CHEM 112 – General Chemistry II – 3 credit hours
Spring 2022, Sections 031-038

Instructor Dr. Min Zhang

Office Hours By appointment

Email Zhang339@mailbox.sc.edu

Academic Bulletin Description Continuation of CHEM 111. Special emphasis on chemical equilibrium. Three lecture and one recitation hours per week.

Prerequisites Grade of C or better in CHEM 111 **AND** MATH 111, 115, 122, 141 or higher. Students who do not meet the prerequisites will be administratively dropped from the class.

Corequisite Chemistry 112L is a co-requisite for this course, but it is administered and graded separately**.**

Learning Outcomes

After completing CHEM 112, students will be able to:

- Make both qualitative and quantitative predictions of the solubility of compounds.
- Predict the physical properties of dilute solutions.
- Predict the direction and extent of chemical reactions at various temperatures using equilibrium constants and thermodynamic data.
- Calculate pH of solutions of acids and bases and pH changes in acid–base reactions.
- Determine rate laws from kinetic data and vice versa. Calculate chemical reaction rates at different temperatures.
- Balance oxidation–reduction reactions and assess the number of electrons transferred.
- Interconvert voltages, spontaneity and thermodynamic quantities in electrochemical reactions.

All learning outcomes in this course are equivalent to face-to-face versions of this course.

Materials

- Supplemental Lecture Slides, Fall 2020 edition, Taylor-Perry, Reger, Goode and Freeman. Available as a stand-alone product ISBN 9781938535208 OR part of the CHEM 112L Lab Manual ISBN 9781938535345.
- Achieve Homework Access. ISBN 9781319404857.
- Graphing Scientific Calculator
- Computer with internet access and functioning webcam and microphone. Must be compatible with Respondus LockDown Browser with Monitoring.
- Recommended: C*hemistry: Principles & Practice*, 3rd Edition, Reger, Goode and Ball,
- Chapters 12–18. e-book access ISBN 9780357693339.

Course Format This course is being taught in a hybrid format. The lecture meets in a traditional, face-to-face format. The recitation meets in a synchronous, online format. Exams are administered in an online synchronous format.

All dates and times are Eastern Standard Time.

Lecture Mondays, Wednesdays and Fridays face-to-face 10:50 am – 11:40 am EST in JONES 210

Be prompt. Always have lecture slides and a calculator.

Recitation Recitations are **required** weekly meetings during which problem-solving strategies will be reviewed and a Blackboard exercise will be completed. **Recitation meetings will begin the week of January 10.** Recitations will be delivered via Blackboard Collaborate Ultra. Once classes begin, you should see a separate Blackboard course for recitation. If you do not have a recitation Blackboard course, please contact me as soon as possible. The enrollment in these recitation Blackboard courses must be manually kept, so if you change sections or drop the class, you will need to email me to correct your enrollment.

A set of recitation questions will be provided prior to recitation. Students will have the opportunity to work on the recitation questions and attend office hours to get help. During the recitation period, the instructor will review some of the questions from the worksheet and give a Blackboard exercise covering similar questions. Recitation is worth 50 points. Grading for recitation will be 50% participation (25 points: logging in on time, staying the whole session, completing the Blackboard exercise) and 50% (25 points) determined from the recitation exercise grade. The lowest two recitation participation scores and the lowest two recitation exercise scores will be dropped. The remaining participation and exercise recitation grades will be averaged separately and then combined to produce a recitation score out of 50 points. Since two low recitation scores are dropped, the first two absences in recitation (excused or unexcused) will be handled using this policy. To make up a third or more absence, official documentation must justify the absence as excused. A tentative schedule of recitation material is included below.

