

Requirements for the Chemistry Major (with or without a Biochemistry Concentration) March 2009

Thank you for your interest in the chemistry major! The department offers an exciting and stimulating curriculum that will prepare you well for a number of career options after Haverford College. Our alumni Chemistry Majors have been successful in medical school, graduate school, law school and business school. Also some of our graduates have pursued careers in teaching, art preservation and research both in industrial and university laboratories (see <http://www.haverford.edu/chem/alumni/>).

The detailed outline below will explain the requirements for the major or for a major with a biochemistry concentration, or for a minor. If we do not cover your particular situation below, please see any member of the Chemistry Department for assistance. We're happy to answer any questions you have.

The Chemistry Major

There are four options for the chemistry major. Most of you have taken or are taking Chemistry 221 (Organic Chemistry II), so *each of the following options assumes a common background of two semesters of organic chemistry.*

1) Standard (Non-ACS) Chemistry Major

In order to graduate with a Chemistry major, you must take the following courses:

- At least one semester of Mathematics (after enrollment at Haverford College) at the level of Math 114/115(or 116) or higher. An additional semester of math (e.g. Math 121) is strongly recommended.
- Two semesters of physics at the level of Physics (101/102 or 105/106) **or** two semesters of molecular-based Biology (200a/200b).

Two semesters of Chemistry Superlab (Chem 301 and Chem 302; please note that Chem 301 is a pre-requisite for Chem 302)

Instructors (tentative)

Chem 301 Fall 2009: Fran Blase and Josh Schrier

Chem 302 Spring 2010: Terry Newirth and Helen White

- One semester of Physical Chemistry (Chem 304).

Instructor

Chem 304 Fall 2009: Josh Schrier

- One semester of Inorganic Chemistry (Chem 320 (0.5 credit) followed by Chem 351 or Chem 353 (each 0.5 credit).

Instructors (tentative)

Chem 354 Fall 2009: Alex Norquist

Chem 320g Spring 2010: Alex Norquist

Chem 351h Spring 2010: Rob Scarrow

- One semester of advanced course electives in chemistry at the 300-level. (The Department can also approve selected 300-level and 400-level Biology and Physics courses (including research tutorials) as electives for the chemistry major.)

Instructors (tentative)

Chem 354, Solid State Chemistry Fall 2009: Alex Norquist

Chem 355, Advanced Organic Chemistry Fall 2009: Fran Blase

Chem 357, Bioorganic Chemistry Spring 2010: Terry Newirth

Chem 357, Bioorganic Chemistry Spring 2010: Terry Newirth

Chem 358, Environmental Chemistry Spring 2010: Helen White

Chem 305, Quantum Chemistry Spring 2010: Josh Schrier

- One Semester of Research (Chemistry 36x or Chem 380)

All faculty in the Chemistry Department mentor research students

- Departmental Seminar (Chem 391) 0.5 credit course, senior year

The following might be a typical schedule for a chemistry major who chooses to do a full year of research in his/her senior year (see also colored flow chart).

	Junior Year	Senior Year
Fall	Chem 301 (Superlab) Chem 304 (PChem I) (Physics or Biology)	(Chem 3xx (adv. course)) Chem 36x (Research) Chem 391 (Seminar)
Spring	Chem 311/312 (Superlab) Chem 320/35x* (Inorg) Chemistry 305* (PChem II for ACS certification) (Physics or Biology)	Chem 391 (Seminar) Chem 36x (Research) (Chem 3xx (adv. course))

*One of these courses may be deferred to the senior year.

If you choose not to pursue laboratory research (Chem 36x course(s)), then you are required to take Chemistry 380 "Independent Research in Chemistry", which involves a library research project and proposal.

2) American Chemical Society (ACS) Accredited Chemistry Major

We are the only department in the College that is certified by a professional organization, The American Chemical Society (ACS), which is a large national organization whose members include chemists in industry and academics. The ACS has specific curriculum guidelines for an undergraduate degree, and these include two semesters of physical chemistry, a year of introductory physics, and at least one semester of biochemistry. Consequently, the Chemistry Major becomes an ACS accredited Chemistry major by the addition of **Chemistry 305** (P Chem II), **Physics 101/102 or 105/106**, and either **Biol 200b** or **two of the advanced 35x senior seminars selected from 351, 352 or 357 or Chemistry B242 or Chemistry B345 at Bryn Mawr College**.

