



USC University of Southern California

MASC 110L: Materials Science

Units: 4

Term—Day—Time: Fall 2022, MWF 10:00-10:50am

Location: ZHS 352

Instructor: Ken-ichi Nomura

Office: VHE 609

Office Hours:

In person: Friday 2-3pm

Online: by appointment

Contact Info: knomura@usc.edu

Teaching Assistants:

MASC 110L has several laboratory and discussion teaching assistants. See the “contacts” tab on Blackboard for TA contact information and office hours.

Course Description

MASC 110L is an introductory course intended for undergraduate engineering students. Key concepts in chemistry are discussed in the context of materials science and engineering applications. The laboratory component of the course provides students with hands-on experience, reinforcing concepts covered in lecture through direct observation and experimentation. Topics include the electronic structure of atoms, elements and the periodic table, organic and inorganic compounds, chemical reactions, kinetics and thermodynamics, and the structure and properties of engineering materials.

Learning Objectives

Following completion of this course, students should be able to

- Place concepts from chemistry and materials science into a broader historical context and describe the importance of the underlying science to engineering applications
- Demonstrate familiarity with the organizational scheme of the periodic table, the electron structure of atoms, and the types and mechanisms of atomic bonding
- Differentiate between organic and inorganic compounds, and identify and name compounds
- Describe the difference, at the atomic/molecular level, between solids, liquids, and gasses

- Classify engineering materials as metals, ceramics, or polymers, and describe the types of elements and atomic bonds characteristic of each material type
- Predict the behavior of gas phase chemical systems using ideal gas behavior
- Use tabulated thermodynamic data to determine the spontaneity of a reaction
- Write and balance chemical equations
- Perform experiments, collect and analyze data
- Prepare lab reports in which critical information is presented concisely

Recommended Preparation:

High school chemistry

Course Notes

A Blackboard website for the course (<http://blackboard.usc.edu>) will be used for general announcements, assignments, course emails, and important course documents and information. Be sure to check Blackboard and your USC email regularly.

Communication

Students can attend scheduled office hours or contact me any time via email (knomura@usc.edu). Email will be responded to within 48 hours.

Technological Proficiency and Hardware/Software Required

A computer with internet access is required to access course materials and complete/submit assignments. Please bring a web enabled device (phone, tablet, laptop) to the lecture section of the class to respond to poll questions.

USC Technology Rental Program

If you need resources to successfully participate in your classes, such as a laptop or internet access, there are options for you on campus. While long term laptop rentals are no longer available, short-term rentals can be obtained via the [USC Computing Center Laptop Loaner Program](#). Computers are also accessible via computer labs throughout campus. Wi-Fi is available at all campus and student housing locations.

USC Technology Support Links

[Zoom information for students](#)

[Blackboard help for students](#)

[Software available to USC Campus](#)

Required Materials

Text: Chemistry: Principles and Reactions, Masterton and Hurley, 8th edition

ISBN: 9781305079373

A physical copy of the textbook is *not* required for the class. Purchase a hard copy only if you want one. An electronic version of the text will be available through Blackboard, and students are responsible only for material covered in lecture and discussion sections. Hard copies of the book come with an online web-based learning (OWL) access code (see next page) – if you purchase a physical textbook do not misplace this code.

Online web-based learning (OWLv2)

A web-based system will be used for readings and homework assignments. **Online access to the OWL system (which includes an electronic copy of the textbook) is required for the course.** Register by clicking the “MASC 110L 10am” link at the top of the Content section in the course Blackboard site. The first time you click through you will be guided through a series of prompts to register for access this semester.

Use your USC email and the name that you are registered under at USC when signing up. You will need to select and pay for single term access. A free trial is available if you have not yet finalized your schedule. Any assignments submitted using the trial subscription will transfer over once you pay for semester-long access.

Need help? Visit cengage.com/start-strong for step-by-step registration instructions and videos. When prompted select **OWLv2, Blackboard, and No.**

Description and Assessment of Assignments

Homework

Following each class, OWL problems will be posted online. All problems assigned throughout the week are due prior to the start of class (10am) the following Monday. Homework problems allow multiple attempts and include access to feedback and explanations.

Discussion Worksheets

Discussion sessions are held weekly. In discussion students will work in groups to complete a series of guided inquiry exercises. Discussion is designed to introduce new concepts as well as further clarify concepts covered in lecture. While not all questions addressed in discussion have a single correct answer, discussion work will be graded based on participation and completeness. It is expected that students arrive prepared and engage in small group discussions. OWL problems related to discussion content will be included in Friday assignments.

Lab reports

Lab reports for each experiment are due the following week, prior to the start of your scheduled lab session. Lab reports must be typed and uploaded via Blackboard. A scanned copy of your original lab data sheet must be submitted with your lab report.

There are 9 experiments this semester, your lab grade will be comprised of your top 8 lab report scores (lowest lab report grade dropped).

Participation

Completion of lab and discussion activities requires attending and actively participating in your scheduled lab and discussion sections. You are permitted to miss one lab with no penalty. If you need to miss additional labs or discussions because of travel, illness, etc. discuss it with me and every effort will be made to provide reasonable accommodations.

Lecture sections will involve participation in the form of small group and whole-class discussions and response to poll questions. Attendance to lecture is not required but highly encouraged.

