

Department of Biology
College of Science

Published March 2008

Effective for students beginning degree Summer Sem. 2008 thru Spring Sem. 2009

Admission to These Programs

Premedical, Predental, and other Prehealth Professions students may select any major and will need to meet the admission requirements for the major they select. However, premedical and predental students should be aware that they will need an undergraduate GPA near or above 3.5 to be competitive for acceptance into most medical or dental schools. The higher the student's GPA, the better the chances are of being accepted into these schools. It is advantageous for prehealth students to meet with an advisor before registering for their first semester of classes and to meet with the Prehealth Professions advisor, Dr. Andy Anderson, as early as possible during their first semester at USU. All Prehealth professions students should subscribe to the Prehealth E-mail List. The purpose of this list is to keep students informed about the multitude of opportunities, meetings, activities, and processes involved in gaining admission to a health professions school. To subscribe, visit: http://lists.usu.edu/mailman/listinfo/prehealth_list

The Program

The Premedical, Predental, and other Prehealth Professions Program at Utah State University is designed to fulfill the academic course requirements for entrance to most medical or dental schools in the United States and Canada. Students should become familiar with the specific requirements for each of the medical, dental, or other health professional schools to which they intend to apply.

The minimum requirements in the sciences are: BIOL 1610, 1620; CHEM 1210, 1215, 1220, 1225, 2310, 2315, 2320, 2325; PHYS 2110, 2120; and MATH 1210. BIOL 2320, 2420, 3060, 3300, 5210; and CHEM 3700, 3710 are highly recommended. In addition, many schools require a full year (two semesters) of English Composition (AP English does *not* count toward this requirement). Consult with the Prehealth Professions advisor for details.

Experience has shown that one's chances of being admitted to professional school are notably enhanced by additional upper-division biology, mathematics, and advanced written communication courses. A variety and number of carefully selected courses in the humanities and social sciences should be elected beyond those required for the University Studies requirements. These should include courses in art, music, literature, and theatre arts. Courses in deductive logic, bioethics, medical sociology, and diversity focusing on culture, history, and/or current circumstances of nondominant population groups in the United States are also useful for a well-rounded background. This provides an eclectic background that is generally favored by medical and dental school admission boards.

Choosing a major is a particularly important decision, since not all who aspire to a professional school are accepted. The chosen major should be in an area which best suits the personal needs, interests, and alternative career plans of the student, while still meeting the basic course requirements for professional school.

Most students considering medical or dental school major in Biology or in other scientific disciplines such as Chemistry, Mathematics, Nutrition, or Physics. It should be emphasized, however, that a science major is not a prerequisite for medical or dental school. Many students who have been admitted to professional schools have majored in Psychology, History, Business, Music, etc. Premedical and predental students, regardless of their major, must be competent in the science and mathematics courses listed above, as well as maintain an acceptable overall grade point average. Students who choose not to major in Biology should consult regularly with the Prehealth Professions advisor in order to select appropriate courses and be informed of the various procedural matters for professional school preparation and application. Students must also consult with their major advisor.

Premedical or predental students with a biological science interest might consider the Industrial Hygiene option of the Public Health major. The lower-division requirement for this and the major in Biology are almost identical; therefore, a student may delay the final decision until the junior year. Industrial hygienists command good salaries and are in demand.

Students who are applying to medical or dental school must take the Medical College Admissions Test (MCAT) or Dental Aptitude Test (DAT) approximately **one year** prior to admission. These tests, which survey the student's knowledge of a variety of academic areas, are very important admission criteria. The best preparation for these tests is to establish and maintain consistently good performance in undergraduate courses. It is recommended that students **thoroughly prepare** themselves to take the spring MCAT and DAT examinations. For more information concerning these tests, students should contact the Prehealth Professions advisor or the Biology Advising Center, BNR 101. USU offers an MCAT preparation course (BIOL 1030) and a DAT preparation course (BIOL 1040) during spring semester.

Most medical or dental schools require the use of a specific application service: **AMCAS** (medical) and **AADSAS** (dental). The forms for these application services should be completed and submitted during the **summer** preceding the calendar year in which one expects to enter medical or dental school.

