



Anatomy  
Biology  
Biotechnology  
Microbiology  
Physiology

# Biological Science

Students expecting to transfer to an upper division institution with a major in a Life Science area must comply with the requirements as shown in the catalog under Graduation Requirements and should consult the catalog of the college or university of their choice for required and/or recommended courses. Counselors/advisors will assist the student in planning for an Associate Degree.

**BIOTECHNOLOGY**

Biotechnology uses living organism and their cellular and molecular components to provide goods, services or environmental management. Math, chemistry, biology and agriculture are integrated to produce skills in students that enable them to acquire entry and mid-level jobs in a wide variety of biotechnical corporations.

**Biotechnology Certificate of Achievement**

This program is designed for those students who prefer to learn the fundamental skills required to get a job as quickly as possible. Many of the courses are transferable and/or degree applicable if the student decides to further his/her education.

**Required Courses: 26.5 units**

Course Number	Title	Units
BIOL B3a or BIOL B10 or BIOL B11 or BIOL B20	General Biology I Plant Biology (4.0) Concepts of Biology (4.0) Human Biology (4.0)	5.0
BIOL B51 BIOL B30	Biotechnology Careers Introduction to Biotechnology and Cell Physiology	0.5 4.0
BIOL B31 BIOL B52 BIOL B16	Applied Biotechnology Advanced Biotechnology General Microbiology	5.0 4.0 5.0
Internship/Work Experience Education		3-4.0

**Biotechnology Associate in Science Degree**

Students may continue their training and education beyond the Certificate of Achievement by taking additional related and general education courses which may lead to an Associate in Science degree. Graduation requirements for an Associate in Science degree are found in the beginning of the catalog. Counselors/advisors will assist the student in planning for an Associate Degree.

**Required Courses: 44.5 units**

Course Number	Title	Units
CHEM B1a or CHEM B2a or CHEM B15	General Chemistry Introductory General Chemistry (5.0) Principles of Inorganic Chemistry (4.0)	5.0
CHEM B8 and CHEM B9	Elementary Organic Chemistry Organic Chemistry Laboratory	3.0 3.0
COMS B2 or  COMS B5	Introduction to Computer Information Systems Introduction to Microcomputer Applications	3.0 3.0
BIOL B3a or BIOL B10 or BIOL B11 or BIOL B20	General Biology I Plant Biology (4.0) Concepts of Biology (4.0) Human Biology (4.0)	5.0 5.0
BIOL B51	Biotechnology Careers	0.5

BIOL B30	Introduction to Biotechnology and Cell Physiology	4.0
BIOL B31	Applied Biotechnology	5.0
BIOL B52	Advanced Biotechnology	4.0
BIOL B16	General Microbiology	5.0
BIOL B3b or BIOL B15	General Biology II (biology majors only) Physiology (biology majors only)	5.0
Internship/Work Experience Education		2-4.0

Note: Biology majors must take either BIOL B3b or B15 in addition to all the other courses.

**ASSOCIATE IN SCIENCE DEGREE PROGRAM**

**Bacteriology (Microbiology - Letters and Science)**

A bacteriologist studies: growth, structure, development and general characteristics of bacteria and other microorganisms; isolates and makes cultures of significant bacteria; identifies microorganism by biochemical tests and microscopic examination; makes chemical analyses of substances such as enzymes, alcohols and acids produced by bacteria and other microorganisms.

**Required Courses: 34 units**

Course Number	Title	Units
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
CHEM B8	Elementary Organic Chemistry	3.0
CHEM B9	Organic Chemistry Laboratory	3.0
BIOL B3a	General Biology I	5.0
BIOL B3b	General Biology II	5.0
PHYS B2a	General Physics-Mechanics and Heat	4.0
PHYS B2b	General Physics-Sound, Light, Electricity, Magnetism, Modern Physics	4.0

**Electives**

Course Number	Title	Units
BIOL B16	General Microbiology French or German	4.0
MATH B6a	Analytic Geometry and Calculus I	4.0

**Biology**

Biology is the study of the origin, relationship, development, anatomy, physiology and other basic characteristics of animal and plant life. Graduates may specialize in research based on a particular organism, or aspect of biology. A wide variety of occupations is based on biological science. Major fields are biological oceanography, entomology, life science, teaching, botany, medicine, genetics, molecular biology, biochemistry, pharmacy, ecology, wildlife management, zoology and the related clinical fields.

