

CHEM134 16

STUDENT WARNING: This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

Course Summary

Course : CHEM134 **Title :** General Chemistry II with Lab

Length of Course : 16

Prerequisites : CHEM133 **Credit Hours :** 4

Description

Course Description: This is the second course of a two course general chemistry sequence that introduces students to the principles, terminology, methodology and worldview of chemistry. Lecture and lab topics are both descriptive and mathematical and include solution chemistry, chemical kinetics, chemical equilibrium, acids and bases, aqueous ionic equilibrium, free energy, thermodynamics, electrochemistry, radioactivity, and nuclear chemistry. The laboratory component of this course is hands-on and designed for science students to learn how to make qualitative and quantitative observations about physical and chemical phenomena, make calculations, and test their own reasoning. Students will acquire skills in laboratory techniques designed to help reinforce and build upon the concepts presented in the lecture portion of the class. Students must have a safe work area available to perform laboratory activities, including working with an open flame. Students must be able to document their laboratory work using digital pictures and/or video. Students must also have room temperature storage available in order to maintain laboratory materials. Lab material for this course will only be provided once. If you need replacement lab equipment for any reason or need to retake the course later, you will need to purchase your own lab refills. This is a time and resource-intensive course. Students intending to use this course to satisfy prerequisites for pre-professional programs should verify that the CHEM133 and CHEM134 course sequence meets the requirements of their intended program prior to enrollment. In order to be successful in this course, students must have successfully completed CHEM 133 General Chemistry I with Lab or equivalent. NOTE: This course requires the student to purchase additional materials at substantial cost that are not covered by the book grant. Please refer to the Course Materials section for additional details. (Prerequisite: CHEM133)

Course Scope:

This course is designed to teach the principles of general chemistry and its laboratory to students who are science majors. It builds upon the content from CHEM 133 General Chemistry I with Lab, and it will introduce general inorganic chemical theory, terminology, nomenclature, chemical problem solving, applied mathematics, and methodology, and provide a solid foundation of chemistry for subsequent science courses.

Objectives

The successful student will fulfill the following learning objectives, and upon completion of this course, should be able to:

CO-1 Demonstrate basic knowledge (and related calculations) of solubility, types of solutions, entropy, solution energetics, solution equilibrium, Henry's Law, solution concentration with associated units, colligative properties, and colloids.

CO-2 Solve problems related to reaction rate, rate laws and the integrated rate law (zero, first, and second order reactions), half-life, the effect of temperature on reaction rate, activation energy, frequency factor, reaction mechanisms, and catalysis.

CO-3 Apply basic knowledge of dynamic equilibrium, the equilibrium constant (K), the ICE method of determining equilibrium values, the reaction quotient (Q), predicting the direction of change, finding equilibrium concentrations, and Le Chatelier's Principle in chemical calculations.

CO-4 Apply basic knowledge of acid/base nomenclature, Arrhenius and Bronsted-Lowry definitions, acid and base dissociation constants (K_a , K_b , K_w), water autoionization, pH, pOH, pKa, $[H_3O^+]$, $[OH^-]$, conjugate pairs, polyprotic acids, acid strength and structure, and Lewis acid/base definitions in chemical calculations.

CO-5 Solve mathematical and chemical problems related to buffers, the Henderson-Hasselbalch equation, buffer range and capacity, pKa, titration and pH curves, solubility product constant (K_{sp}), precipitation (Q to K_{sp} ratio), qualitative chemical analysis, and complex ion equilibria.

CO-6 Demonstrate basic knowledge (and related calculations) of spontaneous vs. nonspontaneous processes, entropy, the Second Law of Thermodynamics, heat transfer, changes in entropy, Gibb's Free Energy, the Third Law of Thermodynamics, free energy changes, nonstandard states, and relating free energy to (K).

CO-7 Apply basic knowledge of oxidation-reduction, voltaic cells, EMF, cell potentials, standard electrode potentials, relationship of cell potential to equilibrium constant to free energy, the Nernst equation, batteries, electrolysis, and corrosion in chemical calculations.