Section	Day/Time	Instructor/TA	Email Address
031	Wed 1:10 pm	Kennedy Miller	kem50@email.sc.edu
032	Wed 2:20 pm	Izlen Peksenar	peksenar@email.sc.edu
033	Wed 3:30 pm	Alison Luscomb	aluscomb@mailbox.sc.edu
034	Wed 4:40 pm	Izlen Peksenar	peksenar@email.sc.edu
035	Thur 8:30 am	Matt Powell	powellmj@mailbox.sc.edu
036	Thur 11:40 am	Matt Powell	powellmj@mailbox.sc.edu
037	Thur 2:50 pm	Matt Powell	powellmj@mailbox.sc.edu
038	Thur 6:00 pm	Matt Powell	powellmj@mailbox.sc.edu

Tentative Recitation Schedule – access via the CHEM 112 Recitation Blackboard course

Rec. Week	Dates	Sections
0	1/11-1/13	CHEM 111
1	1/18-1/20	12.1-12.3
2	1/25-1/27	12.4-12.5
3	2/1-2/3	12.6, 14.1-14.2
4	2/8-2/10	14.3-14.4
5	2/15-2/17	14.5-14.7
6	2/22-2/24	15.1-15.4

Rec. Week	Dates	Sections
7	3/1-3/3	15.5-15.7
8	3/15-3/17	15.8, 16.1-16.3
9	3/22-3/24	16.4-16.6
10	3/29-3/31	16.7-16.8, 13.1-13.2
11	4/5-4/7	13.3-13.6
12	4/12-4/14	17.1-17.3
13	4/19-4/21	17.4-17.5

Midterm Exams

There will be three midterm exams administered remotely via Respondus LockDown Browser with Monitoring during scheduled common exam periods. The exams begin promptly at 6:00 pm EST and are scheduled for 75 minutes.

Exam 1	Friday, February 11
Exam 2	Friday, March 18
Exam 3	Friday, April 15

For each exam, please have:

1) calculator (check batteries)
2) pencils
3) printed, unedited copy of the approved Exam Reference Sheets
4) Carolina card or other picture ID

All three midterm exams will be multiple-choice, computer-graded exams consisting of 20 questions. Backtracking will be allowed. The exams will be taken on your personal computer using **Respondus LockDown Browser with Monitoring**. On the day of an exam, you are responsible for having a working computer or tablet connected to a stable power source with a stable internet connection, a copy of the Exam Reference Sheets, a calculator with fresh batteries, paper, a pencil, and your Carolina Card. Students are expected to establish a proper test taking environment on their own. This includes being in a room free of distractions and free of other individuals both physically and virtually. No additional information or assistance will be allowed for exams. Additional devices are prohibited, for example other computers, cell phones, or smart watches. Also prohibited are earphones/headphones and sweatshirts that obscure the ears. If an exam is missed for a valid reason, it is the responsibility of the student to supply the instructor with a valid excuse (doctor's statement, etc.) promptly after the missed exam. One-half of the Final Exam score (200-point basis) will be substituted for one low scoring Midterm Exam (100-point basis). Only one such substitution is allowed.

Download and install the Respondus LockDown Browser:
https://download.respondus.com/lockdown/download.php?id=943743695
The Respondus Monitoring plugin will require that you have a functioning webcam and microphone.

For technical assistance, go to the Respondus Technical Support page at https://web.respondus.com/support/

Final Exam

Rules for midterm exams apply, the test is comprehensive, cannot be exempted, and is scheduled for **Saturday, April 30 from 4:00 – 6:30 pm EST** via **Respondus LockDown Browser with Monitoring.**

Achieve Online Homework

A computerized program will be used for homework. Chemistry problems will be assigned for each chapter. The answers will be submitted via the internet with immediate feedback. Missed problems can be resubmitted within the time frame that will be available from the online site, but with each incorrect submission (per question) a penalty is incurred. One low homework score will be dropped.

This system is online and **should be accessed from the link on Blackboard.**

The following link includes more detailed instructions on how to register for your course:
https://macmillan.force.com/macmillanlearning/s/article/Students-Register-for-Achieve-courses-via-your-school-s-LMS?r=36&ui-knowledge-components-aura-actions.KnowledgeArticleVersionCreateDraftFromOnlineAction.createDraftFromOnlineArticle=1#blackboard .

Information about how to obtain a free grace period for payment can be found by navigating to: https://macmillan.force.com/macmillanlearning/s/article/Achieve-Convert-free-trial-access-to-full-access?r=36&ui-knowledge-components-aura-actions.KnowledgeArticleVersionCreateDraftFromOnlineAction.createDraftFromOnlineArticle=1 .

Need Help? Answers to many common questions are found in our Student Support Community. If you need direct assistance, you can also contact technical support: https://macmillan.force.com/macmillanlearning/s/.

