



CHEM 105: Basic Inorganic Chemistry
Fall 2016
Loyola University Chicago

Course Description

This course is the first in a sequence of two general chemistry courses for chemistry and biochemistry majors. It includes the following topics: introduction to chemistry, atomic structure, periodic properties, characteristics of bonding and properties of molecules, descriptions and relationships of chemical reactions, thermochemistry, and states of matter. Historical and current developments in chemistry as well as real-world problems that chemists address are incorporated into the course.

The emphasis of this course is on understanding, prediction, investigation, explanation and evaluation over memorization. This means that students must foster their problem solving skills, ability to make claims based on evidence, and skills of effective communication of scientific results. It is not enough to know *what* happens in chemistry, the student must also be able to explain *why* it happens.

Course Prerequisites

Satisfactory performance on the Loyola math proficiency exam, or successful completion of MATH 117. A strong high school chemistry background is also highly recommended.

Required Resources

- (1) Brown, T. L., et. al (2015). *Chemistry: The Central Science, 13th ed (with MasteringChemistry)*. Pearson Prentice Hall. ISBN 978-0-321-91041-7.
- (2) Enrollment in this course on MasteringChemistry.com. Course ID: DAUBENMIRECHEM105FALL16
- (3) Moog, R.S. & Farrell, J.J. (2015). *Chemistry: A Guided Inquiry, 6th ed.* John Wiley & Sons, Inc. ISBN 978-1-118-64004-3
- (4) Custom laboratory manual, *details to be shared in class.*
- (5) *Sakai Connection*, sakai.luc.edu

Connection to the “Hungers” of Loyola University’s Transformative Education

This course seeks to assist each student in fostering hungers associated with the University’s model of transformative education¹. The study of introductory chemistry can assist in development of the specific hungers below:

- *A Hunger for Integrated Knowledge* – by building an understanding of a variety of chemical concepts and applying them to problems in many contexts.
- *A Hunger for a Moral Compass* – by examining the variables, benefits, and detriments that exist at the interface of applied science, technology, environment, and society.
- *A Hunger for a Global Paradigm* – by understanding that chemistry is a human endeavor and it resides in the tension between helping and harming life.

The Team Supporting Your Learning

<i>Office Hours</i>	<i>Office</i>	<i>Phone (office)</i>	<i>Phone (mobile)</i>	<i>Email</i>
<i>Patrick L. Daubenmire, Ph.D,</i> Associate Professor W: 2-3 pm Th: 2:30-3:30 pm	FH 415	773.508.8248	630.336.4180	pdauben@luc.edu
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<i>Andrew Oleksijew,</i> Supplemental Student Instructor F, 2-4 pm				aoleksijew@luc.edu
<i>Denis Cipurko,</i> Supplemental Student Instructor T, 2:30-4:30pm W, 4-5:30 pm				dcipurko@luc.edu

¹<http://www.luc.edu/transformatived/>

Primary Instructional Format – Process Oriented Guided Inquiry Learning (POGIL)

This course will not follow a traditional lecture format for delivery of course content and skill development. Instead this course will capitalize on students' current prevailing ideas and thoughts about sets of data or presented models. Then, through guided questions about the presented information, students, working in small groups, discuss ideas and come to consensus about answers to questions. These ideas are further developed in questions that force application of the agreed upon concepts. The instructor is the guide on this journey, pointing out areas that are particularly relevant or that may need attention, and redirecting students when necessary. This format is designed based on the idea that knowledge cannot be directly transmitted from one person to another. Instead, knowledge must be built by the learner his or herself based on their own experiences and in dialog and discussion with others.

Four key ideas about learning have emerged from current research about how people learn. These include:

1. Constructing our own understanding based on our prior knowledge, experiences, skills, attitudes, and beliefs.
2. Following a learning cycle of exploration, concept formation, and application.
3. Discussing and interacting with others.
4. Reflecting on progress and assessing performance.

All of these ideas are incorporated into the design of POGIL in order to help students learn both discipline content and key process skills simultaneously, POGIL is built on this research base with the principles that most students learn best when they are:

1. Engaged and thinking in the classroom and laboratory.
2. Drawing conclusions by analyzing data, models, or examples and by discussing ideas.
3. Working together in self-managed teams to understand concepts and to solve problems.
4. Reflecting on what they have learned and on improving their performance.
5. Interacting with an instructor as a facilitator of learning and peer as collaborating in building understanding of the chemistry content.