**Required Courses: 30 units**

Course Number	Title	Units
BIOL B3a	General Biology I	5.0
BIOL B3b	General Biology II	5.0
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
PHYS B2a	General Physics-Mechanics and Heat	4.0

PHYS B2b or PHYS B4a or PHYS B4b or PHYS B4c or	General Physics-Sound, Light, Electricity, Magnetism, Modern Physics Mechanics and Wave Motion Heat, Electricity and Magnetism Optics and Modern Physics	4.0
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Note: Some universities may require calculus-based physics (PHYS B4a, PHYS B4b, PHYS B4c) for the biology major.

**Electives: at least 2 units**

Course Number	Title	Units
CHEM B8	Elementary Organic Chemistry	3.0
CHEM B9	Organic Chemistry Laboratory	3.0
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
MATH B22	Elementary Probability and Statistics French or German	5.0

**Note:** Students should consult with the university of their choice as to whether CHEM B8 and CHEM B9 should be taken.

**Suggested Program**

This suggested program meets all Intersegmental General Education Transfer Curriculum (IGETC) requirements. This program is a series of courses that community college students can use to satisfy lower-division general-education requirements at any California State University (CSU) or University of California (UC) campus. It will permit a student to transfer to a campus of the CSU or the UC system without the need, after transfer, to take additional lower-division general-education courses to satisfy campus general-education requirements. The program also meets or exceeds the minimum entrance requirements for most medical schools and other health professional programs. **This program assumes you are academically prepared for university-level courses. Students requiring additional preparation in mathematics, reading or English will require at least one additional semester and should consult a counselor for advice.**

**First Semester**

Course Number	Title	Units
BIOL B3a	General Biology I	5.0
CHEM B1a	General Chemistry	5.0
ENGL B1a	Expository Composition Art or Humanities Elective	4.0 3.0

**Second Semester**

Course Number	Title	Units
BIOL B3b	General Biology II	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
ENGL B2 or PHIL B9	Advanced Composition and Critical Thinking Critical Thinking and Composition	5.0 3.0

**Third Semester**

Course Number	Title	Units
MATH B6a	Analytic Geometry and Calculus I	4.0
PHYS B2a	General Physics-Mechanics and Heat	4.0
SPCH B1	Speech Communication	3.0

Art or Humanities elective	3.0
Social or Behavioral Science elective	3.0

**Fourth Semester**

Course Number	Title	Units
MATH B6b	Analytic Geometry and Calculus II	4.0
PHYS B2b	General Physics-Sound, Light, Electricity, Magnetism, Modern Physics Art or Humanities elective Social or Behavioral Science elective	4.0 3.0 3.0

**Note:** Many UC campuses now require calculus-based physics for biology majors. If you are planning to transfer to a UC campus, contact their admissions office for advice. If you are planning to transfer to a CSU campus, consider satisfying the art or humanities requirement by taking two courses from the following list: FREN B2, B3, B4; GERM B2, B3, B4; or SPAN B2ab, B3, B4. These courses simultaneously satisfy the CSU language other than English and the arts and humanities requirements.

**Primary Care Associate (Physician's Assistant)**

Stanford University Medical Center administers a program to train individuals who function in association with physicians in the maintenance and delivery of primary health care to medically underserved communities.

Upon completion of the prerequisite pre-clinical program at Bakersfield College or other accredited institutions, students admitted to the program have 15 months of clinical experience coordinated through Stanford University Medical Center. Students participate in didactic course work full-time for the first quarter (3 months) at Stanford Medical Center in Palo Alto, California. Then they complete an equivalent of five days of didactic instruction each month (12 months) thereafter. All clinical experience occurs in an office practice preceptorship. Contact Counseling Department for further information.

**Prerequisites:**

Minimum requirements for application and admission include:

1. United States citizen or permanent visa.
2. High School Diploma or equivalent.
3. A minimum of 18 months direct patient care experience.
4. Satisfactory completion of the following academic prerequisites or their equivalents.

General Education courses are required for the P.C.A. Program. It is recommended that an AA or AS degree at BC be completed prior to applying to the program.

The student must have a preceptor site established in order to complete the clinical experiences necessary for the program. Some assistance may be available in locating a preceptor.

Upon successful completion of the P.C.A. program. The graduate will sit for a certifying examination administered by

the National Commission on Certification of Physician's Assistants. Passing this examination allows the Physician's Assistant to perform direct patient services under the supervision of primary care physicians certified by the California Board of Medical Quality Assurance.

### Pre-Clinical Program Requirements

A minimum grade of "C" must be attained in each of these courses. Only work from a regionally accredited college can be accepted.

Algebra – Elementary. One year of high school math or MATH B1/B200a at Bakersfield College.

Anatomy (BIOL B14) and Physiology (BIOL B15) at Bakersfield College or equivalent. Must be at least 10-12 quarter units or 7-8 semester units.