CO-8 Demonstrate basic knowledge (and related calculations) of types of radioactivity, decay series, detection of radioactivity, kinetics of radioactive decay, radiometric dating, nuclear fission, mass defect, nuclear binding energy, nuclear fusion, transmutation, and the affects and applications of radiation.

Outline

Week 1: Lesson 1: Solutions and Colloids

Course Objectives

CO-1

Reading/Viewing

Syllabus

Academic Honor Pledge

Lesson 1: Part 1

OpenStax Text: Chapter 11

Lab 1: Graphing Using Microsoft Excel®

Supplemental Media/Content:

See links within Lesson 1

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Academic Honor Pledge

Lab 1

Forum 1 - Introduction Forum

Initial Post Due: Sunday of Week 1, by 11:55 p.m., ET (**please** try to post earlier--preferably by Wednesday)

Responses Due: Sunday of Week 1, by 11:55 p.m., ET (you will be dropped if not completed)

Week 2: Lesson 1: Solutions and Colloids

Course Objectives

CO-1

Reading/Viewing

Lesson 1: Part 2

OpenStax Text: Chapter 11

Lab 2: General Chemistry Lab Safety and Vernier Intro

Supplemental Videos/Materials:

See links within Lesson 1

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 1 Quiz

Lab 2

Forum 2

Initial Post Due: Thursday of Week 2, by 11:55pm ET

Responses Due: Sunday of Week 2, by 11:55pm ET

Week 3: Lesson 2: Kinetics

Course Objectives

CO-2

Reading/Viewing

Lesson 2: Part 1

OpenStax Text: Chapter 12

Lab 3: Molar Mass and Freezing Point Depression

Supplemental Videos/Materials:

See links within Lesson 2

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lab 3

Forum 3

Initial Post Due: Thursday of Week 3, by 11:55pm ET

Responses Due: Sunday of Week 3, by 11:55pm ET

Week 4: Lesson 2: Kinetics

Course Objectives

CO-2

Reading/Viewing

Lesson 2: Part 2

OpenStax Text: Chapter 12

Lab 4: Molar Mass and Vapor Density

Supplemental Videos/Materials:

See links within Lesson 2

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 2 Quiz

Lab 4

Forum 4

Initial Post Due: Thursday of Week 4, by 11:55pm ET

Responses Due: Sunday of Week 4, by 11:55pm ET

Week 5: Lesson 3: Fundamental Equilibrium Concepts

Course Objectives

CO-3

Reading/Viewing

Lesson 3: Part 1

OpenStax Text: Chapter 13

Lab 5: Reaction Rates

Supplemental Videos/Materials:

See links within Lesson 3

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lab 5

Forum 5

Initial Post Due: Thursday of Week 5, by 11:55pm ET

Responses Due: Sunday of Week 5, by 11:55pm ET

Week 6: Lesson 3: Fundamental Equilibrium Concepts

Course Objectives

CO-3

Reading/Viewing

Lesson 3: Part 2

OpenStax Text: Chapter 13

Lab 6: Molar Volume of Gases

Supplemental Videos/Materials:

See links within Lesson 3

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 3 Quiz

Lab 6

Forum 6

Initial Post Due: Thursday of Week 6, by 11:55pm ET

Responses Due: Sunday of Week 6, by 11:55pm ET

Week 7: Lesson 4: Acid-Base Equilibria

Course Objectives

CO-4

Reading/Viewing

Lesson 4: Part 1

OpenStax Text: Chapter 14

Lab 7: Equilibrium Constants

Supplemental Videos/Materials:

See links within Lesson 4

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lab 7

Forum 7

Initial Post Due: Thursday of Week 7, by 11:55pm ET

Responses Due: Sunday of Week 7, by 11:55pm ET

Week 8: Lesson 4: Acid-Base Equilibria & MIDTERM EXAM

Course Objectives

CO-1; CO-2; CO-3; CO-4

Reading/Viewing

Lesson 4: Part 2

OpenStax Text: Chapter 14

Review: Chapters 11 – 14; Labs 1 – 7

Supplemental Videos/Materials:

