DISCLAIMER: This is an example syllabus that is subject to change at faculty discretion.

Course Syllabus

Course Information

CHM 126 - General Chemistry II

4 Credit Hours

Academic Calendar 2024-2026:

https://web.doane.edu/sites/default/files/2025-02/25-26%20OLA%20Calendar%202.25_1.pdf

Instructor Information

Instructor Name

Email Address: fill-in

Phone: fill-in (optional)

Office Hours: fill-in (optional)

If you need to contact me directly, I prefer that you email me. Please allow 24 hours for me to respond to emails Monday through Friday and 48 hours on the weekend.

Communicating With the Instructor

When questions arise throughout the course, please remember to check the following resources for an answer before reaching out to me:

1. Course Syllabus
2. Announcements
3. The Question Center discussion board

Question Center Discussion

The Question Center Discussion is an excellent place to ask questions and get answers from peers and me. You are encouraged to post your questions here before contacting me unless it is a time-sensitive matter. If you have questions of a personal nature, such as relating to a

personal emergency, questioning a grade on an assignment, or something else that needs to be communicated privately, you are welcome to contact me directly via email or phone.

Technology Help

If you have a question about the technology used in the course, please contact the Doane University Service Center for assistance; their contact information is listed later in the syllabus. If third-party tools are utilized in the course, please contact them directly.

Course Details

Catalog Description

Through lecture and lab experience, students will be exposed to and will demonstrate an understanding of the factors that determine the speed and extent of chemical reactions–kinetics, equilibria, thermodynamics, and electrochemistry.

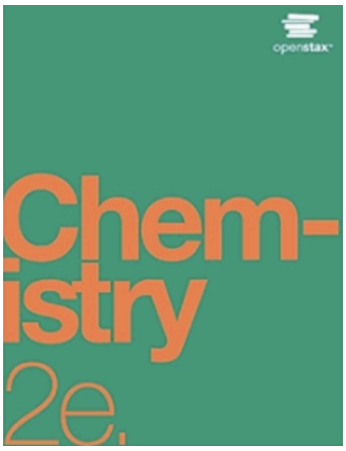
Course Prerequisites

CHM 125 (must have earned at least a C- or by permission)

Course Textbook and Materials

Required

Chemistry 2e
by Flowers, P., Theopold, K., Langley, R., Robinson, W. R.



Course Lab Kits

This course utilizes a lab kit from our educational partner, ***Science Interactive***. You will be required to complete both virtual and hands-on lab activities. The course includes instructions on how to purchase the lab kit.

Required Technology

- Canvas
- Science Interactive
- WileyPlus (Knewton Alta)
- Kaltura
- Smartphone/computer to take videos, pictures/scans

Course books and materials can be purchased at Doane Online Bookstore via eFollet. Select this course from the dropdown menu.

Learning Objectives and Course Outline

Course Objectives

By the end of the course, you will be able to:

1. Apply chemical structure to macroscopic properties of substances.
2. Describe how solutions form and how their makeup influences their physical and chemical properties.
3. Apply foundational mathematical reasoning to reaction kinetics and mechanisms.
4. Apply the concept of chemical equilibria and mathematical reasoning to chemical systems such as acid-base equilibria.
5. Explain the driving forces behind chemical reactions – enthalpy and entropy, and how free energy may be used to determine spontaneity of chemical reactions.
6. Apply the scientific method through hands-on laboratory experiments, following proper laboratory protocol and using proper laboratory techniques.

Course Outline

Module	Topic	Assessments	Aligned Objectives
1	Properties of Liquids	Adaptive Assignments Parts 1 and 2	1.1 Describe and apply the relationship between the strength of a molecule's IMFs and a molecule's melting point, boiling point, and vapor pressure 1.2 Determine which IMFs are present for a given molecule

