

## CHEMISTRY

At Mount Wachusett Community College (MWCC) students have the opportunity to earn an Associate of Science Degree in Chemistry. Upon the successful completion of the program students will be well prepared for the rigors of a four-year institution to finish a baccalaureate degree in chemistry or related disciplines such as biological science or chemical engineering. The chemistry degree at MWCC offers students the opportunity to explore and participate in hands-on laboratory experience not only in chemistry but also in physics and biology. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations.

### CHEMISTRY (CHEM)

The chemistry degree is designed to prepare students to transfer in chemistry to a four-year university after they complete their Associate degree at MWCC. The chemistry curriculum is based on STEM CORE requirements and Mass Transfer benefits so that students will continue as juniors at their four-year institution when transferring from MWCC.

In addition to having the opportunity to continue on to a Bachelor's in chemistry at a four-year institution, students have the option to go on to biological sciences, chemical engineering, pharmacy or physician assistant, as the flexibility of the chemical sciences degree affords the option of transfer to those areas.

Alternatively, students can market their essential lab skills through hands-on experiments using: UV spec, pH, IR and HPLC, which contribute to creating competent lab technicians in fields related to both chemistry and biology. These hands-on experiences are designed to enhance lab job skills and guide students as they continue their educational degree. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations.

#### Year 1

		Credits
<b>Fall</b>		
CHE 107	General Chemistry I	4
ENG 101	College Writing I	3
MAT 163	Pre-Calculus	4
Social Science Elective <sup>1</sup>		3
<b>Spring</b>		
CHE 108	General Chemistry II	4
ENG 102	College Writing II	3
MAT 211	Calculus I	4
Social Science Elective <sup>1</sup>		3
BIO 118	Biology I	4
<b>Year 2</b>		
<b>Fall</b>		
CHE 207	Organic Chemistry I	4
MAT 212	Calculus II	4
PHY 120	Physics for Engineering and Science I (or PHY 105)	4
Humanities Elective <sup>2</sup>		3
<b>Spring</b>		
PHY 121	Physics for Engineering and Science II (or PHY 106)	4
CHE 208	Organic Chemistry II	4
Humanities Elective <sup>2</sup>		3
Professional Elective (see list below)		4
<b>Total Credits:</b>		<b>62</b>

<sup>1</sup> Social Science Electives: See Elective Courses by Abbreviation (<http://catalog.mwcc.edu/electivecoursesbyabbreviation/>).

<sup>2</sup> Humanities Electives: See Elective Courses by Abbreviation (<http://catalog.mwcc.edu/electivecoursesbyabbreviation/>).

**Professional Electives**

		Credits
BIO 119	Biology II	4
BIO 205	Microbiology	4
BIO 210	Genetics	4
MAT 213	Calculus III	4

See Chemistry program student learning outcomes and technical standards.

**Campus**

This program is offered on the Gardner campus only.

**Transfer Options**

For transfer options, please click here (<http://catalog.mwcc.edu/academicresources/#transferinformationtext>). It is recommended that you also consult with your academic advisor.

**MASSTRANSFER**

Students who plan to transfer to a Massachusetts state university or a University of Massachusetts campus may be eligible to transfer under the MassTransfer agreement, which provides transfer advantages to those who qualify.

Please click here for MassTransfer information (<http://www.mass.edu/masstransfer/>)

**PROGRAM COMPETENCIES FOR CHEM**

Upon completion of this program, students should be able to:

- Formulate clear and precise questions about complex problems and ideas relevant to a variety of disciplines — math, science, the technology— and gather, assess, and interpret information to reach well-reasoned conclusions and solutions.
- Demonstrate an understanding of complex written texts that demand an appreciation of subtext, irony, metaphor, and the subtlety and nuances of language.
- Successfully complete a substantial scientific research paper that demonstrates the ability to formulate a research question, conduct research using the library's databases, and synthesize information from a variety of sources into a cohesive and in-depth analysis of a topic.
- Demonstrate knowledge of and understanding their own society and other societies, with an emphasis on important ideas and events that have shaped, and continue to shape, their world.
- Demonstrate scientific literacy, which can be defined as the matrix of knowledge needed to understand enough about the universe to deal with issues that come across the horizon of the average citizen, in the news or elsewhere.
- Demonstrate the ability to collect, record and organize scientific data correctly.
- Demonstrate the ability to work safely in a laboratory environment.
- Demonstrate the ability to manipulate and use scientific tools, such as the microscope, pH meter, measurement tools, glassware and other scientific instrumentation. This would include independently conducting an experiment using written directions such as lab manuals or Standard Operating Procedures as a guide.
- Demonstrate the ability to use mathematical tools as applied to science. This could include building and interpreting graphs, using equations and formulas to solve problems, and fitting data to a mathematical model.
- Demonstrate the ability to search scientific literature and use the information.
- Successfully transfer to a baccalaureate degree-granting institution if desired, with the proper educational foundation for transition into a chosen field of study.