An essential part of every application to professional schools is the letter of recommendation. At USU, letters of recommendation may be requested from the Prehealth Professions Evaluation Committee. The request for a letter of recommendation and the supporting information must be provided to the evaluation committee at the end of the **fall semester two years** before one expects to enter medical or dental school. Contact the Biology Advising Center in BNR 101 for further details. Another function of the evaluation committee is to help students who are applying to professional schools learn to present themselves well in interviews, thereby increasing the probability that they will succeed.

Students should consider getting involved in the following pre-professional clubs at USU: Alpha Epsilon Delta (AED), Women in Medicine (WIM), Dental Club, HOSA, Pharmacy Club, and/or Medical Unity. These clubs provide students with opportunities for discussions with professionals and peers, practical experience, and an opportunity to learn through volunteer service. For more information, contact the Biology Advising Center, BNR 101.

Career Opportunities

Competition for admission to medical school and dental school is keen. A number of factors are involved in the final admission decision, such as MCAT or DAT scores, grade point average, and letters of recommendation, as well as extracurricular activities and interests, undergraduate research, shadowing health care professionals, personal experiences, leadership, and service to others.

If a biology major does not go to medical or dental school, the electives chosen as part of the undergraduate program can prepare the student for post-graduate training in such health-care related specialties as hospital administration, biomedical engineering, and health service management. The more traditional biological disciplines, including botany, cell biology, ecology, genetics, microbiology, molecular biology, plant pathology, physiology, and zoology, are also options for graduate-level study.

Graduates with a bachelor's degree in Biology may start their careers as laboratory technicians, teachers (with a teaching license), technical representatives, or in quality control. Opportunities may be found in research laboratories at universities or in industry, genetic engineering companies, hospitals, and in food processing and drug manufacturing enterprises. Some graduates may find employment in governmental regulatory agencies or with environmental consulting firms.

Biology Advising Center

The Department of Biology department head, the director of undergraduate studies, and advisors are available to provide all undergraduate majors with additional information regarding specific programs and career opportunities. The Biology Advising Center and the director of undergraduate studies are located in BNR 101. Additional information and an "Ask an Advisor" e-mail service are on the web at <http://www.biology.usu.edu/>

Undergraduate Degrees Offered Through This Department

Biology: Bachelor of Science (BS), Bachelor of Arts (BA)

Emphases: Biology

Cellular/Molecular

Ecology/Biodiversity

Environmental

Composite Teaching—Biological Science: BS, BA

Public Health: BS

Emphases: Industrial Hygiene

Environmental Health

Public Health Education

Graduate Degrees Offered Through This Department

Biology: MS and PhD

Ecology: MS and PhD

Toxicology: MS and PhD

Academic Advisement

All students should contact their academic advisor for assistance with course selection, program planning, and meeting graduation requirements. If students do not know who their advisor is, they should contact their department, college, or the Office of University Advising.

Graduation Requirements: BS and BA Degrees in Biology

Candidates for the **Bachelor of Science Degree** in the Department of Biology must meet all of the minimum requirements for the University, College of Science, and Department.

Candidates for the **Bachelor of Arts Degree** in the Department of Biology must meet all of the minimum requirements for the University, College of Science, and Department. In addition to the requirements listed on this sheet, a **BA Degree** candidate must receive foreign language training. For further information about the foreign language requirement for a BA degree, see the Utah State University *General Catalog*.

All candidates for BS and BA degrees should refer to the *General Catalog* for more detailed information and review this requirement sheet.

Minimum University Requirements*

Total credits	120
Grade point average (most majors require higher GPA)	2.00 GPA
Credits of C- or better	100
Credits of upper-division courses (#3000 or above)**	40
USU credits	30
(20 of which must be upper division, including 10 required by major)	
Completion of approved major program of study	See department
Credits in minor (if required by department)	12
Credits in American Institutions (ECON 1500; HIST 1700, 2700, or 2710; POLS 1100; or USU 1300)	3
University Studies requirements	See next column

*Colleges and departments may require more credits or a higher GPA. See requirements on this sheet.