To support this research-based learning environment, POGIL uses learning teams, guided-inquiry activities to develop understanding, questions to promote critical and analytical thinking, problem solving, reporting, metacognition, and individual responsibility. These components are the tools for developing process skills and the mastery of discipline content and will use a blend of venues between face-to-face and online environments.

You will work together in learning teams through a series of ChemActivities (CA) modules. The modules are designed to help you acquire knowledge and develop understanding through guided inquiry - examining data, models, or examples followed by responding to critical thinking questions (CTQ). Generally, data are presented before a theoretical explanation, whereby the CTQ lead the student through the thought processes which results in the building of a certain theoretical model. This is what

makes these modules guided-inquiry. Exercises & Problems are included to reinforce the concepts being presented.

For the ChemActivities (CA) modules, you will be placed into groups of 3 or 4 students with the following designations within each group: Manager, Recorder, Technician, & Present.

The roles you may have throughout the semester when working in groups include:

- ❖ *Manager*: The student in this role ensures that the group is functioning efficiently and progressing within the time frame set by the instructor. This student is not a supervisor, but a full participant. Additionally, this student monitors the participation of all group members to make sure all ideas have been heard.
- ❖ *Recorder*: The student in this role transcribes the agreed upon responses of the group to questions and problems. The recorder is not solely responsible for doing the work, but is responsible for accurately recording the results of the group's work. There will be times during the semester when the group's answer(s) to certain questions will be collected. The recorder submits these responses.
- ❖ *Technician*: The student in this role primarily handles calculations and the management of equipment for the group. If special operating instructions are needed for an instrument during an activity, the technician is the point person for these applications and will be trained as necessary.
- ❖ *Presenter*: The student in this role represents the group during all class discussions or during inter-group interactions. Similarly to the recorder, the presenter's responses should accurately reflect the results of the work of the group.

Selected Common Loyola Objectives

Within the activities of this course, student will be encouraged to:

1. gain a basic understanding of chemistry (factual knowledge, methods, principles, generalizations, and theories).
2. learn to *apply* course material (to improve thinking, problem solving, and decision-making).
3. gain a broader understanding and appreciation of the intellectual/cultural activity that is chemistry.
4. learn how to find, evaluate, and use resources to explore chemistry topics more in depth.

Academic Honesty

Academic honesty is an expression of interpersonal justice, responsibility and care, applicable to Loyola University faculty, students, and staff, which demands that the pursuit of knowledge in the university community be carried out with sincerity and integrity. The School of Education's Policy on Academic Integrity can be found at: http://www.luc.edu/education/academics_policies_integrity.shtml. For additional academic policies and procedures refer to: http://www.luc.edu/education/academics_policies_main.shtml

Accessibility

Students who have disabilities which they believe entitle them to accommodations under the Americans with Disabilities Act should register with the Services for Students with Disabilities (SSWD) office. To request accommodations, students must schedule an appointment with an SSWD coordinator. Students should contact SSWD at least four weeks before their first semester or term at Loyola. Returning students should schedule an appointment within the first two weeks of the semester or term. The University policy on accommodations and participation in courses is available at: <http://www.luc.edu/sswd/>

Harassment (Bias Reporting)

It is unacceptable and a violation of university policy to harass, discriminate against or abuse any person because of his or her race, color, national origin, gender, sexual orientation, disability, religion, age or any other characteristic protected by applicable law. Such behavior threatens to destroy the environment of tolerance and mutual respect that must prevail for this university to fulfill its educational and health care mission. For this reason, every incident of harassment, discrimination or abuse undermines the aspirations and attacks the ideals of our community. The university qualifies these incidents as incidents of bias.

In order to uphold our mission of being Chicago's Jesuit Catholic University-- a diverse community seeking God in all things and working to expand knowledge in the service of humanity through learning, justice and faith, any incident(s) of bias must be reported and appropriately addressed. Therefore, the Bias Response (BR) Team was created to assist members of the Loyola University Chicago community in bringing incidents of bias to the attention of the university. If you believe you are subject to such bias, you should notify the Bias Response Team at this link: <http://webapps.luc.edu/biasreporting/>

Safety

Students must adhere to proper safety protocols and practices when conducting classroom activities and laboratory investigations. A separate agreement describing these practices must be signed before a student may participate in coursework.