Module	Topic	Assessments	Aligned Objectives
			1.3 Compare the strength of IMFs between molecules 1.4 Describe how IMF's impact things like viscosity, contact angle, and capillary action. 1.5 Calculate the heat absorbed or released during a temperature change and/or a phase change for a material. 1.6 Describe the features of a phase diagram and use a phase diagram to determine the state of a material at a given temperature and pressure combination.
2	Liquids and Solids	Microplastic Removal from Drinking Water Using Reverse Osmosis Discussion Adaptive Assignments Parts 1 and 2 Modules 1 and 2 Unit Quiz (w/companion assignment)	2.1 Discuss the solvation process in terms of the IMFs of solute and solvent compounds 2.2 Write out the dissociation of both strong and weak electrolytes 2.3 Describe a mixture's saturation based on the solute's solubility 2.4 Use Henry's law to relate the solubility of a gas in a liquid to the partial pressure of the gas above the liquid 2.5 Predict the miscibility of two liquids based on their chemical structure 2.6 Predict the temperature dependence on the solubility of a solid, liquid, or gas 2.7 Express concentration of solution components using molarity, molality, mole fraction, mass percent, and ppm 2.8 Calculate the vapor pressure of a solvent in a solution 2.9 Calculate freezing point and boiling point of a solution 2.10 Calculate the osmotic pressure of a solution 2.11 Calculate the molar mass of a compound through a colligative property observation
3	Kinetics	Adaptive Assignments Parts 1, 2, and 3 Solubility and Solubility Curves - Lab	3.1 Calculate the average rate of a chemical reaction given concentration vs time data. 3.2 Use a derived rate expression to relate the rate(s) of consumption for the reactants to the rate(s) of formation for the products

Module	Topic	Assessments	Aligned Objectives
			3.3 Use a rate law to relate the reaction rate to the rate constant and concentrations of the reactants 3.4 Determine a rate law using the method of initial rates 3.5 Apply the integrated rate laws to problems involving concentration of a reactant and time. 3.6 Use collision theory to discuss how temperature and concentration impact a reaction's rate 3.7 Draw and label activation energy diagram for a particular reaction 3.8 Use the Arrhenius equation to relate reaction rates, activation energy, temperature, and a rate constant 3.9 Describe a reaction mechanism and determine the rate determining step of a multi-step chemical reaction 3.10 Describe the impact catalysts have on reaction mechanisms and chemical reactions overall
4	Chemical Equilibrium	Adaptive Assignments Parts 1 and 2 Reaction Order and Rate Laws - Lab Modules 3 and 4 Unit Quiz (w/companion assignment)	4.1 Describe the state of a system that has reached chemical equilibrium 4.2 Write out an equilibrium constant expression for homogeneous and heterogeneous reactions in terms of both concentrations and partial pressures 4.3 Use equilibrium constant expressions to solve problems given equilibrium conditions 4.4 Use a reaction quotient to determine whether a system is at equilibrium 4.5 Use Le Chatlier's Principle to determine how equilibrium is impacted by changing the amount of a species, the total volume of the system, and changes in temperature 4.6 Calculate an equilibrium constant when given initial and equilibrium concentrations/partial pressures 4.7 Calculate equilibrium concentrations of any species when given initial concentrations/partial pressures and an equilibrium constant
5	Acid-Base Equilibria	Adaptive Assignments Parts 1 and 2	5.1 Write out the products of an acid-base proton transfer reaction and the acid, base, conjugate acid, and a conjugate base

Module	Topic	Assessments	Aligned Objectives
			5.2 Identify a substance as either an acid or a base and determine its strength 5.3 Predict the strength of a conjugate acid or conjugate base 5.4 Convert between [$H3O^{+}$], [OH^{-}], pH and pOH 5.5 Calculate the pH of the solutions of a strong acid, strong base, weak acid, weak base or of a buffered solution 5.6 Write out the dissociation reactions and equilibrium expressions for polyprotic acids and bases
6	Advanced Equilibria Systems	Adaptive Assignments Parts 1 and 2 Titration for Acetic Acid in Vinegar - Lab Modules 5 and 6 Unit Quiz (w/companion assignment)	6.1 Describe the attributes of a buffer solution and describe how a buffer solution is made 6.2 Calculate the pH after mixing acid and base solutions 6.3 Draw and label a pH curve for an acid-base titration 6.4 Calculate the concentration of an acid or base solution based on the results of acid-base titration 6.5 Calculate the molar solubility of an insoluble ionic compound in water and in a solution with a common ion. 6.6 Describe how common ion effect and solution impacts the solubility of an insoluble ionic compound 6.7 Predict whether or not mixing solutions will result in a precipitate 6.8 Describe Lewis acid-base chemistry
7	Thermodynamics	Adaptive Assignments Parts 1 and 2 Beer's Law - Lab	7.1 Describe what it means for a process to be spontaneous 7.2 Calculate the change of entropy for a system experiencing heat transfer 7.3 Describe a process's entropy change using the idea of microstates 7.4 Apply the second and third laws of thermodynamics 7.5 Determine the spontaneity of a process using it's change in Gibbs Free Energy

