. the chemical properties of the elements) to predict chemical reactions
- Apply the mole concept and stoichiometry to solve quantitative problems (e.g. titrations, percent yields, solubility) involving the four types of chemical reactions
- Explain how energy plays a central role in molecular structure and chemical reactions
- Calculate equilibrium constants and use them to determine the extent of reactions for different types of chemical reactions
- Apply the concepts of enthalpy, entropy, free energy and temperature to determine whether a chemical reaction proceeds spontaneously
- Explain the relationship between the equilibrium constant and free energy for a chemical reaction
- Interpret mathematical equations, figures, tables and graphs correctly
- Develop conceptual models and hypotheses from observed chemical data and phenomena
- Synthesize knowledge to solve complex chemistry problems
- Increase process skills such as: communication of scientific concepts and experimental results, group dynamics and teamwork, management and self-assessment
- Explain to others the major learning outcomes of CHEM 1A

Note that many of the intended learning outcomes above are applicable outside of chemistry! Being able to apply knowledge, being able to grapple with tables and graphs – these are all foundational skills that will allow you to be creative, critical thinkers in any field you apply yourself to.

For each class period, a list of **specific learning outcomes** will be provided to you, so that you can gauge your mastery of the materials and skills covered in CHEM 1A.

COURSE MATERIALS

- Zumdahl and DeCoste's **Chemical Principles**, 8th ed (required)
  Option 1: *OWLv2, 4 terms (24 months) Instant Access for E-book* **9781305864184**
  Option 2: *Chemical Principles, Loose-leaf Version, 8th ed. + OWLv2, 4 terms (24 months) Printed Access Card for E-book* **9781337128742**
- *Chemistry 1a Laboratory Manual* (required; available from the stockroom)
- In class activities, lecture slides, videos, problem sets and additional materials will be posted on **Sakai**. You should check this site frequently and be familiar with its contents.
- Calculator
- Active Pomona College email account. I email the class frequently. You are expected to check your Pomona email account for these emails and to read them.

COURSE OVERVIEW

Your Tasks

Before class: You will be given initial reading assignments to work on as an individual before class. These assignments must be ready at the start of class – your preparation will form part of your participation grade.

In class: ***Engaging content in class – through discussion and problem solving – can lead to great learning gains.*** This concept serves as the foundation for this course that aims to maximize your learning while also developing important skills such as communication, teamwork, management and self-assessment. During our class meeting time, you will function as a member of a Learning Team, examining chemistry concepts as a unit. Working as a team is also reflective of how science is actually done – in research groups, through collaboration, etc. Your team effort is part of your participation grade. Periodically, team responses to key questions on in-class activities will be evaluated for correctness and effective communication. The team may also strategize on ways to improve teamwork and team products. These responses will also form part of your participation grade.

After class: **Actively** working on questions stemming from the reading and in-class work is essential for your understanding of the material, as they bring your concept development full circle. "Actively working" means that you work out, in writing, the problems yourself – you do not simply watch someone else tackle the problem. There are two sources of questions for you to work on:

- ***Online Web Learning (OWLv2) and Mastery Questions:*** The OWL electronic resource is designed to enhance your learning in conjunction with the text; access is gained via the course Sakai site. There are two types of assignments:

  Quick Prep: Designed to check your understanding of the chemistry you may have learned in high school / secondary school, and /or to bolster your understanding of beginning topics if this if your first time taking chemistry. Your Quick Prep score will not count toward your final grade.

  Mastery Questions: These test your understanding of the concepts as we proceed through the material. Note that the first Mastery assignment is about learning to use the OWLv2 system and should be completed as soon as possible. You must receive a score of ≥90% on this first mastery assignment to gain access to the others. These exercises are meant to give your practice in expanding your toolset. You may retake any mastery assignment as many times as you wish and

move along at your own pace. All mastery assignments must be completed by the end of December 8, 2017. Successful completion of mastery questions counts toward your final grade.

- For each in-class activity, **problems** (both from the text and beyond) will be used to form **problem sets** that you should work on in your mentor groups. These problem sets will not be graded and do not count toward your final grade. These problem sets allow you to practice using your expanded toolset, prepare you for the exams, and are important for your success in the course.

Mentor Sessions: Attendance to your **assigned, weekly mentor** session is highly recommended. Mentors are hand-picked peers who are committed to helping you succeed in this course. The mentors will help you sharpen your problem-solving skills for this course. Through these sessions, where you continue to work on problems, you will also solidify concepts learned in class. The small size of the mentor sessions will maximize your opportunity to ask questions and develop a positive rapport with your mentor.

Review Sessions: As an additional resource, I lead a weekly session that is Q&A style, where you ask me questions, and I provide guidance as to how to effectively approach the question to reach the answer.