**Students must accumulate a minimum of 40 upper-division credits by careful selection of courses. The minimum requirements for the major may not automatically meet this requirement.

Minimum College of Science Requirements

All College requirements are met by completing the Departmental degree requirements; no additional coursework is required.

Changes in Graduation/Catalog Requirements

Students who can complete a baccalaureate degree within seven years of enrollment at USU can qualify for graduation by meeting (1) the General Education/University Studies requirements in effect when they initially enrolled and (2) the major requirements in effect when they officially declared their major, even though there may have been changes in General Education/University Studies and major requirements since that time.

Students who have not completed the baccalaureate requirements within seven years of their initial enrollment at USU must have their General Education/University Studies and major requirements evaluated and approved by their department head and dean.

Undergraduate Course Expiration Policy

Coursework (including transfer credit) that is more than 10 years old and is required by the major may be disallowed by the student's department. Students will have an opportunity to revalidate coursework that is disallowed.

University Studies Requirements for Biology Major

Note: Approved University Studies courses and requirements are listed in the back section of each semester's *Schedule of Classes*.

General Education Requirements (30-34 credits)

Competency Requirements (9-10 credits)

Communications Literacy (CL1 and CL2) (6 credits)

ENGL 1010 (CL1) (3 credits) or satisfactory AP, CLEP, IBO, ACT, or SAT score

AND

ENGL 2010 (CL2) (3 credits) or satisfactory IBO score

Quantitative Literacy (QL) (3-4 credits)¹

MATH 1030 or 1050 or STAT 1040 (3-4 credits)

OR

One MATH or STAT course requiring MATH 1050 as a prerequisite

OR

Satisfactory AP, CLEP, IBO, ACT, or SAT score

Computer and Information Literacy (0 credits)

Passing grade on six computer and information literacy related examinations.

Breadth Requirements (18-20 credits)¹

Select at least one approved course from each of the following six categories: **American Institutions (BAI)**, **Creative Arts (BCA)**, **Humanities (BHU)**, **Life Sciences (BLS)**¹, **Physical Sciences (BPS)**¹, and **Social Sciences (BSS)**. At least two of the six breadth courses must be University Studies courses with a **USU prefix** (excluding USU 1000, 1010, 1100, 3330, 4900, and 6900). (CLEP or AP credit may be used.)

Exploration Requirement (3-4 credits)

Choose an additional class from one of the following General Education categories: QL, BAI, BCA, BHU, BLS, BPS, or BSS. CHEM 1220 (BPS), in conjunction with *either* PHYS 2120 (BPS) *or* PHYS 2220 (BPS/QI), will fulfill the Exploration Requirement for students in the Biology major.

Depth Education Requirements

Communications Intensive (CI) (2 courses)

BIOL 5250, along with another course having CI designation, will meet this requirement.

Quantitative Intensive (QI) (1 course)

STAT 3000 will meet this requirement.

Depth Course Requirements (4 credits minimum, including 2 credits minimum completed in each of two courses)

Complete at least 2 credits in approved 3000-level or above courses from each of the following two categories: **Humanities and Creative Arts (DHA)** and **Social Sciences (DSS)**.

¹Biology majors complete the Quantitative Literacy Competency with MATH 1210, complete the Physical Sciences Breadth Requirement with CHEM 1220, and complete the Life Sciences Breadth Requirement with BIOL 1620.

Required Coursework for Biology Major

(For Premedical, Predental, and other Prehealth Professions students who major in Biology with either a Biology or Cellular/Molecular Emphasis)

To graduate, a candidate for any bachelor's degree offered by the Department of Biology must maintain a grade point average of 2.25 in all Department of Biology (BIOL or PUBH prefix) courses required for the major and a grade of C- or better in BIOL 1610 and 1620. The *Pass-Fail* option is not acceptable for any course required for the degree, but D grades are permitted within the restrictions of the 2.25 GPA.

Students may be asked to participate in an overall assessment exam covering important concepts in their major field of study.

Laboratory fees required for some Biology Department courses are used to purchase expendable laboratory items and other materials required for successful completion of laboratory assignments.

