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Spring 2023

### Chem 126-016-104: Chemistry, A Molecular Approach

Cassandra Diaz-Allen

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THE DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE

**CHEM 126 General Chemistry**  
**Spring 2023 Course Syllabus**

*Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working to achieve. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:*

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

*Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu)*

**COURSE INFORMATION**

**Course Description:** CHEM 126

**Number of Credits:** 3

**Pre-requisites:** CHEM 125

**Corequisites:** C or higher in Math 110 or equivalent

Course: Section	Meeting times
Chem 126: 016	M 8:30 AM - 9:50 AM W 8:30 AM - 9:50 AM
Chem 126: 104	W 6:00 PM – 8:50 PM

**Office Hours: Tier 323A**

Day	Time
M	11:00 am - 2:00 pm
T	Virtual* 1:00 pm – 2:00 pm
W	11:00 am - 2:00 pm
R	Virtual* 6:00 pm - 7:00 pm

**Webex meeting room:** <https://njit.webex.com/meet/cnd3>

**Webpage:** The course website is available through Canvas, which can be accessed via [canvas.njit.edu](https://canvas.njit.edu). Please email me immediately if you cannot access the class site. All materials including lecture summaries, PowerPoint slides, and other documents will be posted on the class site. Please check the site frequently for new materials and announcements. All grades for this course will be posted to Canvas on a regular basis. You are responsible for all updates posted to Canvas, and if you find any mistakes in content or grading, or you need help accessing these materials, please contact me as soon as possible at [Cassandra.diazallen@njit.edu](mailto:Cassandra.diazallen@njit.edu).

**Required Textbook:**

<b>Title</b>	Chemistry, A Molecular Approach
<b>Author</b>	Nivaldo J. Tro
<b>Edition</b>	Fifth
<b>Publisher</b>	Pearson
<b>ISBN #</b>	ISBN-13: 978-0134874371

**University-wide withdrawal date:** The last day to withdraw with a **W** is Monday, April 03, 2023.

**Learning Outcomes**—You should be able to:

1. Define reaction rate, relate reaction rate to stoichiometry, and determine order of a reaction.
2. Describe the factors affecting reaction rate.
3. Use kinetic data to write reasonable reaction mechanisms.
4. Explain equilibrium and equilibrium constants.
5. Understand the difference between the equilibrium constant (K) and the reaction quotient (Q).
6. Determine the direction a reaction will proceed, and the product yield based on the equilibrium constant.
7. Use Le Chatelier's principle to determine direction of reaction.
8. Understand different definitions of acids and bases.
9. Explain the autoionization of water, the concept of pH, and what determines the strength of acids/bases.
10. Memorize and know how to perform calculations relating to acid and base dissociation constants.
11. Explain what a buffer solution is and understand the importance of buffer solutions.
12. Calculate the efficiency of buffer solutions.
13. Interpret equilibrium constants ( $K_{sp}$ ) and discuss solubility of sparingly soluble salts.
14. Interpret titration curves and calculate the pH of a solution during any number of titration points.
15. Understand and explain energy transformations in chemical reactions.
16. Explain entropy, Gibbs free energy, and the second and third laws of thermodynamics.
17. Determine whether a reaction is spontaneous.
18. Calculate the thermodynamic parameters  $\Delta G$ ,  $\Delta S$ , and  $\Delta H$ , and understand how the equilibrium constant relates to these parameters.
19. Balance redox reactions and write oxidation and reduction half-reactions.
20. Calculate the cell potential for a redox reaction in a galvanic cell.
21. Relate cell potential to thermodynamic parameters and determine the direction of spontaneity.
22. Use Faraday's law to determine the amount of material deposited during electroplating.
23. Explain electrolysis and overvoltage.
24. Know the difference between chemical reaction and nuclear reaction.
25. Balance nuclear equations and describe the particle emitted during the process.
26. Predict the type of emission from unstable nuclides.
27. Use the mass-energy relationship to calculate the energy released during nuclear processes.
28. Distinguish the difference between nuclear fission and fusion.
29. Describe the applications of nuclear reactions in energy production.
30. Name simple organic compounds and recognize (and name) the basic functional groups.
31. Write reactions of alkanes, alkenes, and alkynes.