Module	Topic	Assessments	Aligned Objectives
			7.6 Calculate or predict the change in Gibbs Free Energy for a process 7.7 Calculate a reaction's equilibrium constant using thermodynamic data 7.8 Calculate a reactions equilibrium constant using thermodynamic data
8	Electrochemistry	Adaptive Assignments Parts 1 and 2 Final Exam (w/companion assignment)	8.1 Assign oxidation numbers to all atoms in a molecule or ion in a redox equation. 8.2 Identify an oxidizing and reducing agent for a redox equation 8.3 Balance redox equations for acidic and basic solutions 8.4 Evaluate and explain all components of a basic galvanic cell 8.5 Calculate cell potentials of galvanic cells under standard and nonstandard conditions 8.6 Evaluate the relationship between standard cell potential, Gibbs free energy, and equilibrium constant

Course Requirements

This is an online course, and there will **not be any face-to-face class sessions**. All communications, submissions of assignments, course interactions, and posting of grades will utilize Canvas LMS (https://doane.instructure.com). You must have a **reliable internet connection** throughout the course.

Attendance/Participation

Attendance in an online course means logging into Canvas regularly and participating in all the activities posted in the course. In addition, check your Doane University email account regularly, as I may send important information about the course.

Class Preparation

Preparation for class means reading the assigned readings and reviewing all information required for that module. You should plan to work on this course every day. Regular engagement is expected for online courses.

Netiquette Guidelines

At heart, netiquette (etiquette for the Internet) is simple, including good manners and business courtesy. Some of it may seem basic, but some infringements can result in major problems for others or create an unintended insult to another user. The guidelines are adapted from Virginia Shea's *The Core Rules of Netiquette* (1994). Please review the Netiquette Guidelines in the Student Resource Center for more information.

Computer Requirements

To successfully use Canvas, please refer to Doane University's minimum computer requirements. This also includes:

- Reliable computer and internet connection
- A web browser (Chrome or Mozilla Firefox)
- Adobe Acrobat Reader (free)
- Word processing software—Microsoft Word or Google Docs

Campus Network or Canvas Outage

When access to Canvas is not available for an extended period of time (greater than one entire evening - 6 pm until 11 pm), you can reasonably expect that the due date for assignments will be changed to the next day.

Drop and Add Dates

If you feel it necessary to withdraw from the course, please contact your advisor for full details on the types of withdrawals available and their procedures.

Federal requirements state that students must complete 75% of the coursework to be eligible to receive an incomplete for the course. Students who fall more than two weeks behind cannot meet this requirement.

Access to Course

You can access the course in Canvas starting from the first day of the course and for 15 days after the term ends. If you need access beyond those 15 days, you must submit a request with a valid reason, which the administration must approve.

Academic Integrity

Fundamental to our mission, core values, and reputation, Doane University adheres to high academic standards. Students of Doane University are expected to conduct themselves in a

manner reflecting personal and professional integrity. Disciplinary actions may be taken against students whose academic behavior is not congruent with the expectations of the University. Students are responsible for adhering to the standards detailed in this policy. Not being familiar with these standards does not mean that the students will not be accountable for adherence to them. Additional details on the Academic Integrity policy for violating academic integrity are published in the undergraduate and graduate catalogs. Please review Doane University's Academic Integrity Policy.

Course Grading

Submitting Assignments

Unless otherwise communicated to me, all assignments must be submitted via Canvas. Each assignment will have a designated place to submit your work. All materials, assignments, and deadlines are subject to change without prior notice. You are responsible for staying in touch with me and reviewing the course site, including Announcements, regularly to learn about changes to assignments or due dates.

Quizzes and Exams

Due to the limitations of the Canvas rich-text editor tool, some quiz/exam questions will require a hand drawn or hand written response on scratch paper. A copy of your scratch paper needs to be scanned/photographed and submitted to the quiz/exam Companion Assignment within 30 minutes of submitting the quiz/exam.

*IMPORTANT!

- If you fail to submit your work within 30 minutes of the completion of the quiz/exam you will not be eligible to receive partial credit for these questions.
- If the work you submit is not sufficient to justify your answer you will receive zero credit for that work.
- If the work you submit is not readable due to poor image quality or the work is too small you will receive zero credit for that work.
- If your work is sent but is not in an acceptable format, you will receive a zero for all questions that require work. Keep in mind that the copy of your exam work needs to be sent as a .doc, .pdf, .jpeg, or .png formatted image. .pages or .HEIC formatted images are not accepted. A scanned PDF is preferred.

Grading Scale

Assignment of letter grades is based on a percentage of points earned. The letter grade will correspond with the following percentages achieved. All course requirements must be completed before a grade is assigned.

