



**UNIVERSITY OF
NORTHWESTERN**
ST. PAUL

OFFICE OF DUAL ENROLLMENT

CHE1006

Concepts of Chemistry

SPRING 2023

SYLLABUS

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CHE1006 Concepts of Chemistry

University of Northwestern – St. Paul

COURSE DESCRIPTION

A survey of chemistry and its applications, intended to promote understanding and literacy in the sciences in general and especially in the field of chemistry. Topics studied include the scientific method and its relationship to faith and reason; matter and energy; atomic and molecular structure; chemical bonding and intermolecular forces; chemical formulas and equations; water, acids and bases; oxidation-reduction reactions; and chemistry around the house. Students carry out the experiments at home using a small kit supplied by the campus store and readily available equipment, supplies and chemicals.

Credits: 5

Prerequisites: One year of high school algebra or two years recommended. NOT available to students who have received a grade of “C” or better in any CHE course

INSTRUCTOR INFORMATION

Please see “Contacting the Instructor” on the course site.

COURSE OUTCOMES

At the end of this course, a successful student will be able to

- CO-1. Measure masses, volumes, temperatures, pressures, etc., with common laboratory glassware and equipment
- CO-2. Explain the structures of atoms, both nuclear and electronic
- CO-3. Predict chemical and physical properties and names of ions, atoms, and molecules on the basis of atomic, and electronic, and molecular structure
- CO-4. Compare and contrast the properties of solids, liquids, and gases
- CO-5. Draw conclusions based on scientific laws, theories, and principles
- CO-6. Calculate quantities based on scientific laws, theories, and principles

MATERIALS

Required Textbooks and Materials

Lewis, C.S. Miracles. Publisher: New York, NY: HarperOne. Year: 2009

Knewton access code for General Chemistry (available through the UNW Campus Store)

This course uses the following open textbook at no cost to students. A link to a digital copy of the open textbook is provided on the course site.

Chemistry 2e. Publisher: Houston, TX: OpenStax. Year: 2019

Provided by Student

For this course, students will need access to Microsoft Office (available at no cost to students through the University of Northwestern-St. Paul), a PDF reader, and a standard internet browser. Please refer to the Tech Requirements found in the Technology Help section at the top of the course site for the full requirements.

Additional lab materials: See the page entitled Shopping List in the Introduction to Labs resource on the course site. Most of these supplies can be gathered from home; the rest may be purchased at the local supermarket or hardware store.

GRADING POLICIES AND PROCEDURES

Course Grade Explanation

Assignments	Grade Weight
Lab Exercises and Reflection Forums	25
Homework Assignments (on Knewton)	25
Quizzes (on Knewton)	25
<u>Final Exam (Part 1 on Knewton)</u>	<u>25</u>
Total	100

Grading Scale Percentages

A	≥ 93	B	≥ 83	C	≥ 73	D	≥ 63
A-	≥ 90	B-	≥ 80	C-	≥ 70	D-	≥ 60
B+	≥ 87	C+	≥ 77	D+	≥ 67	F	< 60

Late Work

All assignments are due as described in the course syllabus and the course site. Students are responsible for meeting assignment deadlines. Late assignments will be automatically deducted one letter grade. The assignments will drop an additional grade per day it is late, up to a 50% deduction in grade; late assignments will not be accepted for a grade beyond one week past the original deadline. Forum discussion activities must be completed on time to earn points. Late forum posts will earn zero points. Students should contact the instructor via e-mail if an extenuating circumstance exists.

Feedback Expectations

Students should expect feedback for their submitted assignments within 5 days of the assignment due date or the time of their submission, whichever is later.

INSTITUTIONAL POLICIES AND SERVICES

Guidelines and Information

Students are responsible for all content of the DE Student Handbook. The most recent version of the DE Student Handbook is located on confluence.unwsp.edu and includes the following policies and procedures:

- Deadlines for Dropping or Withdrawing
- Student/instructor Communication

- Appeals, Exceptions, Disciplinary Process, & Grievances
- Assignments (late work and plagiarism)
- Examinations
- Grading System

Instructors may have course-related expectations that further detail the policies and procedures outlined in the DE Student Handbook. Any such expectations must be provided to students in writing (e.g., handout, course site posting) prior to or at the beginning of the class.

Traditional undergraduate students enrolled in DE courses are subject to the traditional undergraduate student handbook for all non-course-specific policies and procedures.

