

Chemistry

The Chemistry Department strives to provide a solid foundation in the basic areas of chemistry (analytical, organic, inorganic, physical, and biochemical) for a student preparing for graduate school, a laboratory career, or a professional school. The program introduces students to each area in both the class and the laboratory. Advanced work also is available. The hub of our department, the junior research techniques lab, is designed to provide a laboratory experience with each professor of the department and to prepare the student for a senior research project.

Pre-Professional Programs

The Chemistry Department offers a pre-professional program in **Pharmacy**. This program is designed for students who may be interested in attending Pharmacy school after graduation. Interested students should contact the Chemistry Department Chair and visit www.bridgewater.edu

CHEMISTRY MAJOR REQUIREMENTS

The following courses are required for a major in Chemistry:

CHEM 161 General Chemistry

CHEM 162 General Chemistry
CHEM 305 Organic Chemistry I
CHEM 310 Organic Chemistry and Spectroscopy
CHEM 341 Physical Chemistry I
CHEM 342 Physical Chemistry II
CHEM 351 Chemical Techniques I
CHEM 352 Chemical Techniques II
CHEM 440 Advanced Inorganic Chemistry
CHEM 451 Advanced Chemical Techniques I
CHEM 452 Advanced Chemical Techniques II
And 3 additional credit hours at the 400 level

Supporting courses for the major are:

PHYS 221 General Physics I
PHYS 222 General Physics II
MATH 131 Calculus I
MATH 132 Calculus II

Strongly recommended courses are:

BIOL 207 Organisms I
BIOL 208 Organisms II

Students wishing to pursue further study in Chemistry are encouraged to take additional courses in Biology, Physics, Mathematics, Computer Science, and Foreign Language (preferably German or French).



► FOR INFORMATION ON CAREERS IN CHEMISTRY VISIT THE OFFICE OF CAREER SERVICES OR GO TO: WWW.BRIDGEWATER.EDU

CHEMISTRY MINOR REQUIREMENTS COURSES

The following courses are required for a minor in Chemistry:

- CHEM 161 General Chemistry
- CHEM 162 General Chemistry
- CHEM 305 Organic Chemistry I
- CHEM 310 Organic Chemistry and Spectroscopy
- CHEM 351 Chemical Techniques I

6 credit hours from Chemistry courses numbered 340 and above.

- PHYS 221 General Physics I
- PHYS 222 General Physics II
- MATH 131 Calculus I
- MATH 132 Calculus II

GENERAL EDUCATION REQUIREMENT

The following courses satisfy Bridgewater College's general education requirement for Physical Science:

- CHEM 102 Earth and its Physical Resources (for students majoring in a non-science area)
- CHEM 125 Fundamentals of Inorganic Chemistry (for allied health science and nutrition and wellness majors)
- CHEM 161 General Chemistry (for science majors)

Majors in any non-science department can take and benefit from:

- CHEM 125 Fundamentals of Inorganic Chemistry
- OR
- CHEM 161 General Chemistry

GENERAL CHEMISTRY COURSE PREREQUISITES

Prerequisites or co-requisites include the following courses:

- MATH 110 College Algebra (for any courses numbered 140 or above)
- MATH 132 Calculus II (for any course numbered 330 or above, except for Biochemistry)

CHEM 102 The Earth and its Physical Resources

4 Credits F, S

The history of the earth and its place in the universe, geologic processes, environmental problems and weather. Three hours of lecture and one two-hour laboratory per week. Some trips will be taken during lab.

General Education: Natural Science

CHEM 120 Fundamentals of Environmental Chemistry

3 Credits I

This course offers an introduction to the chemical basis of environmental issues. Water, atmospheric, and soil chemistry will be addressed. Topics covered will include water pollution, acid rain, the ozone layer, the greenhouse effect, and the pollution of heavy metals and pesticides. The course will consist of lectures, field trips, and a laboratory.

CHEM 121 Energy and the Environment

3 Credits I

Benefits and problems associated with various methods of energy generation. Field trips are scheduled to the North Anna Nuclear Power plant, a hydroelectric plant, and a coal-fired power plant.

CHEM 122 Science and Pseudoscience

3 Credits I

Examination of rational and skeptical thinking as applied to scientific and pseudoscientific phenomena. Explorations of such topics as unidentified flying objects, the Bermuda Triangle, and "Chariots of the Gods" are given via lectures by the instructor and individual student presentations.

CHEM 124 The Hydrogen Economy and Alternative Energy

3 Credits I

A study of the energy production methods for the industrial, residential, and transportation sectors.

The major focus of the course will be to contrast how energy is produced now in the U.S. and how it might be in the future with a hydrogen economy. One week on campus and two weeks off campus in Iceland and Denmark. (Credit may not be received for both CHEM 121 and CHEM 124.)

CHEM 125 Fundamentals of Inorganic Chemistry

4 Credits F

Basic principles of structure, composition, and reactions of matter. This course is designed to be a survey course for health science majors and counts toward the natural environment requirement for graduation. This course does not satisfy requirements for majors in Biology or Chemistry. (Credit may not be received for both CHEM 125 and 161.) Three hours of lecture and one two-hour laboratory per week.

General Education: Natural Science

CHEM 161, 162 General Chemistry

4 Credits each F, S

Principles of chemistry including stoichiometry, states of matter, atomic and molecular structure, chemical bonding, periodicity, energy relationships and equilibria, acid-base chemistry, electrochemistry, kinetics, solubility, thermodynamics, kinetic molecular theory of gases, and the systematic study of families of elements. (Credit may not be received for both CHEM 125 and 161.) Three hours of lecture and one four-hour laboratory per week.