For more information on Achieve or for any technical problems please go to https://macmillan.force.com/macmillanlearning/s/achieve . USC does not have administration access to Achieve. **Please do not e-mail instructor!**

Achieve Homework due dates: Achieve problems will generally be due by 4:55 AM on Monday mornings. Homework due dates will be posted in the Achieve homework system. Additional problems may be added shortly after each class. Extensions will not be granted unless the homework system fails.

Grading

This course is point-based and will have a total possible of 650 points.

Midterm exams	3 @	100 points	each
Final Exam		200 points	
Achieve Homework		100 points	
Recitation		50 points	

Grading Scale

A	590 points or higher
B+	565 – 589 points
B	525 – 564 points
C+	500 – 524 points
C	460 – 499 points
D+	435 – 459 points
D	395 – 434 points
F	394 points and lower

This course is point based. Percentages are NOT considered when assigning final letter grades.

All required elements of the course are to be completed within the normal term. Failure to complete all elements on time will result in a grade of F. Incompletes will only be assigned in unusual circumstances and according to university policy.

Student Success Center

Your success in this course is important. In partnership with University of South Carolina faculty, the Student Success Center (SSC) offers a number of programs to assist you in better understanding your course material and to aid you on your path to success. SSC programs are facilitated by trained undergraduate peer leaders who have previously excelled in their courses. Resources available to students in this course include:

Peer Tutoring: You can make a one-on-one appointment with a peer tutor by going to www.sc.edu/success. Drop-in tutoring and online tutoring may also be available for this course. Visit our website for a full schedule of times, locations, and courses.

*Supplemental Instruction (SI)***:** SI Leaders are assigned to specific sections of courses and hold three weekly study sessions. Sessions focus on the most difficult content being covered in class. The SI Session schedule is posted through the SSC website

each week and will also be communicated in class by the SI Leader. Your SI Leader is Shannon Henry (slhenry@email.sc.edu)

Success Connect: Throughout the semester, your instructor may communicate with the SSC regarding your progress in the course. If contacted by the SSC, please schedule an appointment to discuss campus resources that are available to you. Success Connect referrals are not punitive and any information shared by your professor is confidential and subject to FERPA regulations. SSC services are offered to all UofSC undergraduates at no additional cost. You are invited to call the Student Success Hotline at 803-777-1000 or visit www.sc.edu/success to check schedules and make appointments. Success Consultants are available to assist you in navigating the University and connecting to available resources.

This course participates in a progress report initiative through the SSC. At key points throughout the semester, the instructor may alert the SSC of students who may not be meeting criteria that has been established for both attendance and course grade performance. Students who receive an alert will get an e-mail and then be contacted via the SSC Call Center, during which they are encouraged to connect with additional academic support resources. For more information, please contact the Student Success Center at 803-777-1000 or visit our website at www.sc.edu/success.

Accommodating Disabilities

Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, contact the Student Disability Resource Center: 803-777-6142, TDD 803-777-6744, email sasds@mailbox.sc.edu, or stop by Close-Hipp Suite 102. All accommodations must be approved through the Student Disability Resource Center.

https://www.sc.edu/about/offices_and_divisions/student_disability_resource_center/

Electronic Devices

Ringing or answering cell phones, **including text messaging**, has been defined by the College as "disruptive behavior" and must be avoided during class. **Phones and tablets** may be used in lecture for **notetaking only** and must remain flat on the desk the entire class to avoid distracting other students. Laptops may be used in class for taking notes only. Misuse of devices will be monitored.

Attendance

Attendance Policy: **Students must attend all classes in the format they are offered** (For example, students are expected to attend in-person classes in person). Students who miss classes due to COVID quarantine, a diagnosed health condition or registered disability should contact the Undergraduate Student Ombudsman or Student Disability Resource Services to document the reason for their absence. Students with documented absences *may be offered* recorded classes, be considered present for participating in class virtually and have the opportunity to reschedule exams or assignments at the instructor's discretion; first utilizing any syllabus statement regarding missed class, assignments or exams. EXAMPLE: If the syllabus has a policy on dropping a low or missed exam then that policy will be used for the first missed exam. If a student misses more than one exam with proper official documentation, then the second missed exam may be rescheduled. **ALL excused absences and accommodations for disabilities MUST have proper official documentation.**

Attendance is *required* for this class. Attendance is defined as being present for the entire class. Attendance in lecture will be taken through iClicker. More than four absences from class will lower your final grade one half grade. More than six absences will lower your grade one full grade. More than ten absences will result in the grade of F. Arriving late and/or leaving early are recorded as a missed class.