Assessments

Final Grade Calculation		Grading Scale			
OWLv2 Mastery Questions:	5%	A	93-100	C	73-76
Mid-term exams:	36% (12% each)	A-	90-92	C-	70-72
Final exam:	24%	B+	87-89	D+	67-69
Project:	5%	B	83-86	D	63-66
Participation:	5%	B-	80-82	D-	60-62
Laboratory work:	25%	C+	77-79	F	≤59

There is no curve for this course – you need only worry about your own performance. Please note that an "A" grade represents excellent mastery and astute discussion of concepts covered in this course.

Exams: Three in-class mid-term exams will be given throughout the semester. The exams will be comprised of short answer questions. The questions will be drawn from lectures, in-class activities, assigned homework and problem sets. The exams will focus on testing your ability to apply what you have learned and not rote memorization. No make-up exams will be given. If you know in advance that you will miss an exam, please notify me at least one week ahead of time so that alternative arrangements can be made. If you miss an exam due to a documented health or family-related emergency, your other two exams will each count 18% of your total grade. **The final exam will be cumulative.** The final exam is worth more than the individual mid-terms to allow you to learn and grow from those formative assessments, and to receive recognition of those efforts.

Project: To help you meet the goal of learning *who* chemists are and *what* chemistry is, you will complete a small project, individually. Details will be provided and can be found on Sakai.

Attendance: Attendance in class is mandatory in an active learning environment. In addition to mastering the material yourself, you are responsible for assisting the other members of your team in their understanding of the material. You must not miss class. Please be respectful of me and your fellow classmates and show up to class on time. You can expect your grade to drop substantially with 3 or more absences. Valid reasons for missing class are serious illness, religious observations or family emergencies. **You are responsible for handing in all assignments on time and obtaining all activities, regardless of missed classes.**

Participation: An important part of this course is to develop problem solving skills and the ability to work with others. Therefore, you will be assigned to a team of 3-4 students to work with for all of the in-class activities. Throughout the semester, you will be asked to assess yourself and your teammates. Your grade for Participation can be broken down in the following manner:

2% Team Work and Attendance (You can't be a team member if you aren't in class)

1% Self-Evaluation (How well do you feel you contributed to your team?)

1% Teammate Evaluations (How do your teammates see your efforts?)

1% Instructor Evaluation (How are your efforts viewed by an outsider?)

Evaluations will be based on the Team Performance Rubric, which can be found on the course Sakai site. You should refer to this rubric *frequently* throughout the semester to make sure you are fulfilling the criteria of being a productive team

Laboratory: The laboratory work begins Wednesday of the first week of classes. The lab begins promptly at 1:15 p.m. in room SN 111. Please obtain the laboratory manual and lab notebook prior to the first week of lab and bring it to the first laboratory session. For all labs, please wear clothes that completely cover your legs and closed-toed shoes, and bring your safety glasses, lab coat, notebook, and a calculator. If you must change your section in a particular week, see Professor Wellman **beforehand**. All permanent laboratory section changes must occur during the first week of classes.

Grading Policy: Any query regarding scores on graded assignments or exams should be presented within three days of return of the assignment/exam. It is the student's responsibility to meet with the professor to make any adjustments. Please note that I reserve the right to regrade the entire submission, and as a result, she may raise or lower your entire score. After three days, all scores become final and unalterable.

Late policy: For all assignments (other than OWL Mastery Questions), late work will be accepted. However, for every 24 hours that the assignment is tardy, a 10% deduction will be applied to your grade on that assignment.

Special circumstances: If there are special circumstances, such as illness of other form of emergency, which should be taken into account with regard to any of the stated class policies, please inform me as soon as possible so that alternative arrangements can be made.

Disability Accommodations: Pomona College is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations may be made by contacting the Dean of Students Office. It is up to the student to contact the professor to fulfill the accommodations.

Academic ethics and integrity policy: You are expected to abide by the Pomona College Standards of Academic Integrity. For the official policy go to:
http://catalog.pomona.edu/content.php?catoid=7&navoid=394. Plagiarism, whether deliberate or unintentional, and cheating on examinations is not acceptable.

Detailed information on Pomona College's policy on academic honesty is presented in your "Critical Inquiry" course (ID 1); you are expected to follow the policy in Chemistry 1A. An especially important academic honesty standard for Chemistry 1A concerns laboratory work - "In laboratory or research projects involving the collection of data, students accurately report data observed and do not alter these data for any reason." One purpose of college laboratory courses is to develop the proper ethical conduct in scientific work. Unethical professional practices and research fraud have ruined the careers of practicing scientists not to mention the problems caused using faulty data that is believed to be correct. Hence, one purpose of having you turn in a copy of your laboratory data each day when you leave the laboratory is to help remove the temptation of altering your data when preparing your final report. All of your work on examinations and in laboratory reports must be your own. You are encouraged to work together on homework, laboratories, and in study of course material. However, any work that you turn in for a grade must be your own. Working together on homework is a good idea, but you should not simply copy another student's work. Academic dishonesty cases will be reported to the Dean of Students Office in accordance with college policy.