Note: Effective Summer Semester 2006, some course numbers changed, due to House Bill 320 (Common Course Numbering). Course numbers used *prior* to Summer Semester 2006 are shown in parentheses, following *formerly*.

Biology Emphasis

Required Biology Courses (21-22 credits)	Credits
<input type="checkbox"/> BIOL 1610 Biology I (F).	4
(formerly BIOL 1210)	
<input type="checkbox"/> BIOL 1620 (BLS) Biology II (Sp).	4
(formerly BIOL 1220)	
<input type="checkbox"/> BIOL 2220 General Ecology (F,Sp).	3
<input type="checkbox"/> BIOL 3060 (QI) Principles of Genetics (F,Sp,Su).	4
(formerly BIOL 3200)	
<input type="checkbox"/> BIOL 3300 ² General Microbiology (F,Sp) (4 cr)	
Or	
<input type="checkbox"/> BIOL 5210 Cell Biology (F) (3 cr)	3 or 4
<input type="checkbox"/> BIOL 5250 (CI) Evolutionary Biology (F,Sp).	3

²A student choosing BIOL 3300 in this section may need to take BIOL 5210 as an elective (see *Biology Electives* section below), since BIOL 5210 is required in some prehealth programs. For more information, students should consult their advisor.

Field Course Requirement (2-3 credits)

Students must take one course from the following list:

<input type="checkbox"/> BIOL 2410 Plants and Fungi in the Field (Su).	2
<input type="checkbox"/> BIOL 3220 (QI) Field Ecology (F)	2
<input type="checkbox"/> BIOL 4500 Applied Entomology (Sp).	3
<input type="checkbox"/> BIOL 5530 Insect Systematics and Evolution (F).	3
<input type="checkbox"/> BIOL 5550 Freshwater Invertebrates (Sp).	3
<input type="checkbox"/> BIOL 5560 Ornithology (Sp)	3
<input type="checkbox"/> BIOL 5570 Herpetology (Sp)	3

Physiology Course with Lab Requirement (4-5 credits)

Students must take one upper-division physiology course with an integrated or separate laboratory from the following list:

Courses with integrated laboratories:	Credits
<input type="checkbox"/> BIOL 4400 (QI) Plant Physiology (F).	4
<input type="checkbox"/> BIOL 5300 (QI) Microbial Physiology (Sp).	4

Courses with separate lecture and lab; one of the following three lecture courses and BIOL 5610 must be taken to meet the requirement:

<input type="checkbox"/> BIOL 5100 Neurobiology (F) (3 cr) or	
<input type="checkbox"/> BIOL 5600 Comparative Animal Physiology (Sp) (3 cr) or	
<input type="checkbox"/> BIOL 5620 Medical Physiology (F) (3 cr).	3
And	
<input type="checkbox"/> BIOL 5610 (QI) Animal Physiology Laboratory (F,Sp)	2

Biology Electives (10 credits)

Students must select an additional 10 credits of 4000-level and above BIOL or PUBH prefix courses as electives. BIOL 3065 (Genetics Laboratory) may also be included toward these elective credits, even though it is a 3000-level course. A maximum of 4 credits from BIOL 4250 (1-2 credits), BIOL 4710 (1 credit), BIOL 5800 (1-3 credits), or seminar courses (1-2 credits) may be included among the 10 elective credits.

Required Physical Science Courses (32 credits)