## **POLICIES**

**All CES students must familiarize themselves with, and adhere to, all official university-wide student policies.** CES takes these policies very seriously and enforces them strictly. In addition, obtaining course materials such as past exams or solutions to homework and/or class assignments from external sources constitutes as cheating. The official Student's Solutions Guide is exempt. Posting course materials on external websites without the approval of the instructor violates intellectual property laws and is therefore **strictly forbidden**. Any student caught cheating on homework will be assessed a penalty of 20 points, in addition to a grade of zero for the given homework assignment. **Students are encouraged to seek help from their instructors during office hours.**

**Grading Policy:** The final grade in this course will be determined by a point total based on the following:

<b>Homework</b>	150
<b>Class Participation (recitation + lecture)</b>	150
<b>Pre-Exam Worksheets (virtual) 25 pts X 4 worksheets =</b>	100
<b>Common Exam I</b>	100
<b>Common Exam II</b>	100
<b>Common Exam II</b>	100
<b>Final Exam</b>	300

Your final letter grade in this course will be based on the following tentative curve:

<b>A</b>	>83.5	<b>C</b>	60.0-65.9
<b>B+</b>	77.5-83.4	<b>D</b>	55.0-59.9
<b>B</b>	71.0-77.4	<b>F</b>	<55.0
<b>C+</b>	66.0-70.9		

**You must maintain an average of 35%, which is 228 points in the common exams and finals to be considered for a grade of D or higher. You will receive an F even if you have adequate point total without this requirement.**

**ATTENDANCE POLICY:** Attendance at both lecture and recitation classes is **mandatory** and will be recorded. Each class is a learning experience that cannot be replicated through simply “getting the notes.” If you are late, you WILL NOT receive attendance points for the day.

**LECTURE (IN PERSON):** A computer and scientific (non-graphing, non-programmable) calculator are required for all lectures. Students are expected to come to lecture after having reviewed the lecture notes available in Canvas. Instruction will be offered in person, so attendance is required for all the classes. We will be doing a lot of problem-solving, so a paper notebook where you can do problems is highly recommended.

**RECITATION (SECOND LECTURE PERIOD) IN PERSON:** During each recitation, students will be given a worksheet to solve. You will be given adequate time to complete the worksheets and upload your work. These worksheets are essential for helping you learn and are worth points, so please take the time to do the work neatly and upload them in the space provided in CANVAS. Students who miss a recitation for a valid reason must still make up the worksheet to get credit.

**COURSE LEARNING RESPONSIBILITY:** The COVID-19 pandemic has required that both instructors and students make changes to their normal working protocols for courses. Students are asked to practice extra care and attention regarding academic honesty, with the understanding that all cases of plagiarism, cheating, multiple submission, and unauthorized collaboration are subject to penalty. Students may not collaborate on exams or assignments, directly or through virtual consultation, unless the instructor gives specific permission to do so. Posting an exam, assignment, or answers to them on an online forum (before, during, or after the due date), in addition to consulting posted materials, constitutes a violation of the university’s Honesty policy. Likewise, unauthorized use of live assistance websites, including seeking “expert” help for specific questions during an exam, can be construed as a violation of the honesty policy. All students should be familiar with the NJIT integrity code:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>

In addition to adhering to the NJIT Integrity statement, converged learning also places a significant amount of responsibility on you. Please review the email sent by the registrar for detailed instructions on classroom assignment and dates when you will be on campus.

**HOMWORK POLICY:** Homework is 100% online and accessed via CANVAS. The homework is to test your understanding of the material being taught. This homework will build on the classroom content and enhance your understanding of the material. This homework will also be good preparation for the common exams. It is important that you aim to get >90% in all your homework assignments to get the most benefit. **Each homework assignment has its due date.** In addition, Canvas has a calendar with due dates. **ALL HOMEWORK MUST BE DONE ON TIME. DO NOT WAIT TO THE LAST MINUTE TO DO YOUR HOMEWORK. ONLINE SYSTEMS ARE NOT 100% RELIABLE. UNEXPECTED EVENTS, like Canvas being down, MAY OCCUR but they are not considered valid excuses for missing a due date. Plan to finish your homework at least one day before it is due.**

**PRE-EXAM WORKSHEET (25 PTS):** A week before each exam, including the Final Exam, there will be a Pre-Exam worksheet on Canvas. The purpose of this worksheet is to give students problems that assess the student's knowledge of core principles, as well as their problem-solving skills at a time when the student can still ask for help. These points will be counted as EXAM points!

