

CHM 2045 Chemistry 1

Fall 2023

Welcome to CHM 2045 – Chemistry 1

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The STEM core courses, while not the same, share a similar feel and similar course policies. Moreover, the courses strive to set consistent expectations of what it means to take responsibility for your own learning and how to do university-level work. The courses are designed to be fair and reasonable. They are challenging, but they will set you up for success in your chosen degree program.

As a sign of the importance Florida Poly places on these courses, key department chairs and faculty have come together to form a Freshman Council that collectively manages course standards and delivery. We recognize the enormous impact these courses have on your future academic success. Please note the various resources that are available if you find yourself struggling in any way. Make these courses a priority!

Course Information

Course Number and Title: CHM 2045 Chemistry 1

Credit Hours: 3

Current Academic Term: fall 2023

Official Catalog Course Description: This course introduces the principles of chemistry and their applications based upon the study of physical and chemical properties of the elements. Topics covered in this class includes stoichiometry, atomic and molecular structure, the states of matter, chemical bonding, thermochemistry, and gas laws.

Gordon Rule (6A-10.030): No

Prerequisites: N/A

Co-Requisite: CHM 2045L – Chemistry 1 Laboratory

Required Text: Brown, T.E.; LeMay, H.E.; Bursten, B.E.; Murphy, C.; Woodward, P.; Stoltzfus, M.E. Chemistry: The Central Science (15th edition); Pearson: New York, NY. ISBN: 9780137542970

Equipment and Material:

- Scientific Calculator capable of scientific notation (Texas Instruments TI-30Xa recommended)
Please note: On exams you will not be permitted to use a programmable (or wifi enabled) calculator of any kind.
- Access to the course Canvas LMS website and University Email System

Communication: Florida Polytechnic University email is the official method of communication for the University. Students are required to check their email frequently. The subject of your emails must start with "CHM 2045 Section X" followed by the topic. Failure to provide the correct subject, will result in ignoring the email. Any email received from an address other than the one with the floridapoly.edu domain will not be replied to. Emails will typically be answered within 24-48 hours, Monday-Friday.

Course Objectives:

At the end of this course, you should be able to:

1. Apply appropriate scientific methods (unit/dimensional analysis/vocabulary/etc.) in problem solving exercises.
2. To enable students to interpret chemical equations make chemical calculations.
3. Relate atomic and molecular structure to explain chemical and physical properties of elements.
4. Understand types of chemical bonding, Lewis Structures and apply the knowledge to predict molecular geometry of the molecules
5. Correlate basic chemistry to explore the fundamental of advanced technologies useful for real-life problems of societal, global, environmental, and economic consequence.
6. Making students aware to understand and execute processes and methods solve the issues of engineering required to for understanding the improving the performance.
7. Active engagement needed for professional success through cultivating collaboration with multidisciplinary teams-based approaches which will help to improve technical knowledge, communication abilities, and leadership skills.

Course Learning Outcomes:

Students who pass CHM-1 are expected to demonstrate:

1. Ability to understand the concept of engineering systematically based on chemistry (formula, equations, units, scientific vocabulary, and process).
2. Use stoichiometric methods to convert between mass, moles, and concentration.
3. Relate the quantum numbers and electron configurations of atoms to the periodicity in chemical and physical properties of elements as represented in the periodic table.
4. Predict the bonding and resulting geometry of atoms in molecules.
5. Determine enthalpy change in chemical reactions-First Law of Thermodynamics.
6. Employ the kinetic theory of gases and the ideal gas laws to determine pressure, volume, temperature, and/or amount of a gas.
7. Ability to execute lecture learning to develop and conduct appropriate experiments, analyze, and interpret data, and use engineering judgment to draw conclusions.
8. An ability to correlate the knowledge of chemistry with the improved performance emerging smart materials, sensing, environmental safety & monitoring, and healthcare.
9. An ability to communicate effectively with a range of audiences.

Grading Scale

Grade	A	B+	B	B-	C+	C	D	F
Percentage	90%	87%	83%	80%	77%	70%	60%	< 60%
GPA	4.0	3.33	3.0	2.67	2.33	2.0	1.0	0.0

Assignment/Evaluation Methods

Attendance and In-class activities	5%*
Homework:	25%

Exams (three at 15% each)	45%**
Final Exam	25%
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Total	100%

*Up to 2 unexcused absences are permitted. Each subsequent unexcused absences will result in a 1% penalty.