Required Physical Science Courses (32 credits)	Credits
<input type="checkbox"/> CHEM 1210 Principles of Chemistry I (F,Sp).	4
<input type="checkbox"/> CHEM 1215 Chemical Principles Laboratory I (F,Sp)	1
(formerly CHEM 1230)	
<input type="checkbox"/> CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su).	4
<input type="checkbox"/> CHEM 1225 Chemical Principles Laboratory II (F,Sp).	1
(formerly CHEM 1240)	
<input type="checkbox"/> CHEM 2310 Organic Chemistry I (F)	4
<input type="checkbox"/> CHEM 2315 Organic Chemistry Laboratory I (F).	1
(formerly CHEM 2330)	
<input type="checkbox"/> CHEM 2320 Organic Chemistry II (Sp).	4
<input type="checkbox"/> CHEM 2325 Organic Chemistry Laboratory II (Sp)	1
(formerly CHEM 2340)	
<input type="checkbox"/> CHEM 3700 Introductory Biochemistry (Sp)	3
<input type="checkbox"/> CHEM 3710 Introductory Biochemistry Laboratory (Sp).	1
<input type="checkbox"/> PHYS 2110 The Physics of Living Systems I (4 cr) and	
<input type="checkbox"/> PHYS 2120 (BPS) The Physics of Living Systems II (4 cr).	8
Or	
<input type="checkbox"/> PHYS 2210 (QI) General Physics—	
Science and Engineering I (4 cr) and	
<input type="checkbox"/> PHYS 2220 (BPS/QI) General Physics—Science and	
Engineering II (4 cr).	8

Mathematics and Statistics Requirement (7 credits)

<input type="checkbox"/> MATH 1210 (QL) ³ Calculus I (F,Sp,Su)	4
<input type="checkbox"/> STAT 3000 (QI) Statistics for Scientists (F,Sp,Su)	3

³Students should be certain that they have the proper background to enroll in MATH 1210. See the *General Catalog* for prerequisites or contact the Department of Mathematics and Statistics.

Cellular/Molecular Emphasis

Required Biology Courses (30 credits)	Credits
<input type="checkbox"/> BIOL 1610 Biology I (F).	4
(formerly BIOL 1210)	
<input type="checkbox"/> BIOL 1620 (BLS) Biology II (Sp).	4
(formerly BIOL 1220)	
<input type="checkbox"/> BIOL 2220 General Ecology (F,Sp).	3
<input type="checkbox"/> BIOL 3060 (QI) Principles of Genetics (F,Sp,Su).	4
(formerly BIOL 3200)	
<input type="checkbox"/> BIOL 5190 Molecular Genetics (Sp)	3
<input type="checkbox"/> BIOL 5210 Cell Biology (F).	3
<input type="checkbox"/> BIOL 5230 Developmental Biology (Sp)	3
<input type="checkbox"/> BIOL 5250 (CI) Evolutionary Biology (F,Sp).	3

Choose one of the following Biotechnology courses:

<input type="checkbox"/> BIOL 5160 Methods in Biotechnology: Cell Culture (Sp)	3
<input type="checkbox"/> BIOL 5240 Methods in Biotechnology: Protein	
Purification Techniques (Sp)	3
<input type="checkbox"/> BIOL 5260 Methods in Biotechnology: Molecular	
Cloning (F).	3

Physiology Course with Lab Requirement (4-5 credits)

Students must take one upper-division physiology course with an integrated or separate laboratory from the following list:

Courses with integrated laboratories:	Credits
<input type="checkbox"/> BIOL 4400 (QI) Plant Physiology (F).	4
<input type="checkbox"/> BIOL 5300 (QI) Microbial Physiology (Sp).	4

Courses with separate lecture and lab; one of the following three lecture courses and BIOL 5610 must be taken to meet the requirement:

<input type="checkbox"/> BIOL 5100 Neurobiology (F) (3 cr) or	
<input type="checkbox"/> BIOL 5600 Comparative Animal Physiology (Sp) (3 cr) or	
<input type="checkbox"/> BIOL 5620 Medical Physiology (F) (3 cr).	3
And	
<input type="checkbox"/> BIOL 5610 (QI) Animal Physiology Laboratory (F,Sp)	2

Biology Electives (9 credits)

Students must select an additional 9 credits of 4000-level and above BIOL prefix courses as electives. BIOL 3065 (Genetics Laboratory) and BIOL 3300 (General Microbiology) may also be included toward these elective credits (even though they are 3000-level courses). A maximum of 4 credits from BIOL 4250 (1-2 credits), BIOL 4710 (1 credit), BIOL 5800 (1-3 credits), or seminar courses (1-2 credits) may be included among the 9 elective credits.