Review links from within Lessons 1 – 4

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 4 Quiz

Midterm Exam

Forum 8

Initial Post Due: Thursday of Week 8, by 11:55pm ET

Responses Due: Sunday of Week 8, by 11:55pm ET

Week 9: Lesson 5: Equilibria of Other Reaction Classes

Course Objectives

CO-5

Reading/Viewing

Lesson 5: Part 1

OpenStax Text: Chapter 15

Lab 8: Preparation of Buffer Solutions

Supplemental Videos/Materials:

See links within Lesson 5

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lab 8

Forum 9

Initial Post Due: Thursday of Week 9, by 11:55pm ET

Responses Due: Sunday of Week 9, by 11:55pm ET

Week 10: Lesson 5: Equilibria of Other Reaction Classes

Course Objectives

CO-5

Reading/Viewing

Lesson 5: Part 2

OpenStax Text: Chapter 15

Lab 9: Standardization of a Solution

Supplemental Videos/Materials:

See links within Lesson 5

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 5 Quiz

Lab 9

Forum 9

Initial Post Due: Thursday of Week 9, by 11:55pm ET

Responses Due: Sunday of Week 9, by 11:55pm ET

Week 11: Lesson 6: Thermodynamics

Course Objectives

CO-6

Reading/Viewing

Lesson 6: Part 1

OpenStax Text: Chapter 16

Lab 10: Acid-Base Titrations

Supplemental Videos/Materials:

See links within Lesson 6

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lab 10

Forum 11

Initial Post Due: Thursday of Week 11, by 11:55pm ET

Responses Due: Sunday of Week 11, by 11:55pm ET

Week 12: Lesson 6: Thermodynamics

Course Objectives

CO-6

Reading/Viewing

Lesson 6: Part 2

OpenStax Text: Chapter 16

Lab 11: Titration Indicators

Supplemental Videos/Materials:

See links within Lesson 6

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 6 Quiz

Lab 11

Forum 12

Initial Post Due: Thursday of Week 12, by 11:55pm ET

Responses Due: Sunday of Week 12, by 11:55pm ET

Week 13: Lesson 7: Electrochemistry

Course Objectives

CO-7

Reading/Viewing

Lesson 7: Part 1

OpenStax Text: Chapter 17

Lab 12: Oxidation-Reduction Reactions

Supplemental Videos/Materials:

See links within Lesson 7

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lab 12

Forum 13

Initial Post Due: Thursday of Week 13, by 11:55pm ET

Responses Due: Sunday of Week 13, by 11:55pm ET

Week 14: Lesson 7: Electrochemistry

Course Objectives

CO-7

Reading/Viewing

Lesson 7: Part 2

OpenStax Text: Chapter 17

Lab 13: Electrochemical Series

Supplemental Videos/Materials:

See links within Lesson 7

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 7 Quiz

Lab 13

Forum 14

Initial Post Due: Thursday of Week 14, by 11:55pm ET

Responses Due: Sunday of Week 14, by 11:55pm ET

Week 15: Lesson 8: Nuclear Chemistry

Course Objectives

CO-8

Reading/Viewing

Lesson 8: Part 1

OpenStax Text: Chapter 21

Lab 14: Electrochemical Cells

Supplemental Videos/Materials:

See links within Lesson 8

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lab 14

Forum 15

Initial Post Due: Thursday of Week 15, by 11:55pm ET

Responses Due: Sunday of Week 15, by 11:55pm ET

Week 16: Lesson 8: Nuclear Chemistry & Final Exam

Course Objectives

CO-5; CO-6; CO-7; CO-8

Reading/Viewing

Lesson 8: Part 2

OpenStax Text: Chapter 21

Review: Chapters 15 – 17, 21; Labs 8 – 14

Supplemental Videos/Materials:

