



**UNIVERSITY OF  
NORTHWESTERN**  
ST. PAUL

OFFICE OF DUAL ENROLLMENT

**CHE1006**

# **Concepts of Chemistry**

**SPRING 2021**

**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 ordered from 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 of ions, atoms, and molecules on the basis of atomic and electronic structure
- CO-4. Compare and contrast the properties of solids, liquids, and gases
- CO-5. Calculate an amount of substance in terms of number of particles, moles, or mass
- CO-6. Calculate stoichiometric amounts of products and/or reactants involved in a chemical reaction

## MATERIALS

### Required Textbooks and Materials

*CHE1006 Course Lab Kit*

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

### Course Site Resources

*CHE1006 Concepts of Chemistry*. Online Video. Publisher: St. Paul, MN: Northwestern College – St. Paul. Year: 2013

Ball, D. and Crane, D. *Introduction to Chemistry*. Open-Source Textbook. Year: 2014.

## 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	20
Chapter Quizzes	20
Exam 1	20
Exam 2	20
Exam 3	<u>20</u>
<b>Total</b>	<b>100</b>

### 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](http://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—steal 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 and Subject Tutoring](#), advocating, transitional skill building, [Academic Coaching](#) (organization, time management, test taking, etc.).

Contact Academic Achievement for more information: [AcademicAchievement@unwsp.edu](mailto:AcademicAchievement@unwsp.edu) • 651-628-3316 • N4012 (Revised 06/20)

## 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

Sometimes collaboration is an excellent idea. Two people are often able to push a car out of a ditch when neither person is able to do it alone. In the realm of education, very few people are truly self-taught and, for most people, collaboration accelerates the rate of learning. Joe Student clearly sees a particular concept and can clearly explain it to Mary Student. On the next concept, Joe gets stuck, but Mary understands it and can explain it to Joe.

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 took the 50 BB's off of 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  $16.40 \pm 0.01$  g, and the 50 BB's that Dr. Evelyn Researcher picked might have a mass of  $16.43 \pm 0.01$  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.

### **Collaborative Wiki**

The Collaborative Wiki is located in the Resources section of the course site. This is an optional area for students to share some of the things that they found fascinating or potentially experienced for the first time about an experiment. The course is independent study in nature, so the purpose of the wiki is to provide students a place to share interesting facts and connect with their classmates, without sharing anything that might impact the grade of another student or compromise privacy.

### **Reflections**

The Reflections that are included in this course will explore the relationship between science and miracles, some of which are related to topics that are in the textbook for this course. Where appropriate, there are Bible readings that are accompanied by the excerpts from *Miracles* by C.S. Lewis. You are encouraged to read the entire book from beginning to end, but the Reflections will refer to various chapters from Lewis' book. The leading ideas that are expressed in these reflections may appear on the exams.

### **Lessons**

Lesson Overview pages direct you to the appropriate learning activities needed to complete each lesson. Activities may include assigned reading from the textbook (Introduction to Chemistry); the instructor's notes; viewing of a course lecture along with a Viewing Guide; and homework from the textbook and labs. The lessons are organized by things to Read, View and Apply. By following the recommended learning sequence, you should easily interact with the course materials and accomplish the intended learning outcomes.

## **Chapter Outlines**

The chapter outlines are to be used by the student for taking notes while watching the video lectures.

## **Practice Problems**

After you have viewed the recorded lectures, you should attempt the practice problems, which are listed in the resources section of the course site and are found in the textbook. All of these problems are intended to help you grasp the course material. They are for your own benefit, but they are not graded. The answers for odd numbered questions and problems can be found at the back of your textbook. Do not submit these for grading.

## **Lab Experiments**

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". The laboratory portion for this course must be satisfactorily completed in order to fulfill the laboratory science requirement for the core curriculum of University of Northwestern - Saint Paul.

## **Reflection Forums**

Before each test, 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**

Quizzes will be administered to assess if the student comprehends the content that is listed in the lesson overviews. These quizzes will also serve as practice for the upcoming exams. There are ten chapter quizzes during the first ten lessons of the course. Students have the option to check their answers as they complete the quiz by clicking the "check" button provided under the question in Moodle. If a question is answered incorrectly students will have the option to submit a second or third answer during the attempt if they click "check" then "try again". However, to discourage guessing, each change in answer, because the previous submission was incorrect, will be penalized 33.33% of the question point total, not 33.33% of the total quiz. Students will have up to three attempts for each question. The attempt will be finalized when students submit the quiz for grading. Students' final score will be reflective of their first attempt. However, the quiz will remain open for students if they would like to practice taking the questions again. Quizzes are open book, open note, and are not assigned a time limit. Students are allowed seek assistance from another person while attempting the quiz.