Academic Integrity

Plagiarism is theft—theft of someone else’s words or ideas. It is claiming another’s work as one’s own. This would also include the following:

- Using the words or work of a former or current student in this class
- Recycling previously submitted assignments from a previous course attempt
- Using outside literature support sites such as, but not limited to, SparkNotes, Enotes or Schmoop that provide literary analysis of the texts we read throughout the semester

Students found plagiarizing are subject to discipline. The standard response ranges from loss of credit for the plagiarized assignment to earning an immediate “F” for the course to being placed on disciplinary probation. We should be committed to conducting ourselves with integrity in all things. Please refer to the DE Student Handbook for more detailed information about UNW’s honesty and integrity policies.

In every course, students are required to view the Understanding Plagiarism video and complete the Understanding Plagiarism Quiz prior to completing any of the course content. These items are part of the course orientation.

Academic Achievement

UNW students requesting academic accommodations in association with the Americans with Disabilities Act (ADA) are directed to notify [Disability Services](#) to begin the application process. Academic Achievement also provides the following: [Writing Tutoring](#), [Subject Tutoring](#), advocating, transitional skill building, [Academic Coaching](#) (organization, time management, test taking, etc.).

Contact Academic Achievement for more information: AcademicAchievement@unwsp.edu | 651-628-3316 | N4012 (Revised 07/21).

Support Services

Links to support services are available found in the Student Services section at the top of the course site.

COURSE POLICIES AND INFORMATION

Email and Announcements

Students are responsible to regularly check their Northwestern student email and the announcements in the course site in order to receive updates and information.

Attendance

Students are expected to participate in all course activities. Students must contact the faculty member in advance or as soon as possible if unable to participate in all or part of the course activities for a given week because of a medical (which includes having to quarantine or isolate due to COVID-19 exposure or confirmed illness), family, or work-related emergency. Students should refer to their course syllabus and/or faculty member for specific requirements. Students who do not participate in course activities and fail to withdraw from the course will receive a failing "F" grade.

Submission Standards

All written assignments should adhere to the following DE guidelines. Documents should be in the following format **unless directed differently by the syllabus or course instructor**:

- Submitted on the course site in Microsoft Word document format (.doc or .docx)
- Set in a traditional typeface 12-point font
- Double-spaced (unless the syllabus instructs otherwise)
- Set with one-inch margins
- Formatted in APA style for in-text citations and reference page (LIT1100 may ask for MLA documentation style)
- Labeled and submitted with the following information (APA papers require this information on a cover sheet, as detailed in A Pocket Style Manual): Student Name, Course Code and Title, Instructor Name, and Date.

Critical Response to Alternate Viewpoints

When students are reading or viewing course materials, they may encounter viewpoints, words, or images that their instructors would not use or endorse. Students should know that materials are chosen for their value in learning to read, write, and view critically, not because the materials are necessarily Christian.

Collaboration

There are instances in which collaboration is not a good idea. If Joe Student figures out how to do a difficult problem and Mary Student writes the answer down without trying to understand it, Mary derives no benefit from doing the problem. In order for you to derive the maximum educational benefit from this class, you should do all of the assignments, especially the experiments, yourself. This does not mean that you must work alone. It does mean that two students taking the class at the same time, for instance, could work side by side and share equipment as long as each student performs the experimental measurements and observations. The disadvantage of working at the same time side by side is that if the first student measures the mass of 50 BB's and says out loud, "I got 16.40 grams" and then the second student simply looks at the same scale, the second person will be biased in his or her measurement. If the second person removed the 50 BB's from the balance, tared the balance, and then made the measurement, it is very unlikely that he or she would get 16.40 grams, just like the first person did. The mass would probably be very close to 16.40 g, but it would probably not be exactly the same result.

It may seem silly and a grand waste of time for two people working on the same experiment to proceed as above, but it is essential. Two trained scientists making the same measurement working side by side in the same lab using the same equipment are probably going to get slightly different results for at least two different reasons. First, their experimental setups will not be exactly the same. Second, their measurements of the setup will not necessarily be exactly the same.

Regarding the setup, each scientist has to set up the system in order to make a measurement and there might be slight differences in their setups. For instance, each might use 50 BB's from different manufacturers. BB's are fairly uniform, but not necessarily exactly the same. Therefore, the 50 BB's that Dr. Joe Scientist picked might have a mass of 16.40 ± 0.01 g, and the 50 BB's that Dr. Evelyn Researcher picked might have a mass of 16.43 ± 0.01 g. These are different masses, very slightly different, but definitely not the same within the limits of measurement. Even if they used the very same 50 BB's, their measurements might be different, because each should zero the balance before making the measurement and they will not necessarily zero the balance at exactly the same point.

Regarding the measurements of the setup, as we will see in Lab 1, measurement is a process that involves inherent uncertainty. Two trained scientists reading the same scale at the same time might not get exactly the same value. If the balance is working correctly, the two values should be awfully close to each other, but not necessarily exactly the same.