Review Supplemental materials from Lessons 5 – 8

Assignments (Due date ends at 11:59 pm Eastern Time)

Due by Sunday:

Lesson 8 Quiz

Final Exam

Forum 16

Initial Post Due: Thursday of Week 16, by 11:55pm ET

Responses Due: Sunday of Week 16, by 11:55pm ET

Evaluation

Various types of graded assessments/activities will be assigned to enhance your understanding of chemistry principles. Participation in all of the activities is essential for developing problem solving skills and concepts presented in the course. Your course grade is based on your performance on the following activities:

Discussion Forums:

There will be a Discussion Forum for each week in this course. *There will be a required introductions discussion forum during the first week of the course*. You are to post a thoughtful post after reading the instructions for each forum, expressing critical thought and analysis. You are then required to post a response to the post of at least **2** of your classmates as well. There will be a total of 16 discussion forums. **DO NOT** plagiarize your answer (i.e. do not copy paste directly from the internet or any other source) or you **WILL NOT** receive credit. There are many tools available for instructors to help catch this, so please don't try it.

NOTE: Brief statements, saying something very vague, or congratulatory or acknowledgement-type postings will not count towards adequate participation credit. They do not contribute to an understanding of the material, raise important issues regarding the material, or forward the conversation about the content.

See the link in the Lessons area for due dates and a rubric to see expectations and how the discussion forums will be graded.

Lesson Quizzes:

There will also be quizzes in the Lessons to help you and your Professor assess your comprehension of the Lesson material. You will complete the assignment in the Tests & Quizzes area of the classroom. Your percentage will be a score out of 100 points. There are 8 quizzes, each worth 100 points. You will have **1 hour** to complete each quiz—after 1 hour, the assessment will be submitted automatically and you will only be able to receive credit for what you have completed at that time.

Labs:

After completing the labs for each lesson, you will complete an assignment in the Tests & Quizzes area of the classroom. Though they are being delivered in the Tests & Quizzes area, they are not technically quizzes. You should think of them simply as assignments that accompany the lab exercise that happen to be delivered in a quiz format. Each lab assignment will consist of multiple choice and short answer questions, as well as the

requirement of uploading pictures and your own data (see instructions within each lab). These lab assignments are **not timed**. You will not be able to answer the questions without performing the lab and generating your own individual data. Follow the directions in each lab, save your answers, data, and pictures as the instructions indicate, and use those answers to complete the questions on the lab assignments.

Exams:

There will be a *Midterm Exam* and a *Final Exam* for this course, both consisting of short-answer/essay questions. The *Midterm Exam* and the *Final Exam*. Please take the preparation for the exams in the forms of the previous assignments (and practice materials) very seriously. They are meant to help prepare you for these exams. The format of both of these exams is short answer/essay, so they will naturally be longer than your quizzes, and they are open book/notes. You **MUST** show your work in order to receive any partial credit. You will have **2 hours** to complete each exam. There are NO EXCEPTIONS to this policy. Once you access these exams the timer starts as soon as you open it the first time. Be sure to keep close track of your time and DO NOT take any chances!

Midterm Exam: This exam is cumulative/comprehensive and will cover Lessons 1-4, including labs.

Final Exam: This exam is cumulative/comprehensive but will only cover Lessons 5-8, including labs—everything since the Midterm. However, as you will learn, chemistry is a very cumulative/comprehensive subject whereby the material in subsequent chapters builds off material in previous chapters. So, there will certainly be information from the Midterm material found on the Final Exam that is inherent to the content. It's just that you will not be directly tested on the Lessons 1-4 material.

Please see the [student handbook](#) to reference the University's [grading scale](#).

Grading:

Name	Grade %
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Materials

Book Title: Principles of Chemistry: A Molecular Approach, 2nd ed. - the VitalSource e-book is provided via the APUS Bookstore; hard copy not available from the APUS Bookstore, please try other sources.