Chemistry – Introductory. One year of high school chemistry or CHEM B15 and B16 at Bakersfield College or equivalent.

Cultural Anthropology or Sociology: ANTH B2, SOCI B1 at Bakersfield College, or another acceptable course.

English Composition – Freshman level: ENGL B1, ENBL B1a at Bakersfield College, or other acceptable course.

General Psychology – PSYC B1a at Bakersfield College or other acceptable course.

Microbiology with laboratory; BIOL B16 at Bakersfield College, or other acceptable course.

\*American History and Institutions. HIST B17a and HIST B17b at Bakersfield College.

\*Computer Literacy – Two semester units. Must include experience at a terminal (COMS B2 or COMS B12) at Bakersfield College, or other acceptable course.

\*Ethnic Studies – A course that reflects the experience of an American ethnic group.

\*Humanities – One course from List A and one course from List B. (A) Literature, Philosophy (not Logic), or Western Civilization. (B) Art Appreciation, Music Appreciation, or Theatre Arts Appreciation.

\*Physical Education – Four quarter courses or three semester courses.

\*Speech – Public Speaking or interpersonal communication: SPCH B1 or SPCH B2 at Bakersfield College, or other acceptable course.

\*These courses are required if candidate does not possess an A.A., A.S. or higher academic degree.

## COURSE DESCRIPTIONS

The following abbreviations are commonly used in the course descriptions: **lect** lecture; **lab** laboratory; **demo** demonstration; **Repeat** repeatability (see policy on course repetition); **CCS** Course Classification System. Hours given in parentheses are total hours for the course. Hours lecture, lab, etc., are hours required per week usually. **Offered:** F=course is offered fall semester; S=course is offered spring semester; SS=course is offered summer session. If there is no designation, the course is offered irregularly. Check with the department for information. Many classes are offered occasionally during the summer. Check the summer class schedule for additional course listings. Prerequisites are expressed as minimum requirements. See page 40 for a complete explanation. (CSU) indicates transferable to California State Universities; (UC) indicates transferable to University of California.

### BIOLOGY

*Credit limitations may apply. For specific information see a counselor.*

#### BIOL B3a General Biology I (5 units)

Introductory course for students majoring in biological sciences and related subjects. Science of life, survey of living organisms introduction to ecology and evolutionary biology, Mendelian genetics. **Prerequisite:** Reading Level 5 or 6. **Hours:** (162) 3 lect, 6 lab. Field trips required. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

#### BIOL B3b General Biology II (5 units)

Principles of cell biology, molecular biology, metabolism, biochemistry, molecular genetics, and physiology. **Prerequisites:** CHEM B1a and BIOL B3a. **Hours:** (162) 3 lect, 6 lab. Field trips required. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

#### BIOL B7 Environment (3 units)

Introduction to environmental science. The process which will sustain humans on this planet. Topics included: the relevance of ecology to human affairs; historical aspects of ecological principles; population ecology; and ecology and the human future. **Prerequisite:** Reading Level 5 or 6. **Hours:** (54) 3 lect. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

#### BIOL B10 Plant Biology (4 units)

An introductory course covering the fundamental principles of plant biology with emphasis on structure, function, reproduction, and development of seed plants. The principles will be related to the practices of applied plant biology in agriculture, forestry, horticulture, and plant biotechnology; to ecology; and to civilization. **Prerequisite:** Reading Level 5 or 6. **Hours:** (108) 3 lect, 3 lab. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

**BIOL B11 Concepts of Biology (4 units)**

A non-majors introductory course which applies biological concepts to issues of everyday life. Concepts considered include scientific method; ecosystems and energy flow; organization, structure, function, behavior and evolution of organisms; inheritance; disease; ethics. **Prerequisite:** Reading Level 5 or 6. **Hours:** (108) 3 lect, 3 demo/disc/lab per week, plus at least one field trip. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

**BIOL B14 Human Anatomy (4 units)**

The essential features of human anatomy with special emphasis upon the needs of students majoring in biology, nursing, physical education and the medical sciences. Includes the microscopic and gross anatomy of all systems: skeletal, muscular, circulatory, respiratory, digestive, excretory, nervous, endocrine, reproductive and integumentary. **Prerequisite:** Reading Level 5 or 6. Satisfactory completion of a high school biology course with a laboratory or one semester of college biology. **Hours:** (144) 2 lect and 6 lab. **Offered:** F, S. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges. (CAN BIOL 10)

**BIOL B15 Human Physiology (5 units)**

Introductory course in human physiology. Physiology of cells, tissues, circulation, respiration, digestion excretion, controls and reproduction. **Prerequisite:** BIOL B14, CHEM B15, CHEM B16. **Hours:** (162) 3 lect, 6 lab. **Offered:** F, S. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges.

