

## Navigating the Chemistry Major

Core Curriculum: Common to all Concentrations		Requirement completed (record course and semester)
Introductory <i>or</i> General Chemistry	Chem 1091 (F) and Chem 1092 (S) <i>or</i> Chem 1101 (F) <i>and</i> Chem 1102(S) <i>or</i> Chem. 1109 AP/IB Credit <i>or</i> placement	<input type="checkbox"/>
Chemical Analysis	Chem 2100 (F)	<input type="checkbox"/>
Organic Chemistry	Chem 2250 (F)	<input type="checkbox"/>
Inorganic Chemistry	Chem 2400 (S)	<input type="checkbox"/>
Integral Calculus	Math 1700 or 1750 or placement higher than 1750*	<input type="checkbox"/>
Introductory Physics I	Physics 1130	<input type="checkbox"/>
Introductory Physics II	Physics 1140	<input type="checkbox"/>

\* Students placed above Math 1700/1750 intending to pursue graduate studies are encouraged (not required) to take a Math course

\*\* Only one physics course is required for students placed into PHYS 1140; students placed above PHYS 1140 are not required to take a physics course to complete the major.

In addition to the core curriculum (above), majors must complete the required courses for one of the five concentrations below: Chemical, Educational, Environmental, Geochemical, and Neurochemical

1. Chemical Concentration		Requirement completed (record course and semester)
Organic Chemistry II	Chem 2260 (S)	<input type="checkbox"/>
Chemical Thermodynamics and Kinetics	Chem 2510 (F)*	<input type="checkbox"/>
Quantum Chemistry and Spectroscopy	Chem 2520 (S)**	<input type="checkbox"/>
Chem. Elective #1***	Chem 2320 (S) (Biochemistry), Chem 2550, <i>or</i> any course at the Chem 3000 or above	<input type="checkbox"/>
Chem. Elective #2***	Chem 2320 (S) (Biochemistry), Chem 2550, <i>or</i> any course at the Chem 3000 or above	<input type="checkbox"/>

\*Pre-req: Physics 1130 or Physics 1140, Math 1700 or higher; \*\* Pre-req: Physics 1140, Math 1700 or higher;

\*\*\*Only one elective of the two electives can be a Chem40XX course (Advanced Independent Study or Honors);

**ACS certified major requirements:** The department also offers an ACS certified major in chemistry. The requirements for certification are met by taking the Chemical Concentration and additional courses in chemistry and other disciplines. Students interested in this certification program should consult their advisor and refer to guidelines found in at [acs.org/cpt](http://acs.org/cpt).

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2. Educational Concentration*		Requirement completed (record course and semester)
Chemical Thermodynamics and Kinetics OR Quantum Chemistry and Spectroscopy	Chem 2510 (F) ** OR Chem 2520 (S)***	<input type="checkbox"/>
Contemporary American Education	Edu 1101(S/F)†	<input type="checkbox"/>
Educating all Students	EDU 2203 (S/F)†	<input type="checkbox"/>
Teaching and Learning	EDU 3301 (F)†	<input type="checkbox"/>
Curriculum Development	EDU 3302 (F)†	<input type="checkbox"/>
Chem. Elective #1	Select in consultation with advisor	<input type="checkbox"/>
Chem. Elective #2	Select in consultation with advisor	<input type="checkbox"/>

\* Students interested in pursuing a minor or coordinate major in education or the Bowdoin Teacher Scholars certification program should consult with their major advisor as well as with a faculty member in the Education Department to discuss course selection and content area pre-requisites; \*\*Pre-req: Physics 1130 or Physics 1140, Math 1700 or higher; \*\*\* Pre-req: Physics 1140, Math 1700 or higher; †These courses also count towards an Education minor or Education coordinate major; This is the only exception to chemistry's double-counting rule for majors that allows only two courses to count double between two majors or a major and a minor.

3. Environmental Concentration*		Requirement completed (record course and semester)
Chemical Thermodynamics and Kinetics	Chem 2510 (F)**	<input type="checkbox"/>
<b>FOUR Electives in total: At least TWO molecular, ONE Environmental perspective courses and ONE at the 3000 level.</b>		
<b>At least TWO</b> of the following Molecular Perspective Electives.	Chem 2050 Environmental Chemistry (S***) Chem 3050 Environmental Fate of Organic Chemicals (NS****) Chem 3055 Catalysis in Sustainable Chemical Processes (NS****) Chem 3060 Transformation of Organic Chemicals in the Environment (NS****) Chem 3100 Instrumental Analysis (S***)	<input type="checkbox"/> <input type="checkbox"/>
<b>At least ONE</b> of the following Environmental Perspective Electives*	Chem 1105 Perspectives in Environmental Science (S) EOS 2005, Biogeochemistry: An Analysis of Global Change (F) EOS 2525, Marine Biogeochemistry (S) EOS 2585 Oceans and Climate (Every other Fall) EOS 3020 Earth Climate History (S) Physics 2810 Atmosphere and Ocean Dynamics (Every other Fall) Physics 3810 The Physics of Climate (NS****) Biology 2319 Biology of Marine Organisms (F) Biology 2327 Ecology (F) Biology 2232 Benthic Ecology (F) Biology 2581 Forest Ecology and Conservation (Every other Fall)	<input type="checkbox"/>
<b>At least ONE</b> at the 3000 level*	Course drawn from either molecular <u>or</u> environmental perspectives courses	<input type="checkbox"/>

\* Check with Dharni Vasudevan or the Chemistry Department Chair to see if other courses might qualify; select courses can be taken without prerequisites with permission of the instructor; \*\*Pre-req: Physics 1130 or Physics 1140, Math 1700 or higher; \*\*\* every other Spring (even years, i.e., 2020, 2022); \*\*\*\*nonstandard rotation.