ASSIGNMENTS

See the course site for complete details on the assignments.

Practice Activities (CO-2,3,4,5,6)

The practice activities for each week are conducted on Knewton but must be accessed through Moodle. Students register for this on or before the first week of class from the course Moodle site. Registration is simple. When you try to do the first assignment from the Moodle site, you will be asked to input a CODE or to begin using the free access. All students are encouraged to start with the 14-day free access to Knewton. PSEO students will be sent an email from the campus store with an access CODE during the 2nd week of class allowing access for the remainder of the course. Non PSEO students will need to purchase the access before the free access expires. Note: there is also a video posted on the course Home Page entitled "How to Use Knewton Alta."

Students may use books, notes, Internet sources, etc., while working on the homework assignments. There is no time limit on the homework assignments other than the due date. Students may seek assistance from other persons, including other students in the class, while working on the homework assignments. The Knewton homework system is based on mastery of the learning objectives for the assignment. If a student answers a particular question incorrectly, the Knewton system will provide feedback and may even suggest a short tutorial, either in video or written form. The system will then probably generate another question very similar to the one that was answered incorrectly. Therefore, there is no direct penalty for incorrect answers, but an incorrect response may lengthen the duration of the assignment. In principle, any student willing to spend enough time and effort to achieve mastery for each assignment will earn a grade of 100 for that assignment.

Lab Experiments (CO-1,3,4,5,6)

This course is designed to provide a lab experience in the home setting without having to come to a college laboratory facility. The laboratory portion of this course is designed to make use of common household materials and enables you to perform the experiments within your own home. For complicated or potentially unsafe procedures, we have provided demonstration and visualization through the use of video. You are not expected to perform dangerous experiments. There are twelve laboratory experiments. Detailed instructions for each experiment are provided on the course site in the form of video and written documentation. Results Forms are provided for each experiment. The results forms should be completed

as the experiment is conducted, uploaded to the course site by clicking on the link for that particular lab, and then submitted by clicking on the icon that is designated "add submission".

Reflection Forums (CO-1,2,3,4,5,6)

At the end of each unit, you will be asked to reflect on what you have learned during that unit of material. You will be asked to answer the prompt in the discussion forum and reply to one other student.

Quizzes (CO-2,3,4,5,6)

There are 13 chapter quizzes – one for each week except for Weeks 14 and 15; the final exam is scheduled in Week 15. These quizzes are administered through Knewton via Moodle, and they consist of between eight and fifteen questions designed around the learning objectives in the Knewton homework assignments. Students may use books, notes, Internet sources, etc., while working on the quizzes. There is a time limit on the quizzes, but you will not have to race against the clock to finish the questions (nor will a student have plenty of time to attempt to look up the answer to every question on the Internet). Students may NOT seek assistance from another person while working on the quizzes, nor may they give assistance to other students working on the quiz.

Final Exam (Parts 1 and 2) (CO-1,2,3,4,5,6)

The final exam covers material from Units 1 through 3 with some extra emphasis on Unit 3. Part 1 of the exam will be taken on Knewton. Part 2 of Exam 3 is to be downloaded from the course site, completed by handwritten work on paper, then scanned, and finally uploaded to Moodle as a single document, not as multiple documents with separate pages. The exams that are in this course are open book. You may use notes, course textbooks, videos, and other course materials to aid in completing the exams. However, assistance by another person in completing the exams is considered cheating and is subject to disciplinary action.

COURSE SCHEDULE

Format

Everything needed to successfully complete this course in fifteen weeks is explained on the course site. Each assignment has been designed to work together during each week. When studying, be sure to follow the suggested format explained for each lesson.

For this course, students will receive access to each week's work as the semester progresses. There will be due dates during the week, but most weekly assignments will be due by 11:59 p.m. on Friday. Please refer to the schedule for the due dates of assignments.

Generally, for college-level work, students should expect to have an average of 12 [5 credits] hours of homework per week.

The last official class day in Week 15 varies from semester to semester. Please refer to the Semester Calendar found in the Academic Information section at the top of the course site for the actual last day of class. All course work must be completed and submitted by that day.

Due Dates

All written assignments (outlined below) are to be submitted on the course site by 11:59 p.m. CT on Sundays at the end of each week in which they are assigned, unless otherwise noted.

For any questions regarding these assignments, contact the instructor.