Author: Tro

Publication Info: Pearson

ISBN: 9780321750099

Book Title: Thinkwell Chemistry Online Materials - Thinkwell will send a user name and password to your primary email address. Instructions provided inside the classroom.

Author: Harman, et al

Publication Info: Thinkwell

ISBN: THINKWELL-CHEM

Book Title: CHEM134 Pearson MyLab access provided inside the classroom

Author:

Publication Info: Pearson

ISBN: CHEM134 Note

Book Title: You must validate your cart to get access to your VitalSource e-book(s) and hard copy materials. If needed, instructions are available here - <http://apus.libguides.com/bookstore/undergraduate>

Author: N/A

Publication Info: N/A

ISBN: N/A

Book Title: Additional required items are available to order from the APUS Bookstore. If you buy these items from other vendors, you may not receive all the parts you need for your course. These items (as noted) are not covered by the APUS Book Grant.

Author: N/A

Publication Info: N/A

ISBN: N/A

Book Title: Chemistry II eScience kit

Author: eScience

Publication Info: eScience

ISBN: 4132

Book Title: LabQuest 2 - This item is not covered by the APUS Book Grant.

Author:

Publication Info: Vernier Software & Technology, LLC

ISBN: LABQ2

Book Title: LoggerPro 3 Software - This item is not covered by the APUS Book Grant. If you purchase the electronic download, a link will be sent to you on the next business day.

Author:

Publication Info: Vernier Software & Technology, LLC

ISBN: LP

Book Title: Ph sensor- This item is not covered by the APUS Book Grant.

Author:

Publication Info: Vernier Software & Technology, LLC

ISBN: PH-BTA

Book Title: Stainless Steel Temperature Probe - This item is not covered by the APUS Book Grant.

Author:

Publication Info: Vernier Software & Technology, LLC

ISBN: TMP-BTA

Required Technology

- See the Technology Requirements section of the undergraduate catalog for the minimum hardware and software requirements.
- You will also need a scientific calculator with scientific notation and logarithmic functions. If you do not already own one, Microsoft® Calculator comes with windows PP or you may access an online calculator.
- Microsoft Office 365 is available to APUS students for free. To sign up, visit

<http://products.office.com/en-us/student>. If you have questions about accessing the software, please contact Classroom support at classroomsupport@apus.edu.

Required Lab Materials

The laboratory activities in this course will consist of a hybridized experience involving both virtual and hands-on components. Students will receive a laboratory kit from the university that they will use for the hands-on portion of the laboratory procedures, and will receive specific directions within each lesson regarding how to access any virtual components. Students will perform laboratory exercises that will teach laboratory techniques, as well as cultivate problem solving strategies in a laboratory setting, including generating and analyzing their own data and testing their own hypotheses.

Web Sites

Robinson, W. R. *et al.* (2016) *OpenStax Chemistry: Atoms First*, 1st edition. Rice University.
<https://openstax.org/details/books/chemistry-atoms-first>

Giesbrecht, H. (2012) *Professor Heath's Chemistry Channel*, Online Video Channel.
<https://www.youtube.com/user/theprofessorheath>. YouTube

Course Guidelines

Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

Tutoring

- [Tutor.com](https://www.tutor.com) offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without

citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

Communicating on the Forum

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- “Substantive” means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says “I agree” is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.

Identity Verification & Live Proctoring

- Faculty may require students to provide proof of identity when submitting assignments or completing assessments in this course. Verification may be in the form of a photograph and/or video of the student's face together with a valid photo ID, depending on the assignment format.
- Faculty may require live proctoring when completing assessments in this course. Proctoring may include identity verification and continuous monitoring of the student by webcam and microphone during testing.

University Policies

[Student Handbook](#)

- [Drop/Withdrawal policy](#)
- [Extension Requests](#)
- [Academic Probation](#)
- [Appeals](#)
- [Disability Accommodations](#)

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible,

affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.

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