

Prerequisites: High school chemistry (recommended, but not required)

Instructors: Heather Dorman, Ph.D., Department Chair
Rodney Austin, Ph.D.
David Gallaher, Ph.D.
Kathy Austin, MEd
H Elaine Frey, MHA
Craig Kozminski, MAT
Jessica Schiren, MS, MEd

Contact Information: Faculty may be contacted through the Canvas messaging system

Additional Information: www.portagelearning.com*

Course meeting times: CHEM 103 is offered continuously

Course Description: A systematic investigation of the fundamental principles of chemistry and the scientific method. The laws, theories and mathematical concepts surrounding chemical reactions are examined. Discussions on the metric system, stoichiometry, thermochemistry, and atomic structure are included. Intra and intermolecular interactions, bonding and the physical properties associated with the solid, liquid and gas phases are also covered in detail. The laboratory component of this course is delivered using virtual labs and interactive simulations with detailed instruction and demonstrations from an experienced chemist.

Course Outcomes: As a result of this course experience a student should be able to:

- Apply the principles of the scientific method and measurement
- Describe the electron structure and chemical periodicity of atoms
- Name and write formulas for common inorganic compounds
- Perform stoichiometric, thermochemical and molarity calculations
- Determine the bonding, geometry and polarity of molecules and use these to explain the physical properties of these molecules
- Balance simple and redox chemical equations
- Understand gases and perform gas law calculations
- Explain solid and liquid properties and phase diagrams

*Please see the *Module & Lab Topics* section below for expanded course outcomes.

Lab Outcomes: As a result of this laboratory experience a student should be able to:

- Practice safe procedures in the chemical laboratory
- Perform accurate volume and mass measurement
- Carry out and describe chemical reactions
- Perform gas manipulations and calculations
- Carry out temperature and thermochemical measurements
- Carry out filtration and distillation procedures
- Analyze and apply solubility data

The CHEM 103 student learning outcomes are measured:

- Directly by:
- (1) Module application problems (with instructor feedback)
 - (2) Module exams
 - (3) Lab reports and lab exams
 - (4) Cumulative final exam

Indirectly by an end of course student-completed evaluation survey

Course Delivery: This course is asynchronously delivered online and is composed of 10-15 hours of module assignments, 20-25 hours of video lectures, 10-15 hours of secure online exams, 10-15 hours of demonstration labs, 5-10 hours of lab notebook maintenance, 10-15 hours of written lab reports/exams.

Course Progression: It is the policy for all Portage Learning courses that only one (module lecture/final) exam is to be completed within a 48-hour period. Research on the best practices in learning indicates that time is needed to process material for optimal learning. This means that once an exam has been completed, the next exam may not be opened or taken until 48 hours after the submission of the previous module exam. This allows for instructor feedback/class expectations as the student moves through the material. Instructors, like the College, are not available during the weekend; grading, therefore, is M-F and may take up to 72 hours during these days. Also, it is the policy of Portage Learning to support a minimum of 21 days to complete a course; this is not a negotiable time period. Please plan your time accordingly.

Note: Professors reserve the right to reset any exam taken in violation of these guidelines.

Required readings, lectures and assignments: Portage courses do not use paper textbooks. Students are required to read the online lesson modules written by the course author which contain the standard information covered in a typical course. Please note the exam questions are based upon the readings. Video lectures which support each lesson module subject should be viewed as many times as is necessary to fully understand the material.

We do not support the use of outside resources to study, except for the ones listed in the syllabus under "Suggested External References". If you have questions about the material or would like further explanation of



the concepts, please contact your instructor. If you are still unable to grasp the concepts after messaging your instructor, you may make an appointment with the Academic Helpline (888-724-3590 – Option #2).

Module Problem Sets: The practice problems within the modules are a part of your final grade, and the module work will be reviewed for completeness (not correctness) by the instructor. **Be sure to answer all of the problems, being careful to answer the questions in your own words at all times since this is an important part of adequate preparation for the exams.** After you answer the practice problems, compare your answers to the solutions provided at the end of the module. If your answers do not match those at the end, attempt to figure out why there is a difference. If you have any questions, please contact the instructor via the Canvas messaging system (see Inbox icon).

NOTE: Module problem sets are not an option or a choice; *they are required*. This means that you must complete all the review questions within the modules. Not only are problem sets class participation, they are the best way to prepare for the exams. **Instructors have the option to either not grade your exams until these are completed, or to deduct points from the related exam if blank modules are repeatedly submitted.**

Academic Integrity is a serious matter. In the educational context, any dishonesty violates freedom and trust, which are essential for effective learning. Dishonesty limits a student's ability to reach his or her potential. Portage places a high value on honest independent work. In a distance learning situation, we depend on the student's desire to succeed in the program he or she is entering. It is in a student's own best interests not to cheat on an exam, as this would compromise the student's preparation for future work. It is required of each student to take exams without consulting course materials or study aids including another person, the lesson pages, printed materials, or the Internet. It will be necessary to show all your work on exams.