Orientation

- Read the Getting Started Page
- Participate in the Introductions Forum
- View and Complete Understanding Plagiarism Presentation and Quiz
- Complete Student Responsibilities Exercise

Week 1: Topic A Very Brief Overview of Chemistry; Measurement

- Read the Weekly Overview
- Review all of the items in the Resources section at the top of the course site
- (Optional) Read Miracles, pages 14-15 and pages 141-142
- (Optional) Read Lesson 1 Reflection
- (Optional) Read An Introduction to the Philosophy of Science
- Read the following sections of Chemistry 2e:
 - 1.1 Chemistry in Context
 - 1.3 Physical and Chemical Properties
 - 1.4 Measurements
 - 1.5 Measurement Uncertainty, Accuracy, and Precision
- Watch Week 1 Videos
 - Course Introduction
 - Lecture 1A: Measurement
 - Lab 1A: Measurements

Due Friday

- Complete Knewton Activities (WO-1,4)
 - Practice Activities
 - Quiz
- Complete Lab 1A and submit the Lab 1A Results Form (WO-2,3)

Week 2: Matter and Energy; Scientific Method

- Read the Weekly Overview
- Read the following sections of Chemistry 2e:
 - 1.2 Phases and Classification of Matter
 - 5.1 Energy Basics
- Watch Week 2 Videos
 - Lecture 1B Matter and Energy
 - Lab 1B The Scientific Method

Due Friday

- Complete Knewton Activities (WO-2-5)
 - Practice Activities
 - Quiz
- Complete Lab 1B and submit the Lab 1B Results Form (WO-1,6)

Week 3: Atoms, Ions, and the Periodic Table

- Read the Weekly Overview
- (Optional) Read Miracles pg. 233-242
- (Optional) Read Lesson 2 Reflection
- Read the following sections of Chemistry 2e:
 - 2.1 Early Ideas in Atomic Theory
 - 2.2 Evolution of Atomic Theory
 - 2.3 Atomic Structure and Symbolism
 - 2.4 Chemical Formulas
 - 2.5 The Periodic Table
- Watch Week 3 Videos
 - Lecture 2 Part 1 Atoms, Ions, and the Periodic Table
 - Lecture 2 Part 2 Atoms, Ions, and the Periodic Table
 - Lab 2 Conservation of Mass

Due Friday

- Complete Knewton Activities (WO-2-6)
 - Practice Activities
 - Quiz
- Complete Lab 2 and submit the Lab 2 Results Form

Week 4: Chemical Compounds

- Read the Weekly Overview
- (Optional) Read Miracles pg. 18-20, 129-137
- (Optional) Read Lesson 3 Reflection
- Read the following sections of Chemistry 2e:
 - 2.6 Ionic and Molecular Compounds
 - 2.7 Chemical Nomenclature
- Watch Week 4 Videos
 - Lecture 3 Chemical Compounds
 - Lab 3 Acid-Based Titrations

Due Friday

- Complete Knewton Activities (WO-2-5)
 - Practice Activities
 - Quiz
- Complete Lab 3 and submit the Lab 3 Results Form (WO-1)
- Complete participation in the Unit 1 Reflection Forum

Week 5: Chemical Composition

- Read the Weekly Overview
- (Optional) Read Miracles pg. 17-36
- (Optional) Read Lesson 4 Reflection
- Read the following sections of Chemistry 2e:
 - 3.1 Formula Mass and the Mole Concept

- 3.2 Determining Empirical and Molecular Formulas
- Watch Week 5 Videos
 - Lecture 4 Chemical Composition
 - Lab 4 Moles, m&m's, and BB's

Due Friday

- Complete Knewton Activities (WO-1-7)
 - Practice Activities
 - Quiz
- Complete Lab 4 and submit the Lab 4 Results Form (WO-1-3)

Week 6: Chemical Reactions

- Read the Weekly Overview
- (Optional) Read Miracles pg. 53-60
- (Optional) Read Lesson 5 Reflection
- Read the following sections of Chemistry 2e:
 - 4.1 Writing and Balancing Chemical Equations
 - 4.2 Classifying Chemical Reactions
- Watch Week 6 Videos
 - Lecture 5 Part 1 Chemical Reactions
 - Lecture 5 Part 2 Chemical Reactions
 - Lab 5 Electrochemistry

Due Friday

- Complete Knewton Activities (WO-1-3)
 - Practice Activities
 - Quiz
- Complete Lab 5 and submit the Lab 5 Results Form (WO-4-6)

Week 7: Stoichiometry

- Read the Weekly Overview
- (Optional) Read Miracles pg. 71-87
- (Optional) Read Lesson 6 Reflection
- Read the following sections of Chemistry 2e:
 - 4.3 Reaction Stoichiometry
 - 4.4 Reaction Yields
 - 5.2 Calorimetry
 - 5.3 Enthalpy
- Watch Week 6 Videos
 - Lecture 6 Part 1 Quantities in Chemical Reactions
 - Lab 6A Stoichiometry