**TECHNICAL STANDARDS FOR CHEM<sup>1</sup>**

Students entering this program must be able to demonstrate the ability to:

- Comprehend textbook material at a college level.
- Communicate and assimilate information either in spoken, printed, signed, or computer voice format.

- Gather, analyze, and draw conclusions from data.
- Stand for a minimum of two hours.
- Differentiate by touch: hotness/coldness, wetness/dryness, and hardness/softness.
- Use the small muscle dexterity necessary to do such tasks as gloving, gowning, and operating controls on laboratory instrumentation.
- Respond promptly to spoken words, as well as monitor signals and instrument alarms.
- Identify behaviors that would endanger a person's life or safety and intervene quickly in a crisis situation with an appropriate solution.
- Remain calm, rational, decisive, and in control at all times, especially during emergency situations.
- Manipulate small parts, and make fine hand adjustments to machines and test equipment.
- Operate a computer.

<sup>1</sup> For general information about technical standards and accommodation, see Technical Standards. (<http://catalog.mwcc.edu/academicresources/academicandgradingpolicies/technicalstandards/>)

### **CHE 107. General Chemistry I. 4 Credits.**

This course provides the student with an understanding of the fundamental principles of matter and energy. The course includes atomic and molecular structure, the periodic table, patterns of chemical reactivity, solution chemistry, stoichiometry, thermochemistry, and chemical bonding. A mathematical approach to chemical problems is used to develop problem solving skills as well as a conceptual understanding. Laboratory work is correlated with class discussion. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 162 (or corequisite), RDG 098 or placement; NOTE: MAT 142, Math for Meds, may be substituted for MAT 162 for Vet Tech Students only; Recommended: High school chemistry or other previous chemistry classes.

### **CHE 108. General Chemistry II. 4 Credits.**

A continuation of CHE 107 General Chemistry I, this course covers such topics as intermolecular forces, behavior of gases, liquids and solutions, chemical kinetics, equilibrium, oxidation-reduction and electro-chemistry. A mathematical approach to chemical problems is used to develop problem solving skills as well as a conceptual understanding. Laboratory work is correlated with class discussion. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. A grade of C or better in this course is required for advancement to CHE 207. Prerequisite: CHE 107; MAT 162.

### **CHE 120. Environmental Chemistry. 4 Credits.**

This course is an introduction to the principles of chemistry with an emphasis on the environmental chemistry of air, energy, water and soil. It is recommended as a general science elective or as a foundation for continued study in the sciences, particularly natural resources. The following basic chemical topics will be introduced: matter classification, atomic structure, periodic table, chemical bonds, chemical formulas and names, spectroscopy, solutions, concentration, pH, moles and the use of energy. The course emphasizes an understanding of current environmental problems, such as air and water pollution, the ozone layer and energy issues. The relationships between science, technology and society are also discussed in the context of environmental issues. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations. Prerequisites: ENG 098, FYE 101, MAT 092 or MAT 096, RDG 098 or placement. Spring.

### **CHE 207. Organic Chemistry I. 4 Credits.**

Organic chemistry is the study of carbon and its compounds. In the first semester, the structures and properties of the basic hydrocarbons and their simple substitution products will be studied. This will allow us to explore the following fundamental topics in organic chemistry: isomers, nomenclature, basic reaction mechanisms, spectroscopy (IR, NMR and MS). The functional groups will be introduced. Laboratory work will develop basic skills and techniques and be correlated with class discussion. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: CHE 108 with a grade of C or higher; MAT 163 (or corequisite). Fall.

### **CHE 208. Organic Chemistry II. 4 Credits.**

Organic chemistry is the study of carbon and its compounds. In the second semester, the structures and properties of the substituted hydrocarbons (functional groups) will be studied. This will include their synthesis and their reactions. The use of spectroscopy (IR, NMR and MS) will be further developed. Multistep synthesis of complex organic compounds will be introduced. Laboratory work will develop more advanced skills and techniques, and be correlated with class discussion. Lab sessions will be hands on experiences revolving around and applying the topics listed in the lab section of the syllabus. A formal research lab report that incorporates

previous scientific learning will be required in this course as a capstone experience. Prerequisites: CHE 207; MAT 163 or higher (prerequisite or corequisite). Spring.