Course Evaluation

Grades will be assigned in the course according to the following sources:

Table 1. Grade Criteria

Criteria	Maximum Percent Value
<i>CHEM 105 – Lecture, Lab, Discussion (4.0 credits)</i>	
participation, group responses, and reports	5 %
online quizzes & homework sets	10 %
laboratory preparation & weekly SWH reports	10 %
tests	25 %
laboratory problem reports & calibrated peer review	20 %
final exam	30 %

Participation, group responses and reports will be an important part of the class. This work will be a combination of individual and group work. Students must be present during class sessions in order to receive credit for these assignments. The two lowest scores on these assignments will be dropped from your course evaluation.

Online quizzes will be administered via *MasteringChemistry* on roughly a weekly basis. Content from the previous sessions (whole class and small group) will be the source of material on each quiz. The two lowest quiz scores will be dropped from your course evaluation. Quizzes will be available for a window of time on the dates indicated below. They are also timed, which means that once you begin you have 20 minutes to complete the quiz.

Online Homework Sets will be assigned weekly. Submitted responses must be the result of your individual work and effort. The two lowest homework sets scores will be dropped from your course evaluation.

Laboratory Preparation & Weekly Science Writing Heuristic (SWH) Reports will be a regular part of weekly laboratory work. Pre-laboratory assignments are to be completed prior to each laboratory session, and the written weekly lab report is due by the beginning of the next lab session. The two lowest scores in this category will be dropped from your grade evaluation.

Written Reports to Laboratory Problems will be assigned at three different points in the semester. These problems will require students to use skills and ideas developed in prior laboratory activities in order to formulate an acceptable solution and full written report to communicate results effectively.

Calibrated Peer Review (CPR) is online writing and critical thinking process in which students, once trained, provide personalized feedback to other students on written work. This process will be used with the full written reports.

Tests will be administered twice during the course. Each will primarily reflect the content and concepts developed during prior class sessions. The multiple choice will be administered via the *Masteringchemistry* platform, and like the quizzes, will be available only during your discussion time, and will be timed at 50 minutes. The free response portion of the tests will be administered during the lecture time and will be delivered on paper.

The *Final Exam* will be designed to assess students comprehensive knowledge of concepts and skills developed during the work of the semester.

Practices for Success

Supporting claims with evidence, making applications, solving and analyzing problems, and using chemical principles to explain phenomena are critical skills in the field of chemistry. The development of these skills is not without some frustration, but it carries the reward of deepening one's ability to think critically and solve problems in any field. To do this, one may have to assess, evaluate, and possibly revise approaches to learning. The use of targeted, guiding questions, regularly scheduled work, and strategic study plans can greatly assist the learning of chemistry. With such a focus, hopefully any frustration will quickly turn to appreciation and fascination for the relevance and connectedness of chemistry in your life and within the world around you. Solving and analyzing problems is the most important feature of this work. If, at any time, you need assistance framing such plans for your work in chemistry, please do not hesitate to ask the instructor.

Norms of Course Proceedings

The classroom is to be a safe place to question and explore ideas. Student and teacher voices are important to this work. Collegial disagreement can be a healthy part of this process, but must always include respect for all members of the class.

Course activities will be designed to help students reach the goal of learning chemistry content and developing thinking skills. This will more often driven by the use of data and reasoning to discover concepts and solutions rather than the identification and exchange of chemical facts and algorithms.

Class sessions will begin and end on time. All students should attend class regularly and participate in class discussions. Multiple absences could affect one's ability to learn chemistry during this semester. Anticipated absences should be discussed with the instructor two class days before the absence. Proper documents may be requested to verify the reason for any absence. This is particularly relevant to days missed that include an in-class assessment for which a student is asking for a make-up.

Cell phones and the use of texting devices should be used in appropriate and professional manner. These devices should not distract other participants in the course.

Email messages among students in the course should also be respectful, appropriate, and professional. Response time to email messages is acceptable within 48 hours.