Required Physical Science Courses (36 credits)

Credits

- CHEM 1210 Principles of Chemistry I (F,Sp) 4
- CHEM 1215 Chemical Principles Laboratory I (F,Sp) 1
(formerly CHEM 1230)
- CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su) 4
- CHEM 1225 Chemical Principles Laboratory II (F,Sp) 1
(formerly CHEM 1240)
- CHEM 2310 Organic Chemistry I (F) 4
- CHEM 2315 Organic Chemistry Laboratory I (F) 1
(formerly CHEM 2330)
- CHEM 2320 Organic Chemistry II (Sp) 4
- CHEM 2325 Organic Chemistry Laboratory II (Sp) 1
(formerly CHEM 2340)
- CHEM 5700 General Biochemistry I (F) 3
- CHEM 5710 General Biochemistry II (Sp) 3
- CHEM 5720 General Biochemistry Laboratory (Sp) 2

- PHYS 2110 The Physics of Living Systems I (4 cr) **and**
- PHYS 2120 (BPS) The Physics of Living Systems II (4 cr) 8
Or
- PHYS 2210 (QI) General Physics—
Science and Engineering I (4 cr) **and**
- PHYS 2220 (BPS/QI) General Physics—Science and
Engineering II (4 cr) 8

Mathematics and Statistics Requirement (7 credits)

- MATH 1210 (QL)⁴ Calculus I (F,Sp,Su) 4
- STAT 3000 (QI) Statistics for Scientists (F,Sp,Su) 3

⁴Students should be certain that they have the proper background to enroll in MATH 1210. See the *General Catalog* for prerequisites or contact the Department of Mathematics and Statistics.

Nonscience Electives

Courses in the humanities and social sciences are not specifically required, but most medical and dental schools strongly recommend that a generous number of these courses be taken. The undergraduate years provide the only opportunity to take these courses. Some suggested areas of study include Anthropology, Art, Foreign Languages, History, Literature, Music, Philosophy, Political Science, Psychology, Sociology, Deductive Logic, Bioethics, and Medical Sociology.

Minor Requirements

Biology Minor: The biology minor requires completion of the following: BIOL 1610 and 1620 (both completed with a C- or better grade); and 12 credits chosen from any upper-division (3000-level) BIOL prefix elective credits. **Note:** Although BIOL/NR 2220 is a lower-division course, it may be counted toward the 12 elective credits. A minimum cumulative GPA of 2.25 is required for these courses.

BioMath Minor: This minor requires mathematics and quantitative biology courses beyond those required for the basic biology degrees. It is an excellent option for students considering graduate work. A minimum GPA of 2.25 is required for these courses, with a C- or better grade in both BIOL 1610 and 1620. Biology majors may take this minor through the Mathematics and Statistics Department. The requirements for this minor are described in the Utah State University *General Catalog*. For further information, contact the Biology Advising Center (BNR 101) or Dr. James Haefner (BNR 233).

Public Health Minor: The Public Health minor requires completion of the following: BIOL 1610 and 1620 (both completed with a C- or better grade); and 12 credits of upper-division (3000-level and above) Public Health elective courses. A minimum GPA of 2.25 is required for these courses.

Departmental Honors

Biology majors enrolled in the Honors Program (or those with at least a 3.5 GPA) may earn Departmental Honors by completing 9 credits of upper-division honors Biology coursework, BIOL 5800H, and a research-based Bachelor's Thesis. For further information, contact Dr. Kimberly A. Sullivan, BNR 313, (435) 797-3713, yejunco@biology.usu.edu.

Requirement Changes

Department of Biology majors will be responsible for meeting the requirements that were in effect when they entered the program. Majors should consult with their advisors on a regular basis to be aware of any changes in requirements.

Materials for Persons with Disabilities

This requirement sheet is available in digital format, recordings, or large print upon request to the USU Disability Resource Center.

For more information contact

Biology Department; Biology-Natural Resources 101; Utah State University; 5305 Old Main Hill; Logan UT 84322-5305; tel. (435) 797-3203; e-mail undergrad_info@biology.usu.edu; <http://www.biology.usu.edu/>

Prepared by Registrar's Office, Utah State University