Common Exams are held on Mondays during the common hour. They start at 4:30 pm in assigned rooms (TBD)

**EXAMS:** There will be three common exams and one comprehensive final exam. The following exam periods are tentative, and therefore possibly subject to change:

<b>Common Exam I</b>	<b>February 20</b>
<b>Common Exam II</b>	<b>March 20</b>
<b>Common Exam III</b>	<b>April 17</b>
<b>Reading Day</b>	<b>May 04</b>

**ADMINISTRATION OF EXAMS:** The Common and Final Exams will be administered IN PERSON. Students may only use scientific (non-programmable, non-graphing) calculators on exams. The student will also be asked to show a photo-ID.

**The final Exam will be an in-person, proctored ACS final exam. During the exam, you must comply with the following rules:**

1. No cell phones present anywhere near the exam—any indication of cell phone presence (a ring tone, vibration, music, or a phone visible to the camera) will result in a point penalty.
2. No talking to anyone.
3. No covering of face (either with clothing or hand).
4. No listening to music or having headphones/earbuds on.

**TEST GRADING ERROR:** Test scores will be available in Canvas roughly two weeks after the test. If you wish to go over your exam, arrange to meet your instructor during office hours as the online exams may not be visible after submission. If you believe there is an error, **you have one week after scores are posted to submit a test for regrading.** You must describe the error via email to your professor for consideration. ALL ERRORS NEED TO BE BROUGHT TO THE INSTRUCTOR'S ATTENTION WHEN THEY OCCUR. DO NOT WAIT UNTIL THE END OF THE SEMESTER.

**MAKEUP EXAM POLICY:** There will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. If you have a legitimate reason for missing a quiz or exam, you should contact the Dean of Students office and present written, verifiable proof of the reason for missing the exam (e.g., a doctor's note, police report, court notice, etc.), clearly stating the date AND time of the mitigating problem. You must also notify the CES Department Office/Instructor that the exam will be missed. **One cumulative make-up examination** will be permitted at the end of the semester if there is an acceptable and substantial reason. **A grade of zero will be given for a second missed examination independent of reason.** *Tentative date of the makeup exam is during the last week in April (23 – 29).*

### **Using Respondus LockDown Browser and a Webcam for Online Assignments**

Respondus LockDown Browser is a locked browser that prevents you from printing, copying, going to another URL, or accessing other applications during a quiz. If a Canvas quiz requires that LockDown Browser be used, you will not be able to take the assessment or quiz with a standard web browser. You may be required to use LockDown Browser with a webcam (Respondus Monitor), which will record you during an online exam. The webcam can be built into your computer or can be the type that plugs in with a USB cable. Watch this [short video](#) to get a basic understanding of LockDown Browser and the webcam feature. A student [Quick Start Guide](#) (PDF) is also available.

1. Download and install LockDown Browser from this link:  
<http://www.respondus.com/lockdown/download.php?id=264548414>
2. Once your download has finished, locate the "LockDown Browser" shortcut on the desktop and double-click it. (For Mac users, launch "LockDown Browser" from the Applications folder.)
3. You will be brought to the Canvas or Moodle login page within the LockDown Browser. If you are in Moodle, click "Login with your UCID" to log in with your NJIT UCID and password and then click Login.
4. Under "My courses," click on the course in which you have to take the exam that requires the LockDown Browser. After you enter the course, find the exam and click on it.
5. A confirmation prompt will appear. Click the "Start attempt" button. Once a quiz has been started with LockDown Browser, you cannot exit until the Submit all and finish button is clicked.
6. If you are required to use a webcam (Respondus Monitor), you will be prompted to complete a Webcam Check and other Startup Sequence steps.

## **HOW TO SUCCEED IN THIS COURSE:**

You are responsible for utilizing the resources provided, like pre-recorded lectures, to help yourself learn. You will benefit from the lecture and recitation only if you come prepared to class. Please plan to spend at least 6-9 hours each week outside the lecture/recitation period for this class. **Spend a little time on chemistry and problem-solving every day!** In addition to office hours, the Chemistry tutoring center will be a useful resource where you can get help from peers. On a weekly basis, you should plan to:

- a) Read the textbook chapter and look over the powerpoint notes for each class
- b) Prepare questions to ask the professor during class
- c) Review material and come prepared to do recitation problems
- d) Do all of the online homework and textbook problems
- e) Go to tutoring the center in CKB Room G12. The tutors can help with Canvas homework
- f) Go to Instructor office hours—this is particularly useful for clarifying concepts

## **ADDITIONAL RESOURCES**

**Chemistry Tutoring Center:** Located in the Central King Building, Lower Level, Room G12. Students can get help from peer tutors on a “walk-in” basis. There is no private tutoring available, however if the center is not too busy, you may be able to get more personal attention. In this peer tutoring model, tutors are taught to encourage interaction among students to promote learning. In addition, there will be limited tutoring available online as well. *Hours of operation are from Monday—Friday 10:00 am—6:00 pm*, either virtually or in-person.