**Students may approach the instructor if they score between a 60-69% on an exam for a grade improvement plan. Students may utilize this plan for only ONE midterm exam per semester.

Midterm Exams: Midterm exam dates will be finalized early in the semester and those dates/times will be posted to our Canvas course site once available. Exam dates are subject to change and you should refer to the [Academic Calendar](#) website for the most up-to-date exam schedules. Exam dates will also be announced in class at least one week prior to the scheduled event.

Homework: The homework will be through Canvas and will be due each week on Sunday by 11:59 pm. The assignments will open on the Wednesday prior to the Sunday they are due.

Schedule of Topics by Week

Week	Topics	Chapter/Sections
1	Syllabus, Basic definitions/concepts of matter, measurements and units, uncertainty and significant figures	Ch 1.1-1.3, 1.5-1.6
2	Dimensional analysis, atomic theory, structure, atomic symbols, isotopes NO CLASS 1/16	Ch 1.7, 2.1-2.3
3	Atomic weight, the periodic table, molecules, ions and Ionic formulas, octet rule, polyatomic ions, naming compounds	2.4-2.8
4	Balancing chemical equations, chemical reactions, formula weights, percent composition, the mole concept Midterm #1 – February 3	3.1-3.4
5	Molar mass, empirical formulas, limiting reactant and reaction yields, Intro to aqueous reactions	3.4-3.7
6	Aqueous solutions, precipitation reactions, solubility rules Net ionic equations, acid-base reactions, neutralization, oxidation-reduction reactions NO CLASSES 2/14	4.1-4.4
7	Molarity and solution concentrations, dilution, titrations, energy, heat transfers, enthalpy, enthalpy of reaction	4.5-4.6, 5.1-5.4
8	Heat capacity/specific heat, Hess's law, formation enthalpy, bond enthalpies, Lewis symbols and the octet rule	5.5-5.8, 8.1
9	SPRING BREAK NO CLASSES 3/6-3/10	
10	Bond polarity, Lewis structures, ionic and covalent bonding, formal charge, resonance structures, octet exceptions	8.2-8.7
11	Strengths and lengths of bonds, VSPER model, molecular polarity, covalent bonding and hybrid orbitals	8.8, 9.1-9.5
12	Multiple bonds, molecular orbitals, MO diagrams, properties of gases, gas laws, ideal gas law	9.6-9.8, 10.1-10.2

13	Ideal gas law, volumes in reactions, gas mixtures/partial pressures, real gases, EM radiation, frequency and wavelength	10.3-10.5, 10.7, 6.1
14	Atomic emission, line spectra, Bohr model, uncertainty principle, quantum theory, atomic orbitals Midterm #3 – April 14	6.1-6.4
15	Electronic structure of atoms, quantum numbers and electron configurations, effective nuclear charge	6.5-6.9, 7.1
16	Periodic table trends – atomic size, ionization energy and electron affinity, electronegativity Reading Days-NO CLASS 4/27-4/28	7.2-7.4
17	Finals Week	

CHM 2045L Chemistry 1 Laboratory

Fall 2023

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Course Information

Course Number and Title: CHM 2045L Chemistry 1 Lab

Meeting time:

Credit Hours: 1

Current Academic Term: Fall 2023

Official Catalog Course Description: Students will participate in laboratory experiments designed to reflect the topics presented in [CHM 2045](#).

Gordon Rule (6A-10.030): Yes: This course meets communication/writing-intensive requirements (W)

Co-Requisite: CHM 2045 – Chemistry 1

Required Lab Manual:

Chemistry 2045L Chemistry Lab Manual, **Publisher:** Xanadu, Code for manual available from the Florida Polytechnic Online Bookstore (<https://floridapoly.edu/bookstore/index.php>).