- **Students may not reference or use outside materials from any source, including their own notes or drafts in a word processing document, except for the use of lab notebooks during lab exams only. Citing outside materials on an exam will be considered an academic violation.**
- **The Periodic Table provided by the course is the only Periodic Table that should be used throughout the course and on exams. Use of any other Periodic Table will be considered an outside resource and will be cited as an academic violation.**
- **Additionally, as we are required to evaluate the mastery of the material presented in this course, the use of content/processes/methods from a previous course will be considered as the use of an outside resource and will be cited as an academic violation.**

A violation of the academic integrity policy will result in a 10 point deduction per question for the first offense, a "0" on the entire exam for the second offense, and possible expulsion from the course following review by the instructor in consultation with an administrative-instructional committee for the third offense.



If students have questions about this policy, they should contact their instructor. Failure to understand this policy regarding violations of academic integrity will not excuse any student from its consequences. In the enforcement of the policy, **no notification is required between occurrences**. If three occurrences are found in your course prior to your instructor grading your work, each occurrence will be treated as an individual case, and the enforcement will apply as shown above.

For example: If you take two exams before your instructor has time to review your work and there are violations on both exams, you will receive a 10 point deduction per question involved in the first exam, and a zero for the second exam. If you have any question about the work you submitted, we recommend that you wait until your instructor has had time to grade your exam prior to taking another one.

Review the Student Handbook for more specifics. If you have any questions regarding the academic integrity policy, please consult your instructor **prior** to taking module exam one.

Required Computer Accessories: It is recommended that students use a desktop or laptop computer, PC or Mac, when taking the course. Some tablet computers are potentially compatible with the course, but not all features are available for all tablet computers. The latest full version of Google Chrome, Firefox, Edge, or Safari browser is required for the optimal operation of the Canvas Learning Management System. In addition, this course will use the Respondus Lockdown Browser for exams. **Please note, Chromebooks and tablets (other than iPad) are not compatible on exams using the Lockdown Browser.** Instructions on downloading and installing this browser will be given at the start of the course. It is recommended to also have the latest version of Flash installed as a browser plugin as some sections of the course may require it. We highly recommend using a high-speed Internet connection to view the video lectures and labs. You may experience significant difficulties viewing the videos using a dial-up connection.

For more information on basic system and browser requirements, please reference the following:

- System requirements: <https://community.canvaslms.com/docs/DOC-10721-67952720328>
- Browser requirements: <https://community.canvaslms.com/docs/DOC-10720>
- Respondus requirements: <https://web.respondus.com/he/lockdownbrowser/resources/>

Modules and Labs

Module 1: This module introduces the science of chemistry by examining its fundamental terminology and measurement system. The metric system is explained, compared to the English customary system and applied. Matter is classified and atomic theory is introduced. The Periodic Table is presented as a foundation for discussion of the elements and their application to the naming of chemical compounds and writing of their formulas.



- Module 2: Chemical reactions are considered in this module including balancing and listing of common types and redox equations. Percent composition and determination of empirical and molecular formulas are presented. The mole concept is explained and applied to stoichiometric equation calculations. Molarity solution concentration is also discussed as an application of the mole concept.
- Module 3: The module begins with a discussion of thermochemistry, including temperature-change and phase-change calorimetry, thermochemical equations, heats of reaction and Hess's Law. This module also contains a detail treatment of the kinetic-molecular theory of gases as an introduction to the presentation of and application of the combined and ideal gas laws and use of these in determination of gas volume stoichiometry. The topic of gases is extended further to include an examination of the law of partial pressures and diffusion and effusion.
- Module 4: This module contains a detail treatment of atomic structure including determination of electron configuration and orbital diagrams. The wave theory of the electron is presented along with the quantum theory of the atom leading to the determination of quantum numbers and use of this material to predict periodic trends in the atomic properties of ionization energy, electronegativity and atomic size.
- Module 5: This module includes a detailed treatment of ionic and covalent intra-molecular bonding and various types of inter-molecular bonding. Lewis structures are discussed and used to determine electron geometry, hybridization, and molecular shape. This information is then applied to predict molecular polarity and used to predict physical properties and solubility.
- Module 6: The properties and detailed structure of the liquid and solid phases of matter are studied in this module and used to illustrate and explain phase changes and phase change diagrams of water. Homogeneous and heterogeneous mixtures are illustrated and discussed. Solubility is discussed and applied to explain the solution concentration terms mass percent, molarity, and molality. Various colligative properties of solutions are discussed, and calculations are done to illustrate these, including the determination of molar mass. Ionization in electrolyte solutions is discussed and used to illustrate the conductivity and special colligative properties of these solutions.
- Lab 1: Safety Equipment. This lab includes a presentation of safety and equipment aspects of the chemistry laboratory as well as an examination of mass and volume measurement. Each of the common items of lab equipment are presented and discussed. Mass measurement is carried out using the various types of balances commonly used in the lab. Volume is measured using cylinders, pipettes and burettes and the accuracy of these devices is compared.