**BIOL B16 General Microbiology (5 units)**

Introduction to the study of microorganisms. Topics include: survey of microorganisms history, physical and chemical agents, bacterial genetics, bacterial metabolism, bacterial diseases by transmission, fungal and protozoal infections, viral diseases, immunology, public health and epidemiology, nosocomial infections, biogenetic engineering, applications to food, water and sewage treatment. **Prerequisite:** CHEM B15 and B16 or CHEM B2a. **Hours:** (162) 3 lect, 6 lab. Field trips required. **Offered:** F, S. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges. (CAN BIOL 14).

**BIOL B18 Essentials of Human Anatomy and Physiology (4 units)**

A first course in integrated life science for students in health science programs. Principal emphasis is on the structure and function of human organ systems. Also includes cell structure and function, human development and human heredity. **Prerequisite:** Reading Level 5 or 6. **Hours:** (108) 3 lect, 3 lab. **Offered:** F, S. **CCS:** Liberal Arts and Sciences. **Transferable:** CSU and private colleges.

**BIOL B20 Human Biology (4 units)**

An introductory biology course designed specifically for non-science majors, covering basic chemical principles of life, cell and tissue structure and function, human anatomy and physiology, health aspects, and genetics. Topics include evolution, population growth and environmental impact on humans. **Prerequisite:** Reading Level 5 or 6. **Hours:** (108) 3 lect, 3 lab. Field trips required. **Offered:** F, S. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges.

**BIOL B30 Introduction to Biotechnology (4 units)**

An introductory biotechnology course covering basic terminology, techniques, history and future of biotechnology industries. An overview of important biological molecules, the cell, genetic and bioengineering mechanisms, gene expression and manipulations, basic laboratory skills, safety, and industrial techniques. **Prerequisite:** CHEM B1a or B2a or B15 and BIOL B10 or B11 or B20 or B3a with a grade of "C" or better. **Hours:** (108) 3 lect, 3 lab. Field trips required. **Offered:** S. **CCS:** Occupational Education. **Transferable:** CSU and private colleges.

**BIOL B31 Applied Biotechnology (5 units)**

An intermediate course in Biotechnology; topics include aseptic technique, media production, bacterial culture, nucleic acid isolation and manipulation, DNA cloning, and tissue culturing. Laboratory activities involve GLP's and safety, quality control, use of molecular biology techniques and equipment. **Prerequisite:** BIOL B30 and CHEM B16, or B8 and B9. **Hours:** (162) 3 lect, 6 lab. Field trips required. **Offered:** F. **CCS:** Occupational Education. **Transferable:** CSU and private colleges.

**BIOL B51 Biotechnology Careers (0.5 unit)**

Introduces the student to biotechnology skills, products, and career opportunities. Field trips and guest speakers are an integral part of the program. **Hours:** (9) 1 lect for 9 weeks. Field trips required. **Offered:** F, S. **CCS:** Occupational Education. **Not Transferable:** Associate Degree only.

**BIOL B52 Advanced Biotechnology (4 units)**

An advanced course in Biotechnology. Topics will stress biotechnician training and independent lab skills. Lecture topics will include transformation, restriction analysis of DNA, immunological applications. Lab will emphasize practice and mastery of current techniques including teamwork, design of an original project, assembly of necessary components, collection of data, evaluation and defense of findings. **Prerequisites:** BIOL B31 and CHEM B16 or CHEM B8 and B9 with a grade of "C" or better. **Hours:** (144) 2 lect, 6 lab. **Offered:** S. **CCS:** Occupational Education. **Not Transferable:** Associate Degree only.

**BIOL B53 General Biology (3 units)**

Outlines the main facts and principles of biology; experience in the use of scientific method. Recommended (and may be required) as preparation for other college biological sciences

whenever the previous school record indicates insufficient preparation for such studies. **Recommended:** Reading Level 4. **Hours:** (72) 2 lect, 1 lab, 1 disc. Field trips required. **Offered:** F, S. **CCS:** Precollegiate - discipline specific. **Not Transferable:** Not degree applicable. **Note:** Not open for credit to students who have already completed BIOL B3a, BIOL B11, PHYL B1 or high school biology with a grade of "B."

**BIOL B248ab Cooperative Work Experience Education  
(1-8 units. Limit 16 units)**

See WEXP B248ab description.

**BIOL B249ab Cooperative Work Experience Education  
(1-4 units. Limit 16 units)**

See WEXP B249ab description.