Due Friday

- Complete Knewton Activities (WO-1-3)
 - Practice Activities
 - Quiz

- Complete Lab 6A and submit the Lab 6A Results Form (WO-2,3)

Week 8: Heats of Chemical Reactions

- Read the Weekly Overview
- Watch Week 8 Videos
 - Lecture 6 Part 2 Quantities in Chemical Reactions
 - Lab 6B Conservation of Energy

Due Friday

- Complete Knewton Activities (WO-1,2)
 - Practice Activities
 - Quiz
- Complete Lab 6B and submit the Lab 6B Results Form (WO-1,2)
- Complete participation in Unit 2 Reflection Forum

Week 9: Electronic Structure of the Atom

- Read the Weekly Overview
- (Optional) Read Miracles pg. 87-98
- (Optional) Read Lesson 7 Reflection
- Read the following sections of Chemistry 2e:
 - 6.1 Electromagnetic Energy
 - 6.2 The Bohr Model
 - 6.3 Development of Quantum Theory
- Watch Week 9 Video
 - Lecture 7 Part 1 Electronic Structure of the Atom

Due Friday

- Complete Knewton Activities (WO-1-5)
 - Practice Activities
 - Quiz

Week 10: Electronic Structure of the Atom Continued

- Read the Weekly Overview
- Read the following sections of Chemistry 2e:
 - 6.4 Electronic Structure of Atoms (Electron Configurations)
 - 6.5 Periodic Variations in Element Properties
- View Week 10 Video
 - Lecture 7 Part 2 Electronic Structure of the Atom

Due Friday

- Complete Knewton Activities (WO-1-3)
 - Practice Activities
 - Quiz

Week 11: Chemical Bonding

- Read the Weekly Overview

- (Optional) Read Miracles pg. 159-171
- (Optional) Read Lesson 8 Reflection
- Read the following sections of Chemistry 2e:
 - 7.1 Ionic Bonding
 - 7.2 Covalent Bonding
 - 7.3 Lewis Symbols and Structures
 - 7.6 Molecular Structure and Polarity
- Watch Week 11 Videos
 - Lecture 8 Part 1 Chemical Bonding
 - Lecture 8 Part 2 Chemical Bonding
 - Lab 8 Chemical Bonding

Due Friday

- Complete Knewton Activities (WO-1-4)
 - Practice Activities
 - Quiz
- Complete Lab 8 and submit the Lab 8 Results Form (WO-2)

Week 12: Gases

- Read the Weekly Overview
- (Optional) Read Miracles pg. 130-137
- (Optional) Read Lesson 9 Reflection
- Read the following sections of Chemistry 2e:
 - 9.1 Gas Pressure
 - 9.2 Relating Pressure, Volume, Amount, and Temperature: The Ideal Gas Law
 - 9.5 The Kinetic-Molecular Theory
- Watch Week 12 Videos
 - Lecture 9 Gases
 - Lab 9 Gases

Due Friday

- Complete Knewton Activities (WO-1-5)
 - Practice Activities
 - Quiz
- Complete Lab 9 and submit the Lab 9 Results Form (WO-1,3)

Week 13: Liquids, Solids, and Phase Changes

- Read the Weekly Overview
- (Optional) Read Miracles pg. 245-248
- (Optional) Read Lesson 10 Reflection
- Read the following sections of Chemistry 2e:
 - 10.1 Intermolecular Forces
 - 10.2 Properties of Liquids
 - 10.3 Phase Transitions
 - 10.5 The Solid State of Matter
- Watch Week 13 Videos

- Lecture 10 Liquids, Solids, and Phase Changes
- Lab 10 Intermolecular Forces

Due Friday

- Complete Knewton Activities (WO-1-6)
 - Practice Activities
 - Quiz
- Complete Lab 10 and submit the Lab 10 Results Form (WO-1,4)

Week 14: Household Chemicals

- Read the Weekly Overview
- Read Lesson 11
- (Optional) Read Miracles pg. 249-266
- (Optional) Read Lesson 11 Reflection
- Watch Week 14 Video
 - Lab 11 The Mystery Compound

Due Friday

- Complete Lab 11 and submit the Lab 11 Results Form (WO-1,2)
- Complete participation in the Unit 3 Reflection Forum

Week 15: Final Exam

The final week varies in length based on the semester. Please refer to the Semester Calendars found in the Academic Information section at the top of the course site for details.

Due Last Day of Class

- Complete Final Exam Part 1 on Knewton
- Complete and submit Final Exam Part 2