Hazardous Weather and Emergency Class Cancellations

If the University of South Carolina is closed for reasons stated in policy HR 1.18, students will be excused from class. In the case of an emergency closure, e.g. COVID19 related, the university may require that this course move to be fully online synchronous with little notice.

While Spring 2022 instruction has face-to-face components, changing conditions at the university related to COVID-19 may require that this course move fully online with little notice.

Copyright

All materials from this class are copyrighted. They may not be publicly posted or transferred to third parties. Please contact the instructor if you wish to record the lectures.

Academic Responsibility

Every student has a role in maintaining the academic reputation of the university. It is imperative that you refrain from engaging in plagiarism, cheating, falsifying your work and/or assisting other students in violating the Honor Code. Two important components of the Honor Code:

- Faculty members are required to report potential violations of the Honor Code to the Office of Student Conduct and Academic Integrity.
- When a student is uncertain as to whether conduct would violate the Honor Code, it is their responsibility to seek clarification from the appropriate faculty member.

Your enrollment in this class signifies your willingness to accept these responsibilities and uphold the Honor Code of the University of South Carolina. Please review the **Honor Code** Policies. Any deviation from this expectation can result in severe penalties including probation, suspension, or expulsion and a referral to the Office of Student Conduct and Academic Integrity.

Assignments/ Methods of Assessing Outcomes

The expected learning outcomes will be assessed through homework assignments, recitation quizzes, exams, and the final exam.

EXAM 1: Students will demonstrate an understanding of solution concentration, the solution process, relative solubilities, colligative properties, electrolyte solutions, chemical equilibrium, Le Chatelier's principle, solubility equilibrium, and heterogeneous equilibrium.

EXAM 2: As an extension of the material from Exam 1, the students will demonstrate an understanding of the common ion effect, the autoionization of water, strong acids and bases, weak acids and bases, titrations of strong and weak acids and bases, and buffers.

EXAM 3: As an extension of the material from Exams 1 and 2, the students will demonstrate an understanding of rates of reactions, the concentration dependence of rate, the time dependence of concentration, work, entropy, and free energy.

FINAL EXAM: Students will demonstrate an understanding of the material from Exams 1, 2, and 3, in addition to the temperature dependence of the rate constant, catalysis, collision theory, mechanisms, oxidation numbers, redox reactions, voltaic cells, potential, and the Nernst equation.

ONLINE HOMEWORK: Students will demonstrate critical thinking and problem solving through the homework assignments. The assignments are based on the textbook and follow the chapter progression according to the lecture schedule.

RECITATION EXERCISES: There will be Blackboard exercises every recitation period. These exercises will be part of the attendance record as well as an evaluation tool.