A+ 97-100

A 93-96

A- 90-92

B+ 87-89

B 83-86

B- 80-82

C+ 77-79

C 73-76

C- 70-72

D+ 67-69

D 63-66

D- 60-62

F <60

Grading Scheme

The following outlines the weighted breakdown for how grades will be calculated:

Adaptive Assignments - 15%

Assignments, Discussions and Labs – 35 %

Unit Exams – 30%

Final Exam – 20%

Tutor Me

Students can access a **free online tutoring service** within their Canvas account. You can connect with a live free tutor or submit a paper to get feedback before submitting.

Proctored Assessments

This course **may contain proctored quizzes and exams, which are not optional**. For these proctored events, Doane uses YuJa Verity, a secure, online proctoring service that allows you to complete your exam from any chosen location at any time. Proctoring assures your instructor that any suspicious activity by test takers will be monitored and reported. The cost of the proctoring is included in the tuition and fees for this course.

Late or Missed Assignments

All assignments and labs must be completed and turned in to finish the course. Unless you discuss a late assignment with me before the assignment due date, your assignment will lose 20% each day it is late.

Assignment & Assessment Feedback

Please allow 1-3 days for feedback on assignments. Be sure to review all of my feedback, as this will help you reflect on what you have learned while receiving suggestions for improvement.

Grade Appeals

Students who believe that their grade was miscalculated due to a mathematical error should contact the instructor within **ten (10) days of the grade posting**. Students are encouraged to talk with their advisor to offer an assessment of the concern and clarify the steps of the appeal process. More information is published in the Undergraduate and Graduate Catalogs.

Support and Services

Technical Support

If you need technical assistance, please access the Self-Service Portal. The help desk can be reached at 402-826-8411 or by email at helpdesk@doane.edu.

Accessibility Statement

In compliance with the Rehabilitation Act of 1973, Section 504, and the Americans with Disabilities Act of 1990, professional disability specialists and support staff at Doane University facilitate a comprehensive range of academic support services and accommodations for qualified students with disabilities. Doane University staff coordinate student transitions from high schools and community colleges, conduct in-service training for faculty and staff, enable the resolution of accessibility issues, conduct community outreach, and facilitate collaboration among Doane University staff on disability policies, procedures, and accommodations.

Accommodations & Disability Services

Doane University's Disability Services Office will guide accommodations and universal access. To request accommodation, please complete the Self-Identification Form and visit the website for additional information as soon as possible.

Academic Support

Doane University offers all of its students access to Academic Support services.

Title IX Requirements: Mandatory Reporting

At Doane, all university employees, including faculty, are considered Mandatory Reporters. As a Mandatory Reporter, I am required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator and, thus, cannot guarantee confidentiality. This means that if you tell me about an incident of sexual harassment, sexual assault, domestic violence, dating violence, stalking, and/or other forms of prohibited discrimination, I have to share the information with the University's Title IX Coordinator. My report does not mean that you are officially reporting the incident. This process is in place to ensure you have access to and are able to receive the support and resources you need. Please visit the Campus Advocacy, Prevention, and Education (CAPE) Project for additional information, including confidential resources.

Anti-Harassment Policy

Doane University, referred to as the "University," is committed to providing all University community members with a safe and non-discriminatory learning, living, and working environment. This policy addresses the University's responsibilities under Title IX, the Violence Against Women Reauthorization Act of 2013, and the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act ("Clery Act"). More information is published in the Student Handbooks.

Instructional Technology Accessibility and Privacy Policies

Technology accessibility and privacy policies are available on the Student Resource Center within the Canvas LMS.

Regular and Substantive Interaction

The U.S. Department of Education mandates that online courses include "regular and substantive interaction" (RSI) between students and instructors to be considered distance education. This course adheres to the RSI expected of all distance education courses. The course adheres to the regular component through

- a clear schedule of due dates for lessons, readings, and assessments
- an instructor of record who monitors student progress in the course and alerts the students who are not engaging adequately in the course.

The substantive interaction is achieved through

- assessment of students' work with feedback on a scheduled basis
- an active discussion board about course content monitored by the instructor
- providing information about the course content on a regular basis or in response to questions.

Syllabus Addendum & Disclaimer

I (the instructor) view the course syllabus as an educational contract between myself and each student. Every effort will be made to avoid changing the course schedule, but unforeseen events may make syllabus changes necessary. I reserve the right to make changes to the syllabus as deemed necessary. Students will be notified promptly of any syllabus changes via email or course site announcements. Please check your Doane University email and the course site announcements often.

Syllabus Changes

The instructor and Doane University reserve the right to change this course syllabus. All students will be notified of any changes.

Syllabus Addendum

Each student is responsible for knowing the policies, resources, and expectations specified in the Doane Syllabus Addendum.