- Lab 2: Chemical Reactions. In this lab, several examples of the six types of chemical reactions are carried out and five types of results are observed during the reactions. The oxidation-reduction of methylene blue indicator is carried out to demonstrate the reversibility of a reaction.
- Lab 3: Quantitative Analysis. This lab examines quantitative chemical analysis by examining two analyses that of a metal carbonate and of a hydrate. The analysis of the metal carbonate is carried out to determine percent CO_2 and used to determine the identity of the metal carbonate. The quantitative analysis of a hydrate is carried out to determine the percent water and used to determine the identity of the metal hydrate. Paper chromatography is performed on an amino acid mixture and used to determine the amino acid components of the artificial sweetener Aspartame. Scanning Electron Microscopy is performed on various materials to determine their qualitative elemental composition and used to determine the identity of two unknown substances.
- Lab 4: Thermochemistry. The heat exchange associated with chemical reactions is examined in this experiment using an instrument called a calorimeter. First, a calorimeter is calibrated and then used to measure the heat exchange of an acid-base reaction. Then a second type of calorimeter is used to measure the heat change for the combustion of a hydrocarbon fuel.
- Lab 5: Gas Law Experiment. This lab covers Boyle's Law, Charles Law, and the Ideal Gas Law. Experiments will explore the pressure-volume relationship and the volume-temperature relationship of gases. Also, the ideal gas law will be used to predict the molar mass of a gas.
- Lab 6: Bonding and Properties. In this lab, a variety of organic compounds are compared in regard to water solubility, boiling points determined by distillation and Infrared spectra to determine what types of inter-molecular and intra-molecular bonding might be present in those materials. The types of materials studied are ionic, polar, no-polar, hydrogen-bonding.
- Lab 7: Molality/Colligative Property Experiment. In this experiment, the properties of solutes dissolved in a solvent will be covered. First, the calculation of molality, m , is covered using two salts to demonstrate. Next, the two salts are investigated for their ability to lower the temperature of ice. Preparation of ice cream is used to show the differing impact of the two salts on lowering the melting point of ice.
- Lab 8: Molar mass. In this experiment, colligative properties are used to determine the molar mass of a compound. Solute tend to lower the freezing point of a solvent with more solutes lowering the freezing point to a greater degree. The freezing point of a pure solvent is determined and then compared to that of the solvent with a solute. The molar mass of the solute is estimated from the freezing point difference.



Required Labs and Assignments:

For the laboratory portion of the course, students will observe an experienced lab instructor. **It is the responsibility of the student to view each lab video in its entirety** and only mark the lab as “done” when it is completed. Do not open all the labs at once; otherwise, they may be reset at the discretion of the instructor. Students are required to keep a lab notebook while watching the videos. The lab notebook, alone, can be used as a resource to the student while taking their lab exam(s). Please note that the use of outside material (i.e. the internet, textbooks, articles, etc.) is not permitted while taking the lab exams. A recommended lab schedule can be found on the home page of each lab; the student should follow this schedule to meet course objectives.

Additional Tools: A built-in **scientific calculator** for the course has been incorporated into the website and can be found in the tool bar above each module and exam page. If you choose to purchase a calculator, keep in mind that you do not need to purchase an expensive calculator as the features you will need are available on basic scientific calculators with a cost of less than \$20.

The only calculator that is permitted during an exam is the one that is provided in the course introductory materials and within the exam. It would be wise to familiarize yourself with this calculator and use it for both the practice problems and module problem sets. A tutorial is also provided in the course introductory material. You are allowed to copy and paste your answers from the calculator into the answer boxes. If you have any questions regarding how to input numbers or perform certain calculations, please contact your instructor for assistance before moving forward in the course.

Grading Rubric:

Check for Understanding =	1 pt.
6 Module Exams = 100 pts. each x 6 =	600 pts.
8 Lab Exams = 30 pts each x 8 =	240 pts.
<u>Final Exam = 120 pts.</u>	<u>120 pts.</u>
Total	961 pts.