Completed course assignments must be submitted at the beginning of the class session or by the time specified on the due date. Late assignments may not be accepted without proper verification of reasons.

Table 3. Proposed Semester Topics & Schedule²

Date (Week)	Session	Topics	Resources & Practice	Assignments Due
Week 01: Aug. 29- Sept. 04	Discussion & Class Sessions	Introduction to chemistry, atoms & quantities	Chapters 01, 02 ⁱ , ChemActivity (CA) 01, 02, 28, & 32 ⁱⁱ	
	Lab Session 01	<i>Check-In & orientation to laboratory format and work</i>	Lab Manual ⁱⁱⁱ	<i>Homework #01 (due by 11:30 pm on Tuesday, Sept. 06)</i>

² The schedule of topics is approximate. Depending on class needs, some topics may need more time, and we will adjust the schedule accordingly. Test, exam, and other due dates, however, do not change. The content of those assignments, though, will be adjusted to align with any schedule changes.

Date (Week)	Session	Topics	Resources & Practice	Assignments Due
Week 02: Sept. 05-11	Discussion & Class Sessions	Nuclear chemistry, Electrons in atom & periodic properties	Chapters 06, 07; CA 03-12	<p><i>Quiz #01</i> (timed, and due by 11:30 pm on Tuesday, Sept. 06)</p> <p><i>Homework #02</i> (due by 11:30 pm on Monday, Sept. 12)</p>
	Lab Session 02	<i>SWH #01</i> – Data collection on properties of soda pop	Lab Manual	SWH #01 pre-lab assignment
Week 03: Sept. 12-18	Discussion & Class Sessions	Electrons in atom & periodic properties	Chapters 06, 07; CA 03-12	<p><i>Quiz #02</i> (timed, and due by 11:30 pm on Tuesday, Sept. 13)</p> <p><i>Homework #03</i> (due by 11:30 pm on Monday, Sept. 19)</p>
	Lab Session 03	<i>CPR Lab Problem #01.</i>	Lab Manual	<i>SWH Report #01</i> ; prep for CPR Lab Problem #01; Report for Lab Problem #01, uploaded to the Calibrated Peer Review system by 11:30 pm Wed., Sept. 21.

Date (Week)	Session	Topics	Resources & Practice	Assignments Due
Week 04: Sept. 19-25	Discussion & Class Sessions	Electrons in atom & periodic properties	Chapters 06, 07; CA 03-12	<p><i>Quiz #03</i> (timed, and due by 11:30 pm on Tuesday, Sept. 20)</p> <p><i>Homework #04</i> (due by 11:30 pm on Monday, Sept. 26)</p>
	Lab Session 04	<i>Calibration & Peer Review Process</i>	Online Calibrated Peer Review (CPR)	Peer Reviews completed by 11:30 pm on Mon., Sept. 26
Week 05: Sept. 26-Oct. 02	Discussion & Class Sessions	Characteristics of bonding and properties of molecules	Chapters 08, 09; CA 13-23	<p><i>Quiz #04</i> (timed, and due by 11:30 pm on Tuesday, Sept. 27)</p> <p><i>Homework #05</i> (due by 11:30 pm on Monday, Oct. 3)</p>
	Lab Session 05	<i>SWH #03</i> Sir Robert Boyle's quantitative colorimetric analysis	Lab Manual	<i>SWH #03</i> - pre-laboratory assignment
Week 06: Oct. 03-09	Discussion & Class Sessions	<i>TEST #01</i> (Tuesday, Oct. 04); Characteristics of bonding and properties of molecules	Chapters 08, 09; CA 13-23	