Calendar (Subject to Change)

FALL 2017

SUNDAY	MONDAY	TUESDAY	WEDNES.	THURS.	FRIDAY	SAT.
AUG 27	28	29 CLASSES START	30 LAB STARTS!	31	SEPT 1	2
3	4	5	6 CALIB VOL	7	8	9
10	11	12	13 GRAV CA	14	15	16
17	18 *BIO 40 EXAM*	19	20	21	22	23
24	25	26	27 **1A EXAM 1** 5 ANION	28	29	30
OCT 1	2	3	4 PROJECT DUE DATE 1	5 LOW GRADE NOTICE	6	7
8	9 *BIO 40 EXAM*	10	11	12	13	14
15	16 FALL RECESS	17 FALL RECESS	18 NITRITE	19 LAST DAY TO DROP	20 **1A EXAM 2**	21
22	23	24	25	26	27 PROJECT DUE DATE 2	28
29	30 *BIO 40 EXAM*	31	NOV 1 VOL ACID	2	3	4
5	6 WHAT IS CHEMISTRY?	7	8	9	10	11
12	13	14	15 **1A EXAM 3** EQUILIB	16	17	18
19	20 *BIO 40 EXAM*	21	22 WHAT IS CHEMISTRY?	23 THANKSGIVING	24	25
26	27 BORAX	28	29	30	DEC 1 PROJECT DUE DATE 3	2
3	4	5	6 LAST DAY OF CLASS	7 READING DAY	8 READING DAY	9
10	11	12	13	14 **1A FINAL** 9 AM – 12 PM	15	16
17	18	19	20	21	22	23

Schedule (Subject to Change):

Wk	(Lecture)Date	Topic	Assigned Reading*
1	(1) 8/30	Introduction	
	(2) 9/1	Composition of Matter	Ch 1, Ch 2 (1-3), Mini-Lecture, App 1
2	(3) 9/4	Atomic Theory	Ch 2 (4-7), Appendix 2
	(4) 9/6	The Mole Concept	Ch 3 (1-4)
	(5) 9/8	Empirical and Molecular Formulas	Ch 3 (5-7)
3	(6) 9/11	Stoichiometry	Ch 3 (8-11)
	(7) 9/13	Introduction to Aqueous Solutions	Ch 4 (1-3, 8)
	(8) 9/15	The Periodic Table	Ch 2 (8,9) and Ch 13 (1-3)
4	(9) 9/18	Bonding; Lewis Dot Structures	Ch 13 (1-3, 9-10)
	(10) 9/20	Lewis Dot Structures (continued)	Ch 13 (11-12)
	(11) 9/22	Molecular Geometry	Ch 13 (11-13)
5	(12) 9/25	Precipitation Reactions	Ch 4 (4-8)
	(13) 9/27	**EXAM 1**	
	(14) 9/29	Acid Base Reactions	Ch 4 (9) and Ch 7 (1-2)
6	(15) 10/2	Complexation and Redox Reactions	Ch 4 (10) and Ch 8 (10)
	(16) 10/4	Redox Reactions (continued)	Ch 4 (11)
	(17) 10/6	Redox Titrations	Ch 4 (12)
7	(18) 10/9	Ideal Gas Law	Ch 5 (1-5)
	(19) 10/11	Kinetic Theory of Gases	Ch 5 (6)
	(20) 10/13	Real vs Ideal Gases	Ch 5 (10)
		Fall Recess	
8	(21) 10/18	Chemical Equilibria	Ch 6 (1-4)
	(22) 10/20	**EXAM 2**	
9	(23) 10/23	Chemical Equilibria (continued)	Ch 6 (5-8)
	(24) 10/25	Strong and Weak Acids	Ch 7 (1-2)
	(25) 10/27	pH of Acid/Base Solutions	Ch 7 (3-6)
10	(26) 10/30	Buffers	Ch 8 (1-4)
	(27) 11/1	Acid/Base Titrations	Ch 8 (5-7)
	(28) 11/3	Solubility Product	Ch 8 (8-9)
11	(29) 11/6	What is Chemistry?	
	(30) 11/8	Energy	Ch 9 (1-2)
	(31) 11/10	Heat of Reactions	Ch 9 (3-4)
12	(32) 11/13	Calorimetry	Ch 9 (3-4)
	(33) 11/15	**EXAM 3**	
	(34) 11/17	Hess's Law	Ch 9 (5-6)
13	(35) 11/20	Spontaneous Change and Entropy	Ch 10 (1-4)
	(36) 11/22	What is Chemistry?	
		Thanksgiving	
14	(37) 11/27	Entropy and Free Energy	Ch 10 (5-8)
	(38) 11/29	Free Energy and Equilibrium	Ch 10 (9-11)
	(39) 12/1	Electrochemistry	Ch 11 (1-4)
15	(40) 12/4	Electrochemistry (continued)	Ch 11 (5-8)
	(41) 12/6	**Last Day!**	
16	12/14 9 am	**FINAL EXAM**	

*Assigned reading indicates book chapter (sections) that should be read prior to that day's lecture.