## **Examinations**

There are three examinations each consisting of two parts. Exam 1 covers material from Unit 1. Exam 2 covers material from Unit 2. Both exams are to be completed on the course site. Exam 3 is a comprehensive Final Exam, covering material from Units 1 through 3 with some extra emphasis on Unit 3. 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 9.5 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 Fridays 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

## **UNIT 1: LESSONS 1 - 3**

### **Week 1 - Lesson 1: Matter and Energy**

- Read Miracles, pages 14-16, 91, 141-142
- Read Lesson 1 Reflection
- Read Introduction to Chemistry, Chapter 1
- View Video Course Introduction
- View Video Lecture 1: Matter and Energy
- View Video Lab 1A: Measurements
- Complete Lab 1A and submit the Lab 1A Results Form on the course site

### **Week 2 - Lesson 1: Matter and Energy**

- View Video Lab 1B: The Scientific Method



- Complete Lab 1B and submit the Lab 1B Results Form on the course site
- Complete and submit the Chapter 1 Quiz on the course site

### **Week 3 - Lesson 2: Atoms, Ions, and the Periodic Table**

- Read Miracles, pages 233-242
- Read Lesson 2 Reflection
- Read Introduction to Chemistry, Chapter 2
- View Video Lecture 2: Atoms, Ions, and the Periodic Table
- View Video Lab 2: Conservation of Mass
- Complete Lab 2 and submit the Lab 2 Results Form on the course site
- Complete and submit the Chapter 2 Quiz on the course site

### **Week 4 - Lesson 3: Chemical Compounds**

- Read Miracles, page 18-20 and pages 129-137
- Read Lesson 3 Reflection
- Read Introduction to Chemistry, Chapter 3
- View Video Lecture 3: Chemical Compounds
- View Video Lab 3: Acid-Base Titrations
- Complete Lab 3 and submit the Lab 3 Results Form on the course site
- Complete and submit the Chapter 3 Quiz on the course site
- Post to Unit 1 Reflection

### **Week 5**

- Complete Exam 1 Part 1 and Part 2

## **UNIT 2: LESSONS 4 - 6**

### **Week 6 - Lesson 4: Chemical Composition**

- Read Miracles, pages 17-36
- Read Lesson 4 Reflection
- Read Introduction to Chemistry, Chapter 4
- View Video Lecture 4: Chemical Composition
- View Video Lab 4: Moles, m&m's, and BB's
- Complete Lab 4 and submit the Lab 4 Results Form on the course site
- Complete and submit the Chapter 4 Quiz on the course site

### **Week 7 - Lesson 5: Chemical Reactions**

- Read Miracles, pages 53-60
- Read Lesson 5 Reflection
- Read Introduction to Chemistry, Chapter 5
- View Video Lecture 5: Chemical Reactions
- View Video Lab 5: Electrochemistry
- Complete Lab 5 and submit the Lab 5 Results Form on the course site
- Complete and submit the Chapter 5 Quiz on the course site

### **Week 8 - Lesson 6: Quantities in Chemical Reactions**

- Read Miracles, pages 71-87

- Read Lesson 6 Reflection
- Read Introduction to Chemistry, Chapter 6
- View Video Lecture 6: Quantities in Chemical Reactions
- View Video Lab 6A: Stoichiometry
- Complete Lab 6A and submit the Lab 6A Results Form on the course site
- View Video Lab 6B: Conservation of Energy
- Complete Lab 6B and submit the Lab 6B Results Form on the course site
- Complete and submit the Chapter 6 Quiz on the course site
- Post to Unit 2 Reflection

## **Week 9**

- Complete Exam 2 Part 1 and Part 2

## **UNIT 3: LESSONS 7 - 11**

### **Week 10 - Lesson 7: Electron Structure of the Atom**

- Read Miracles, pages 87-98
- Read Lesson 7 Reflection
- Read Introduction to Chemistry, Chapter 7
- View Video Lecture 7: Electron Structure of the Atom
- Complete and submit the Chapter 7 Quiz on the course site

### **Week 11 - Lesson 8: Chemical Bonding**

- Read Miracles, pages 159-171
- Read Lesson 8 Reflection
- Read Introduction to Chemistry, Chapter 8
- View Video Lecture 8: Chemical Bonding
- View Video Lab 8: Chemical Bonding
- Complete Lab 8 and submit the Lab 8 Results Form on the course site
- Complete and submit the Chapter 8 Quiz on the course site

### **Week 12 - Lesson 9: Gases**

- Read Miracles, pages 130-137
- Read Lesson 9 Reflection
- Read Introduction to Chemistry, Chapter 9
- View Video Lecture 9: Gases
- View Video Lab 9: Gases
- Complete Lab 9 and submit the Lab 9 Results Form on the course site
- Complete and submit the Chapter 9 Quiz on the course site

### **Week 13 - Lesson 10: Liquids, Solids, and Phase Changes**

- Read Miracles, pages 245-248
- Read Lesson 10 Reflection
- Read Introduction to Chemistry, Chapter 10
- View Video Lecture 10: Liquids, Solids, and Phase Changes
- View Video Lab 10: Intermolecular Forces
- Complete Lab 10 and submit the Lab 10 Results Form on the course site

- Complete and submit the Chapter 10 Quiz on the course site

### **Week 14 - Lesson 11: Household Chemicals**

- Read Miracles, pages 259-266
- Read Lesson 11 Reflection
- Read Lesson 11: Household Chemicals
- View Video Lab 11: The Mystery Compound
- Complete Lab 11 and submit the Lab 11 Results Form on the course site
- Post to Unit 3 Reflection

### **Week 15**

*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.*

- Complete Exam 3 Part 1 and Part 2.