Date (Week)	Session	Topics	Resources & Practice	Assignments Due
	Lab Session 06	<i>SWH #04</i> Determining the Identity of a Chemical Reactant	Lab Manual	<i>SWH Report #03; SWH #04</i> pre-laboratory assignment
Week 07: Oct 10-16	Discussion & Class Sessions	<i>Semester Break;</i> Characteristics of bonding and properties of molecules	Chapters 08, 09; CA 13-23	<i>Homework #06</i> (due by 11:30 pm on Monday, Oct. 17)
	Lab Session 07	<i>No lab meeting</i>		
Week 08: Oct. 17-23	Class Session	Describing and characterizing chemical reactions	Chapters 03, 04; CA 29-31	<i>Homework #07</i> (due by 11:30 pm on Monday, Oct. 24)
	Lab Session 08	<i>SWH #02</i> Properties of Molecules and Ions	Lab Manual	<i>SWH Report #04; SWH #02</i> pre-laboratory assignment
Week 09: Oct 24-30	Discussion & Class Sessions	Analyzing heat exchange and chemical reactions	Chapters 05; CA 34, 35	<i>Quiz #05</i> (timed, and due by 11:30 pm on Tuesday, Oct. 25) <i>Homework #08</i> (due by 11:30 pm on Monday, Oct. 31)
	Lab Session 09	<i>SWH #06</i> Investigation of the reactivity of metals	Lab Manual	<i>SWH Report #02; SWH #06</i> pre-laboratory assignment

Date (Week)	Session	Topics	Resources & Practice	Assignments Due
Week 10: Oct. 31- Nov. 06	Discussion & Class Sessions	States of Matter	Chapters 10-12; CA 24-27, 33	<p><i>Quiz #06</i> (timed, and due by 11:30 pm on Tuesday, Nov. 01)</p> <p><i>Homework #09</i> (due by 11:30 pm on Monday, Nov. 07)</p>
	Lab Session 10	<i>Lab Problem #02</i>	Lab Manual	<i>SWH Report #06</i> ; prep for Lab Problem #03;
Week 11: Nov. 07- 13	Discussion & Class Sessions	States of Matter	Chapters 10-12; CA 24-27, 33	<p><i>Quiz #07</i> (timed, and due by 11:30 pm on Tuesday, Nov. 8)</p> <p><i>Homework #10</i> (due by 11:30 pm on Monday, Nov. 14)</p>
	Lab Session 11	<i>Calibration for Peer Review Process</i>	Online Calibrated Peer Review (CPR)	Report for Lab Problem #03, uploaded to the Calibrated Peer Review system by 11:30 pm Wed., Nov 16. Peer Reviews completed by 11:30 pm on Monday, Nov. 21

Date (Week)	Session	Topics	Resources & Practice	Assignments Due
Week 12: Nov. 14-20	Discussion & Class Sessions	<i>TEST #02; States of Matter</i>	Chapters 10-12; CA 24-27, 33	<i>Homework #11</i> (due by 11:30 pm on Monday, Nov. 21)
	Lab Session 12	<i>SWH #05</i> Investigating heat exchange in chemical reactions	Lab Manual	<i>SWH #05</i> pre-laboratory assignment
Week 13: Nov. 21-27	Discussion & Class Sessions	<i>Topics TBD; Thanksgiving Break</i>	Tbd	<i>Quiz #08</i> (timed, and due by 11:30 pm on Tuesday, Nov. 22)
	Lab Session 14	<i>Thanksgiving Break</i>		<i>SWH Report #06; Report for Lab Problem #02</i> , uploaded to the Calibrated Peer Review system by 11:30 pm Tues., Nov 29.
Week 14: Nov. 28- Dec. 04	Discussion & Class Sessions	<i>Topics TBD</i>	Tbd	
	Lab Session 14	<i>Lab Problem #03</i>	Online Calibrated Peer Review (CPR)	
Week 15: Dec. 05-11	Discussion & Class Sessions	<i>Topics TBD; Semester Review</i>	Tbd	Peer Reviews completed by 11:30 pm on Friday, Dec. 09

Date (Week)	Session	Topics	Resources & Practice	Assignments Due
	Lab Session 15	Final surveys & assessments; clean-up and check-out; <i>Calibration for Peer Review Process</i>		
Exam Week	Friday, Dec. 16, 1-3 pm	CHEM 105 FINAL EXAM, Flanner Hall Auditorium		

ⁱ Brown, T. L., et. al (2015). *Chemistry: The Central Science, 13th ed (with MasteringChemistry)*. Pearson Prentice Hall. ISBN 978-0-321-91041-7.

ⁱⁱ Moog, R.S. & Farrell, J.J. (2015). *Chemistry: A Guided Inquiry, 6th ed.* John Wiley & Sons, Inc. ISBN 978-1-118-64004-3

ⁱⁱⁱ Custom laboratory manual, *details to be shared in class.*