**Mental Health and Well-being:** NJIT is committed to the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Center for Counseling and Psychological Services (c-CAPS) at <https://www.njit.edu/counseling/> or by calling the c-CAPS office at 973-596-3414. If you need support and information about options and resources, please also reach out to the Office of the Dean of Students at <https://www.njit.edu/dos/>

**Accommodation of Disabilities:** **O**ffice of **A**ccessibility **R**esources and **S**ervices (**OARS**, formerly known as *Disability Support Services*) offers long term and temporary accommodations for undergraduate, graduate, and visiting students at NJIT.

If you need accommodations due to a disability please contact Scott Janz, Associate Director at the Office of Accessibility Resources and Services at 973-596-5417 or via email at [scott.p.janz@njit.edu](mailto:scott.p.janz@njit.edu). The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation, and additional support services provided please visit the Accessibility Resources and Services (OARS) website at: <http://www5.njit.edu/studentsuccess/disability-support-services/>



**IMPORTANT DATES:**

<b>Month</b>	<b>Day</b>	<b>Weekday</b>	<b>Event</b>
January	16	Monday	Martin Luther King, Jr. Day
January	17	Tuesday	First Day of Classes
January	21	Saturday	Saturday Classes Begin
January	23	Monday	Last Day to Add/Drop a Class
January	23	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	24	Tuesday	W Grades Posted for Course Withdrawals
January	30	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	13	Monday	Last Day for 50% Refund, Full Withdrawal
March	6	Monday	Last Day for 25% Refund, Full Withdrawal
March	13	Monday	Spring Recess Begins - No Classes Scheduled - University Open
March	18	Saturday	Spring Recess Ends
April	3	Monday	Last Day to Withdraw
April	7	Friday	Good Friday - No Classes Scheduled - University Closed
April	9	Sunday	Easter Sunday - No Classes Scheduled - University Closed
May	2	Tuesday	Friday Classes Meet
May	2	Tuesday	Last Day of Classes
May	3	Wednesday	Reading Day 1
May	4	Thursday	Reading Day 2
May	5	Friday	Final Exams Begin
May	11	Thursday	Final Exams End
May	13	Saturday	Final Grades Due

### Course Outline

This is the second part of a two-course Chemistry sequence. This course builds on content from Chem 125. So, it is expected that the student will have reviewed Chapters 1-14 before starting this course.

Week	Outcomes	Topic	Homework
1	1, 2	Chapter 15: Chemical Kinetics	Warm up Basic HW Chapter 15 HW – part 1
2	1, 2, 3	Chapter 15: Chemical Kinetics	Chapter 15 HW – part 2
3	4, 5	Chapter 16: Chemical Equilibrium	Chapter 16 HW – part 1
4	4, 5, 6, 7	Chapter 16: Chemical Equilibrium	Chapter 16 HW – part 2
5	8, 9	Chapter 17: Acids and Bases	Chapter 17 HW – part 1
6	<b>EXAM 1: Chapters 15 and 16 (February 20)</b>		
6	8, 9, 10	Chapter 17: Acids and Bases	Chapter 17 HW – part 2
7	11, 12	Chapter 18: Aqueous Ionic Equilibrium	Chapter 18 HW – part 1
8	13, 14	Chapter 18: Aqueous Ionic Equilibrium	Chapter 18 HW – part 2
9	<b>SPRING BREAK</b>		
10	<b>EXAM 2: Chapters 17 and 18 (March 20)</b>		
10	15, 16	Chapter 19: Free Energy and Thermodynamics	Chapter 19 HW – part 1
11	17, 18	Chapter 19: Free Energy and Thermodynamics	Chapter 19 HW – part 2
12	19, 20, 21	Chapter 20: Electrochemistry	Chapter 20 HW – part 1
13	21, 22, 23	Chapter 20: Electrochemistry	Chapter 20 HW – part 2
14	<b>EXAM 3: Chapters 19 and 20 (April 17<sup>th</sup>)</b>		
14	18, 19, 20	Chapter 21: Radioactivity and Nuclear Chemistry	Chapter 21 HW
15	18, 19, 20	Chapter 21: Radioactivity and Nuclear Chemistry	Chapter 21 HW
16	1 - 21	FINAL EXAM Review	Basic: Chapters 1-8 Basic Chapters 9-12 ACS reviews: I and II