Prerequisite: CHEM 161 or permission of the instructor is required for CHEM 162.

General Education: Natural Science

CHEM 220 Milestones in Scientific Thought

3 Credits I

An introduction to the methods of scientific thought through the study of hypothesis and theories which have shaped the modern world. The topics will include material from a discussion of the beginning of the universe to the current genome project. The course will involve readings from books and separate articles.

Prerequisites: Completion of the Effective Writing and Math requirements in the Core Skills area and completion of one physical science or biological science class that satisfies the general education requirement.

CHEM 250 Fundamental Organic Chemistry

4 Credits F

An overview of the functional groups present in and the reactivity of organic molecules using biological examples, and the three-dimensional structures of the molecules. Three hours of lecture and one two-hour laboratory per week. (Credit cannot be earned for any combination of CHEM 200, 250 and 305.)

Prerequisite: CHEM 125 or 162

CHEM 305, 306 Organic Chemistry I, II

4 Credits each F, S

Structure, nomenclature, reaction mechanisms, synthesis, and identification of organic molecules. (Credit cannot be earned for any combination of CHEM 200, 250 and 305.)

Prerequisite: CHEM 162 or permission of the instructor is required for CHEM 305 (CHEM 305 is required for CHEM 306).

CHEM 308 Organic Spectroscopy

1 Credit F

The study of and interpretation of spectra as applied to organic chemistry. Infrared spectroscopy, proton and carbon nuclear magnetic resonance, ultraviolet spectroscopy, and mass spectrometry. One hour of lecture and laboratory per week

Co-requisite: CHEM 306.

CHEM 310 Organic Chemistry and Spectroscopy

5 Credits S

A continuation of organic chemistry started in CHEM 305, including a study of the interpretation of infrared spectroscopy, proton and carbon NMR, UV-visible spectroscopy, and mass spectrometry. The lab will be an introduction to chemical research that includes research methods and an open ended project dealing with organic chemistry. (Credit may not be received for both 306 and 310, nor for 308 and 310.)

Prerequisite: CHEM 305

CHEM 315 **Fundamentals of Biochemistry**
3 Credits I

A brief survey of the fundamental principles of Biochemistry, including the chemistry of aqueous solutions, proteins, carbohydrates, lipids, and nucleic acids. The course will also examine the chemical reactions and the regulation of major metabolic pathways.

Prerequisites: CHEM 250 or 306

Alternate years

CHEM 320 **Environmental Chemistry**
(Cross-listed as ENVR 320)
4 Credits S

The chemistry and quantitative aspects of environmentally important measurements such as spectrophotometric methods for studying the nitrogen cycle, water quality (pollution, complex aqueous chemistry, salt-affected soils and brackish waters) and methods of analysis, the chemistry and chromatographic analysis of persistent organic pollutants (POP's), the carbon cycle (sources, sinks, fossil fuel consumption and global warming) and gas phase spectrophotometric analysis, methods of analysis for nitrogen oxides and ozone kinetics, thermal pollution and the electrochemical detection of dissolved oxygen, and immunoassays of pesticides and petroleum derivatives. Three lectures and one lab per week.

Prerequisites: MATH 130 or 131, CHEM 250, 306 or 310. (Credit may not be received for both CHEM 120 and 320)

CHEM 341, 342 **Physical Chemistry I, II**
3 Credits each F, S

Physical states of chemical systems and transitions between those states: their thermodynamics (including equilibria), reaction rates, electro- and photochemistry, and solution phenomena. Three hours of lecture per week.

Prerequisites for CHEM 341: CHEM 306 or 310, or permission of the instructor, and PHYS 222

Prerequisite for CHEM 342: CHEM 341

CHEM 351, 352 **Chemical Techniques I, II**
2 Credits each F, S

Chemical literature and basic methods used in compound identification and purification. Each student will complete at least one multi-week project with each faculty member of the department. One hour of lecture and a minimum of seven hours of laboratory per week.

Prerequisite: CHEM 310 or permission of the instructor with CHEM 308 co-requisite. (CHEM 351 is required for CHEM 352)

CHEM 405 **Biochemistry**
(Cross-listed as BIOL 405)
4 Credits F

An introduction to protein structure, enzymes, and kinetics, along with a survey of the metabolism of carbohydrates, proteins, lipids, and nucleic acids. Three lectures and one lab per week.

Prerequisites: CHEM 306 or 310 and BIOL 325

CHEM 430 **Physical Organic Chemistry**
3 Credits For S

Molecular orbital theory, reaction kinetics, and organic name reactions. Three hours of lecture per week.

Prerequisite: CHEM 306 or 310

Alternate years—offered 2007-2008

CHEM 440 **Advanced Inorganic Chemistry**
3 Credits S

Physical properties, electronic structure, and reactivity of transition metal compounds. Three hours of lecture per week.

Prerequisite: CHEM 306 or 310

CHEM 441 **Quantitative Analysis**
4 Credits F, S

Theories and practice of analytical separations and determinations. The laboratory work involves gravimetric, volumetric, and elementary instrumental analyses. Two hours of lecture and six hours of laboratory per week.

Prerequisite: CHEM 308 or 310

Offered on demand