3) Standard (Non-ACS) Chemistry Major with a Biochemistry Concentration

The requirements for the Chemistry major with a Concentration in Biochemistry are the same for the standard Chemistry major with the following exceptions:

- Chemistry 311/312 is replaced by Biol 300a or 300b. (Chemistry 301 (Superlab I) is required of all chemistry majors and cannot be replaced.)
- One semester of an advanced biology course for the concentration requirement. See catalog for a list of advanced Biology courses that satisfy the concentration.
- Two half semester advanced chemistry courses with a biological emphasis are required. These include **Chem 351** (0.5 semester, bioinorganic), **Chem 352** (0.5 semester, biophysical) or **Chem 357** (0.5 semester, multiple offerings, bioorganic). Note that Chem 351 satisfies both the concentration and half of the inorganic requirement, thus it is often taken by biochemistry concentrators.
- **Both** Biol 200a/200b **and** Physics 101/102 or 105/106 are required.

	Junior Year	Senior Year
Fall	Chem 301a (Superlab) Chem 304 (PChem I) (Physics)	Chem 357 (Bioorganic.) Chem 36x (Research) Chem 391 (Seminar)
Spring	Bio 300b (Superlab) Chem 320/351* (Inorg) Chem 305* (PChem II for ACS Certification) (Physics)	Chem 36x (Research) Chem 391 (Seminar) Biol 303, 304

*One of these courses may be deferred to the senior year.

4) ACS Accredited Chemistry Major with a Biochemistry Concentration

The Chemistry major with a Biochemistry Concentration becomes ACS accredited by the addition of **Chem 305** (PChem II)

Study Abroad Programs and The Chemistry Major

A number of our majors opt to go abroad, typically for one semester, in their junior year. Either the fall or spring semester is possible, but typically the spring semester abroad is the least problematic because majors have completed the fall Superlab (Chemistry 301) requirement. There are a number of approved international programs, but the most popular ones have been in England, Scotland, and Australia.

The Chemistry Minor

A student majoring in any other discipline can declare a Chemistry minor after successfully completing the courses below.

Course Requirements for the Chemistry Minor:

General Chemistry: Chemistry 100a, 101b or 105b,

Organic Chemistry: Chemistry 220a, 221b

Physical Chemistry: Chemistry 304a

Chemistry 3xx: One additional semester of advanced chemistry chosen from courses numbers between 301 and 369.

Students who begin by placement in Chemistry 220a must take, in addition to the requirements above, the equivalent of a fifth course having an analytical or physical chemistry laboratory component (such as Chem 301 or 311/312 or BMC Chem 251 or 252 Research Methodology Courses, which are half courses plus an additional chemistry half course.). At least three of the courses taken for the chemistry minor must be taken at Haverford College.

N.B. Students who major in biology or physics and complete the Biochemistry and Biophysics Concentration may not also declare a chemistry minor.

Declaring a Major or a Minor

One of the Chemistry Faculty listed below will serve as your major or minor advisor. All new majors (or minors), please submit your paperwork to Karin Åkerfeldt, Chair (in this way, the documents are lost on only one desk) by **Friday, April 16th**. At that time, you also will be asked to list your 1st and 2nd choices for faculty major advisors. We will do our best to honor your first choice, and we will assign your advisor in the summer of 2009. Please note, your academic advisor is not necessarily the same as your senior research advisor.

The Chemistry Department (alphabetically)

Karin Åkerfeldt* (kakerfel@haverford.edu phone: x1213) Bioorganic Chemistry: protein design; protein structure-function relationship studies

Fran Blase (fblase@haverford.edu phone x1216) Synthetic Organic Chemistry: synthesis of biologically active natural products

Casey Londergan* (clonderg@haverford.edu phone x1217) Physical and Biophysical Chemistry: probing conformational flexibility and structural switching in proteins at the atomic level using vibrational spectroscopy

Terry Newirth (tnewirth@haverford.edu phone x1214) Organic Chemistry: synthesis and mechanistic investigations of natural food dyes

Alex Norquist (anorquis@haverford.edu x2949) Materials Science: crystal growth of new functional materials

Rob Scarrow* (rscarrow@haverford.edu phone x1218) Inorganic Chemistry: synthesis of new ligands and their coordination to metals

Josh Schrier (jschrier@haverford.edu phone x1388) Theoretical and Computational Chemistry: studies of nanometer-scale composite materials with potential applications in photovoltaic devices

Helen White (hwhite@oeb.harvard.edu new hire, to arrive Fall 2009) Environmental Chemistry (Biogeochemistry): understanding the sources, sinks and cycling of organic matter in marine sediments; development of microbial fuel cells

**Rob will serve as advisor for concentrators (Casey and Karin will both be on leave 2009-2010)*

Support Staff

Carl Aronson (instrument specialist)

Joanne Brown (Purchasing and Budget coordinator)

Dennis Collin (Instructor for General Chemistry Labs)

Kathy Dostal (Lab Supervisor for General and Organic Laboratories)

Mike Kukla (Instructor for Organic Chemistry Laboratories)