Grading Breakdown

Assignment	% of Grade
OWL homework assignments	15
Lab reports	15
Discussion worksheets	10
Midterm1	20
Midterm 2	20
Final exam	20
Total	100

Grading Scale

A	92-100
A-	90-91
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	65-69
D	60-64
D-	55-59
F	54 and below

Course-specific Policies (Assignment Submission, Grading Timeline, Late work, and Technology)

Assignment Submission

All course assignments will be distributed and submitted via Blackboard (OWLv2 material redirects to an external site but is fully integrated with the Blackboard grade book).

Grading Timeline

OWLv2 assignments are graded instantaneously upon submission. Lab report grades will be posted two weeks after submission. Students can access feedback on lab reports via Blackboard, OWLv2 problems have integrated feedback and explanations.

Late work

Homework submitted up to one week late will receive 50% credit. Homework problems are unavailable for submission one week following the due date.

Lab reports for each experiment are due the following week, prior to the start of your lab section. Reports submitted up to one week late receive 75% credit, and those submitted up to two weeks late receive 50% credit. No credit is given for lab reports submitted more than two weeks late.

Academic Integrity

Students are welcome to discuss lab reports and homework problems with peers and TAs. All submitted work, however, must be the student's own. Any information taken from sources must be cited – proper citation format for lab reports is provided in the lab manual.

Technology in the classroom

Classroom norms

Students are welcome to take notes on a device or by hand. Phones can be used to respond to poll questions. Students are asked not to use devices for non-course related activities during class time.

Synchronous session recording notice

Lecture sessions may be recorded.

Per university policy, recordings of synchronous sessions as well as all asynchronous course materials (notes, assignments, etc.) cannot be shared outside of the MASC 110L learning environment:

*Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the Internet or via any other media. (See [SCampus Section C.1 Class Notes Policy](#)).*Course evaluation

Course evaluation occurs at the end of the semester university-wide. The learning experience evaluation is a critical tool for instructors and the university to improve teaching. Students are asked to provide honest and constructive feedback and focus on specific aspects of instruction as opposed to personal characteristics of the instructor.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Reading	Lab	Discussion
Week 1 8/22-8/26	Atoms, ions, and isotopes	Ch 1 (all) Ch 2 (2.1-2.3, 2.5) Ch 3 (3.1-3.2)	NO LAB	Matter and chemical vs physical reactions
Week 2 8/29-9/2	Electronic structure and the periodic table	Ch 2 (2.4) Ch 6 (all)	Determination of Avogadro's number via electrodeposition	Electron configuration
Week 3 9/5-9/9 <i>No class 9/5</i>	Metallic and ionic bonding Crystals: structures of metals and ceramics	Ch 9 (9.1, 9.4-9.6)	NO LAB	NO DISCUSSION
Week 4 9/12-9/16	Covalent bonding: Lewis structures	Ch 2 (2.6-2.7) Ch 7 (7.1)	Atomic Spectroscopy	Ionic compounds and naming ions
Week 5 9/19-9/23	Exceptions to the octet rule and VSEPR	Ch 7 (7.2-7.4)	Crystal structures	Molecular shape
Week 6 9/26-9/30	Hydrocarbons MIDTERM 1	Ch 22 (22.1)	Microstructure of metals	Midterm review
Week 7 10/3-10/7	Organic compounds	Ch 22 (22.2, 22.5)	Hardness characterization	Midterm return Organic molecules
Week 8 10/10-10/14 <i>No class 10/13-10/14</i>	Polymer structures	Ch 22 (22.6) Ch 23 (23.1-23.2)	NO LAB	NO DISCUSSION
Week 9 10/17-10/21	Gasses and liquids	Ch 3 (3.3) Ch 5 (5.1-5.5) Ch 9 (9.1-9.2)	Polymers (macromolecules)	Balancing chemical equations and theoretical yield
Week 10 10/24-10/28	Kinetics	Ch 5 (5.6-5.7) Ch 11 (all)	Thermal reduction of copper ore to copper metal	Kinetic molecular theory and real gasses
Week 11 10/31-11/4	Equilibrium MIDTERM 2	Ch 12 (all)	Phase equilibria	Midterm review
Week 12 11/7-11/11 <i>No class 11/11</i>	Equilibrium cont. Thermodynamics	Ch 8 (8.1, 8.7)	NO LAB	Midterm return Temperature and heat
Week 13 11/14-11/18	Thermochemistry	Ch 8 (8.2-8.5) Ch 16 (all)	Corrosion	Reaction coordinates
Week 14 11/21-11/25 <i>No class 11/23-11/25</i>	Redox reactions	Ch 4 (4.2-4.3)	NO LAB	NO DISCUSSION
Week 15 11/28-12/2	Electrochemistry	Ch 17 (17.1-17.5)	OPTIONAL: Virtual makeup lab	Final exam review

Diversity Statement

I am committed to creating an inclusive environment in which all students are respected and valued. I will not tolerate disrespectful language or behavior on the basis of age, ability, color/ethnicity/race, gender identity/expression, marital/parental status, military/veteran's status, national origin, political affiliation, religious/spiritual beliefs, sex, sexual orientation, socioeconomic status or other visible or non-visible differences. I expect the same from you.

You are here to learn the course content, and I am here to teach it, but we are all here to grow as people and learn from one another. It is each of our responsibility to ensure that our online classroom space, and the university, is a safe and inclusive environment that facilitates learning.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](#).

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress
24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086

eeotix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298

usc-advocate.symplcity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776

osas.usc.edu

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-3340 or otfp@med.usc.edu

chan.usc.edu/otfp

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.