Tentative Lecture and Exam Schedule

#	Day	Date	Chapter	Sections	Text Exercises
1	M	10 Jan	Intro.	Syllabus	

			Chapt. 12	1 Solution Concentration	12.17–40
2	W	12 Jan		2 Principles of Solubility	12.41–48
3	F	14 Jan		3 Effects of P & T on Solub.	12.49–62
4	W	19 Jan		4 Colligative Properties	12.63–72
5	F	21 Jan		5 Electrolyte Solutions	12.73–84
6	M	24 Jan		6 Mix. of Vol.	12.85–86
7	W	26 Jan	Chapt. 14	1 Eq. Constant 2 Reaction Quotient	14.13–28 14.29–34
8	F	28 Jan		3 Le Chatelier's Principle	14.35–42
9	M	31 Jan		4 Equil. Calc.	14.43–60
10	W	2 Feb		5 Heterogeneous Equil.	
11	F	4 Feb		6 Solubility Equil.	14.61–74
12	M	7 Feb		7 Common Ion Effect	14.75–84
13	W	9 Feb	Chapt. 15	1 Bron.-Lowry Systems	15.23–32
14	F	11 Feb		2 Autoionization of Water	15.33–42
	F	**11 Feb**		**Exam 1: Sections 12.1-12.6 and 14.1-14.7**	
15	M	14 Feb		3 Strong Acids and Bases	15.43–48
16	W	16 Feb		4 Qual. Wk. Acids, Bases 5 Weak Acids	15.49–68
17	F	18 Feb		5 6 Weak Bases and Salts	15.69–94
18	M	21 Feb		6 7 Mixtures of Acids	15.95–98
19	W	23 Feb		8 Molec. Struct. and Stren. 9 Lewis acids	15.99–104
20	F	25 Feb	Chapt. 16	1 Titrations of Strong	16.13–18
21	M	28 Feb		1 2 Titration Curves	16.19–28
22	W	2 Mar		3 Buffers	16.29–46
23	F	4 Mar		3 4 Titration of Weak: Qual.	
24	M	14 Mar		5 Titration of Weak: Quant.	16.47–58
25	W	16 Mar		6 Indicators 7 Polyprot.	16.59–64 16.65–68
26	F	18 Mar	Chapt. 13	8 Solubil. 1 Rates of Reactions	13.21–32
	F	**18 Mar**		**Exam 2: Sections 15.1-15.8, and 16.1-16.5**	
27	M	21 Mar		1	
28	W	23 Mar		2 Rate and Conc.	13.33–42
29	F	25 Mar		3 Concentration and Time	13.43–58
30	M	28 Mar		3 4 Mech. I: Temp. and Energ.	13.59–66
31	W	30 Mar		4 5 Catalysis	13.67–68
32	F	1 Apr		6 Mech. II: Collisions	13.69–82

33	M	4 Apr	Chapt. 17	1 Work and Heat	17.23–34
34	W	6 Apr		2 1st Law of Thermo.	17.35–48
35	F	8 Apr		3 Entropy	17.51–56
36	M	11 Apr		3	
37	W	13 Apr		4 Free Energy	17.57–82
38	F	15 Apr		5 Free Energy and K_{eq}	17.83–102
	F	**15 Apr**		**Exam 3: Sections 13.1-13.6, and 17.1-17.5**	
39	M	18 Apr	Chapt. 18	1 Oxidation numbers 2 Balanc. Redox Reactions	18.09–20 18.21–38
40	W	20 Apr		2 3 Voltaic Cells	 18.39–42
41	F	22 Apr		4 Potentials 5 Potent., Free Energy, K_{eq}	18.43–54 18.55–60
42	M	25 Apr		5 6 Nernst Equation	 18.61–70
	F	**30 Apr**	**Final Exam**	**Chapts. 12 – 18** **7:30 – 10:00 pm EST**	

Face Coverings

Face coverings protect you and your classmates in case the wearer is unknowingly infected but does not have symptoms. Faculty, students, and staff are required to wear an appropriate face covering in all classrooms and in other designated areas on campus. Face coverings should cover your nose and mouth in a community setting.

Important Links:

• Proper use, removal, and washing of cloth face coverings

• CDC Recommendation Regarding the Use of Face Coverings

Hand and Surface Hygiene

Please use hand sanitizer upon entering the classroom and wipe down your desk/table and chair at the beginning of class. All wipes should be disposed of in the trash can and not left on the desk or floor.

Student Well-Being

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Division of Student Affairs and Academic Support. If you are comfortable doing so, please notify me as the professor so that we can find resources that may be helpful.

Students do not learn when they do not feel safe. If you feel unsafe on campus at any time in any place, please contact Police Dispatch at 803-777-4215 (in an emergency, please call 911) and reach out to the Division of Student Affairs and Academic Support. Again, if you are comfortable doing so, please notify me as the professor, and I will do my best to make appropriate accommodations.

Students may experience situations or challenges that can interfere with learning and interpersonal functioning including stress, anxiety, depression, substance use, concern for a family/friend, or feelings of hopelessness. Pay attention to what is happening in the classroom and in the lives of your fellow students. There are numerous campus resources available to students including University Counseling & Psychiatry Service and University Student Health Services. Help is available 24/7. Students who need immediate help should call 803-777-5223. An outside resource is the National Suicide Prevention Lifeline (800-273-8255).