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<b>4. Geochemical Concentration</b>		<b>Requirement completed (record course and semester)</b>
Environmental Chemistry	Chem 2050 (S*)	<input type="checkbox"/>
Chemical Thermodynamics and Kinetics	Chem 2510 (F) **	<input type="checkbox"/>
Instrumental Analysis	Chem 3100 (S*)	<input type="checkbox"/>
<b>TWO</b> Geochemical Electives*** (One of the two must be at the 3000 Level)	EOS 2005 Biogeochemistry: An Analysis of Global Change (F) EOS 2165 Petrotectonics (Nonstandard rotation) EOS 2585 Oceans and Climate (Every other Year) EOS 3020 Earth Climate History (S) EOS 3115 Research in Mineral Science (Nonstandard rotation)	<input type="checkbox"/> <input type="checkbox"/>

\*Every other Spring (even years, i.e., 2022); \*\* Pre-req: Physics 1130 or Physics 1140, Math 1700 or higher; \*\*\*Please consult the Chemistry Department Chair to see if other courses might qualify; at least one elective must be at the advanced level.

<b>5. Neurochemical Concentration</b>		<b>Requirement completed (record course and semester)</b>
Biological Principles II <i>or</i> Scientific Reasoning in Biology	Biology 1102 (S) <i>or</i> Biology 1109 (S/F)	<input type="checkbox"/>
Organic Chemistry II	Chem 2260 (S)	<input type="checkbox"/>
Biochemistry	Chem 2320 (S)	<input type="checkbox"/>
Chemical Thermodynamics and Kinetics <i>or</i> Quantum Chemistry and Spectroscopy	Chem 2510* <i>or</i> Chem 2520**	<input type="checkbox"/>
<b>TWO</b> Neurochemical Electives	Biology 2135 Neurobiology (F) Biology 2553 Neurophysiology (F) Biology 2566 Molecular Neurobiology (S) Biology 2510 Neuropharmacology (S)	<input type="checkbox"/> <input type="checkbox"/>
<b>ONE</b> 3000-level neuroscience course	Select in consultation with your advisor***	<input type="checkbox"/>

\*Pre-req: Physics 1130 or Physics 1140, Math 1700 or higher; \*\*Pre-req: Physics 1140, Math 1700 or higher; \*\*\*Please consult with Neuroscience Chair for current list of courses.

## Navigating the Chemistry Major

### Grade Requirements for courses counting toward the major:

- Only one grade of D may be counted for the major. This D must be offset by a grade of B or higher in another chemistry course also required for the major.
- Courses must be taken on a graded basis. Students can petition for one course to count credit/D/Fail under special circumstances; For the 2020-2021 academic year, Chemistry will accept one course taken CR/D/F to be counted towards the major. This includes requirements for courses in Physics and Math.
- Chemistry does not accept CR/D/F for any courses counted towards the minor.
- With prior approval from the department chair, up to two transfer credits can count toward the major or minor

### Additional information:

- Majors may double-count two courses with another department or program with one exception: majors pursuing the educational concentration may double-count the four required education courses. Minors may double-count an unlimited number of courses with another department or program.
- Biochemistry majors may not declare a major or minor in chemistry.

### Advance Independent Study towards Honors in Chemistry.

- Requires students to participate in two semesters of independent study during their senior year.
- Attend weekly workshops and seminars on Fridays from 3:30-5 pm in the Fall and Spring semesters designed for students pursuing advanced independent studies.

### Other Options for students interested in Chemistry

1. Biochemistry major administered by the Biochemistry Program
2. Coordinate major with Environmental Studies (ES) administered by the ES Program
3. Coordinate major with Education, administered by the Education Department.
4. Chemical Physics major, jointly administered by Chemistry and Physics (requirements are outlined below)

Interdisciplinary Major: Chemical Physics		Course Selection/Semester the course was completed
Introductory <i>or</i> General Chemistry	Chem 1091 (F) and Chem 1092 (S) or Chem. 1101 (F) <i>and</i> Chem 1102(S) or Chem 1109 (F/S)	<input type="checkbox"/>
Chemical Thermodynamics and Kinetics	Chem 2510*	<input type="checkbox"/>
Differential Calculus	Math 1600	<input type="checkbox"/>
Integral Calculus	Math 1700	<input type="checkbox"/>
Multivariate Calculus	Math 1800	<input type="checkbox"/>
Introductory Physics I	Physics 1130	<input type="checkbox"/>
Introductory Physics II	Physics 1140	<input type="checkbox"/>
Electric Fields and Circuits	Physics 2130	<input type="checkbox"/>
Statistical Physics	Physics 2150	<input type="checkbox"/>
Quantum Chemistry and Spectroscopy OR Quantum Mechanics	Chem. 2520**  OR Phys. 3140	<input type="checkbox"/>

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<b>TWO</b> Electives, with at least one at the 3000 level***	Chem 3100 Instrumental Analysis Chem 3400 Advanced Inorganic Chemistry CHEM 3510 Reactivity and Kinetics CHEM 2550 Introduction to Computational Chemistry Physics 2250 Physics of Solids Physics 3000 Methods of Theoretical Physics Physics 3130 Electromagnetic Theory Physics 3810 The Physics of Climate Or approved topics at the 4000 level	<input type="checkbox"/>  <input type="checkbox"/>
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\*Pre-req: Physics 1130 or Physics 1140, Math 1700 or higher; \*\*Pre-req: Physics 1140, Math 1700 or higher; \*\*\*Other possible electives may be feasible; interested students should check with the department; only one approved course 4000 or higher may count towards the major.