The current course grade and progress is continuously displayed on the student desktop.

Grading Scale:

89.5% - 100% (861 - 961 pts)	= A
79.5% - 89.4% (764 - 860 pts)	= B
69.5% - 79.4% (668 - 763 pts)	= C
59.5% - 69.4% (572 - 667 pts)	= D
<59.4% (< 571 pts)	= F



Suggested External References:

If the student desires to consult a reference for additional information, the following textbooks are recommended as providing complete treatment of the course subject matter.

- Jean Umland, **General Chemistry**, West Publishing
- Darrell Ebbing, **General Chemistry**, Houghton Mifflin Publishing

NOTE: We do not support the use of outside resources to study, except the ones listed above.

Learning Support Services:

Each student should be sure to take advantage of and use the following learning support services provided to increase student academic performance:

Video lectures: Supports diverse learning styles in conjunction with the text material of each module

Messaging system: Provides individual instructor/student interaction

Tech support: Available by submitting a help ticket through the student dashboard

Accommodations for Students with Learning Disabilities:

Students with documented learning disabilities may receive accommodations in the form of an extended time limit on exams, when applicable. To receive the accommodations, the student should furnish documentation of the learning disability at the time of registration, if possible. Scan and e-mail the documentation to studentservices@portagelearning.com. Upon receipt of the learning disability documentation, Portage staff will provide the student with instructions for a variation of the course containing exams with extended time limits. This accommodation does not alter the content of any assignments/exams, change what the exam is intended to measure or otherwise impact the outcomes of objectives of the course.

One-on-one Instruction:

Each student is assigned to his/her own instructor. Personalized questions are addressed via the student dashboard messaging system.

Online learning presents an opportunity for flexibility; however, a discipline to maintain connection to the course is required; therefore, communication is essential to successful learning. **Check your messages daily.** Instructors are checking messages daily Monday-Friday to be sure to answer any questions that may arise from you. It is important that you do the same so you do not miss any pertinent information from us.

Student Helpline:

Portage students have access to our help-line phone service. The phone service is staffed by instructors who will answer questions regarding material in those courses. Please call 1-888-724-3590 and choose option #2 if you would like assistance with your course work.



Due to high call volume, we cannot guarantee that your call can be answered immediately so you may be required to leave a voicemail. The help-line instructors will return the voicemails as soon as possible and within one business day.

If the hours below [see Helpline Hours] do not fit your personal schedule, please leave a message on the helpline voicemail requesting an appointment. In the voicemail, please leave several dates and times convenient for a return call. If a help line representative cannot call you at one of your preferred times, you will be contacted to set up a mutually suitable time. Appointment slots are limited and will be granted as instructor time becomes available and at the discretion of the helpline instructor.

No appointments will be scheduled for Sunday.

Helpline Hours

Mon - Fri: Noon - 9 PM ET

Sat: 9 AM - 11 AM ET

Sun: Closed

Holidays:

During the following holidays, all administrative and instructional functions are suspended, including the grading of exams and issuance of transcripts.

New Year's Day

Easter

Memorial Day

Independence Day

Labor Day

Thanksgiving weekend

Christmas Break

The schedule of holidays for the current calendar year may be found under the Student Services menu at

www.portagelearning.com

Code of Conduct: Students are expected to conduct themselves in a way that supports learning and teaching and promotes an atmosphere of civility and respect in their interactions with others. Verbal and written aggression, abuse, or misconduct is prohibited and may be grounds for immediate dismissal from the program.

This is a classroom; therefore, instructors have the academic freedom to set forth policy for their respective class. Instructors send a welcome e-mail detailing the policy of their class, which students are required to read prior to beginning the course.



Grievances: If a student has a complaint about the coursework or the instructor, the student is advised to first consult the instructor, who will be willing to listen and consider your concern. To file a formal grievance for consideration by the Academic Review Committee, the process must be initiated via written communication to academics@portagelearning.com.

Remediation: At Portage Learning we allow a "one-time" only opportunity to re-take an alternate version of **one** module exam on which a student has earned a grade lower than 70%. This option must be exercised before the final exam is started. If an exam is retaken, the original exam grade will be erased and the new exam grade will become a permanent part of the course grade. However, before scheduling and attempting this retest, the student must resolve the questions they have regarding the material by reviewing both the old exam and the lesson module material. Once ready to attempt the retest of the exam they must contact their instructor to request that the exam be reset for the retest. Remember, any module retest must be requested and completed **before** the final exam is opened.

Note: Exams on which a student has been penalized for a violation of the academic integrity policy may not be re-taken.

Syllabi are subject to change as part of ongoing educational review practices. Students are responsible for accessing and using the most recent version of the course syllabus.