*****Each week you must print the pre-lab assignment sheets, datasheets, and post-lab sheets for the correct experiment from the manual. *****

Equipment and Material:

- Safety goggles, lab coat, and gloves (University provided)
- Scientific Calculator capable of scientific notation (Texas Instruments TI-30Xa recommended)
- Access to the course Canvas LMS website and University Email System
- Access to the lab manual (through the bookstore)

Communication: Florida Polytechnic University email is the official method of communication for the University. Students are required to check their email frequently. The subject of your emails must start with "CHM 2045L Section X" followed by the topic. Failure to provide the correct subject, will result in ignoring the email. Any email received from an address other than the one with the floridapoly.edu domain will not be replied to. Emails will typically be answered within 24-48 hours, Monday-Friday.

Course Objectives:

1. Design and perform a chemistry experiment safely and systematically.
2. Understanding and follow laboratory work practices.
3. Demonstrate ability to generate systematic data.
4. Achieve professional success to analyze an experimental data correctly.
5. Achieve ability to articulate laboratory report based experimental outcomes using professional English, technical details, and scientific explanation.

Course Learning Outcomes:

1. Ability to understand the process of a chemical change.
2. Ability to demonstrate safe laboratory skills.
3. Learning-based ability to apply problem solving skills to perform any experiment which involve processing.
4. Ability to engage constructively and work in a team.
5. Ability to communicate and articulate a laboratory process report.
6. Ability to utilize scientific methodology including quantitative data analysis and interpretation.
7. An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.
8. An ability to execute process-based learning to improve engineering processes involving surface science, materials science, analytics science, environmental science, and technology of sensors and biomedical applications.

Grading Scale

Grade	A	B+	B	B-	C+	C	D	F
Percentage	90%	87%	83%	80%	77%	70%	60%	< 60%
GPA	4.0	3.33	3.0	2.67	2.33	2.0	1.0	0.0

Assignment/Evaluation Methods

Attendance	5%*
Lab Experiments (Best 6 of 7, 7% each)	45%**
Full Lab Reports (2 at 15% each)	30%**
Final Exam	20%
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Total	100%

*See Attendance Policy below

**See Lab Experiments and Reports section below

Schedule of Topics by Week

Week	Title of Experiment	Lab # in Manual	Assignment (due at the beginning of class)
1	Syllabus and check in		*Get access to the online lab manual
2	Mandatory Safety Training and Online Quiz	Exp 0	- Complete: Online Safety Training and Safety Quiz prior to the start of Week 2 *** Students may not work in the laboratory until they have viewed the Lab Safety video and passed ($\geq 80\%$) the Safety Quiz ***
3	Glassware and Uncertainty	Not in manual (Worksheet posted on Canvas)	-Bring the Signed copy of the Lab Safety agreement and submit in person (hard copy) -Submit the pre-lab work for Glassware and uncertainty
4	Identifying Materials by Density	Experiment 1	-Submit Data/post lab –for Glassware and uncertainty -Submit the pre-lab work for Exp. 1
5	Determining the Limiting Reagent and Theoretical Yield (Full lab report due for this expt)	Experiment 3 Part A	-Submit Data/post lab work –Exp. 1 -Submit the pre-lab work Exp. 3
6	No Labs this Week		
7	Limiting Reagent Lab (Full lab report due for this expt)	Experiment 3 Part B	
8	Stoichiometry Concept Discussion and Making a Stock Solution (Dilution concept)	Experiment 5	-Submit Full lab Report and corresponding Data Sheets for Experiment 3 -Submit the pre-lab work Exp. 5
9	No Labs this Week – Spring Break		
10	Acid-base Titration 1 (Full lab report due for this expt)	Experiment 6 Part A	-Submit Data/post lab work–Exp. 5 -Submit the pre-lab work Exp. 6

11	Acid-base Titration 2 (Full lab report due for this expt)	Experiment 6 Part B	
12	Determination of the Enthalpy of Combustion: Magnesium	Experiment 9	-Submit Full lab Report and corresponding Data sheets for Experiment 6 -Submit the pre-lab work Exp. 9
13	VSEPR Theory	Experiment 8	-Submit Data/post lab work – Exp 9 -Submit the pre-lab work Exp. 8
14	Calculating the Molar Volume of Carbon Dioxide	Experiment 4	-Submit Data/post lab work – Exp. 8 -Submit the pre-lab work Exp.4
15	Final Exam for Lab		-Submit Data/post lab work – Exp. 4