

BS IN BIOLOGICAL SCIENCE (CLINICAL LABORATORY SCIENCES)

Units required for Major: 73-85, includes units of study in chosen concentration (see below).

Total units required for BS: 120

Program Description

The curriculum in Clinical Laboratory Sciences meets the undergraduate coursework requirements of the State of California for eligibility to take a Clinical Laboratory Scientist (CLS) licensure examination. Eligibility to take a licensure examination also requires a one year (CLS) internship training program at a state approved clinical laboratory. Completion of BS degree requirements in the Clinical Laboratory Sciences concentration does not guarantee admission to a CLS internship training program. Information on admission criteria and application procedures for the various CLS internship training programs throughout the state is available through the California Association for Medical Laboratory Technology (CAMLT) at their website (<http://www.camlt.org/cls/>). Information about state and out-of-state programs can be found at NAACLS.org.

Program Requirements

Code	Title	Units
Required Lower Division Core Courses (37-41 Units)		
BIO 1	Biodiversity, Evolution and Ecology ¹	5
BIO 2	Cells, Molecules and Genes	5
CHEM 1A	General Chemistry I ¹	5
CHEM 1B	General Chemistry II	5
Select one of the following:		3 - 6
CHEM 20	Organic Chemistry Lecture--Brief Course ²	
CHEM 24 & CHEM 124	Organic Chemistry Lecture I & Organic Chemistry Lecture II	
Select one of the following:		3 - 4
MATH 26A	Calculus I for the Social and Life Sciences	
MATH 30	Calculus I	
PHYS 5A	General Physics: Mechanics, Heat, Sound	4
PHYS 5B	General Physics: Light, Electricity and Magnetism, Modern Physics	4
STAT 1	Introduction to Statistics ¹	3
Required Upper Division Core Courses (7 Units)		
BIO 100	Introduction to Scientific Analysis	3
BIO 184	General Genetics	4
Concentration (29-37 Units)		
Select from the following concentrations:		29 - 37
General Biology		
Biomedical Sciences		
Cell and Molecular Biology		

Clinical Laboratory Sciences

Ecology, Evolution, and Conservation

Forensic Biology

Microbiology

Total Units 73-85

¹ Course also satisfies General Education (GE)/Graduation Requirement.

² CHEM 24 and CHEM 124 may be taken in lieu of CHEM 20. (CHEM 124 is not counted toward the 36 upper division unit requirement in the major except in the Biomedical Sciences Concentration.)

Notes:

- Pre-Health Professional students should take the Chemistry and Math requirements as stated in the Pre-Health Professional Program section of this catalog.
- With approval, up to six units of upper division coursework from related fields may be applied as electives in the major.

Concentration in Clinical Laboratory Sciences (34 units)

Code	Title	Units
Required courses (34 Units)		
BIO 121	Molecular Cell Biology	3
BIO 124	Clinical Hematology	3
BIO 131	Systemic Physiology	4
BIO 139	General Microbiology	4
BIO 144	Pathogenic Bacteriology	4
BIO 149A	Immunology	3
BIO 152	Human Parasitology	3
CHEM 31	Quantitative Analysis	4
CHEM 161	General Biochemistry ¹	3
CHEM 162	General Biochemistry Laboratory ²	3
Total Units		34

¹ CHEM 160A and CHEM 160B may be taken in lieu of CHEM 161. Only three units of the package may be counted toward the upper division requirement.

² CHEM 162 can be included in the 36 upper division unit requirement for this concentration.

Note: A minor in Chemistry may be attained if either CHEM 20L or CHEM 25 is taken.

- No more than 3 units from the following combined can be applied to the Biological Sciences upper division major requirement. No more than 2 units from BIO 195 and BIO 197 series courses will count toward the degree requirement.

Code	Title	Units
BIO 195	Biological Internship	1 - 2
BIO 197A	Laboratory Teaching Assistant	1 - 2
BIO 197B	Laboratory Techniques	1 - 2

BIO 197C	Co-curricular Activities in Biology	1 - 2
BIO 199A	Introductory Undergraduate Research	1 - 2
BIO 199B	Directed Readings	1 - 2

General Education Requirements ¹

Code	Title	Units
Area A: Basic Subjects (9 Units)		
A1	Oral Communication	3
A2	Written Communication	3
A3	Critical Thinking	3
Area B: Physical Universe and Its Life Forms		
B1	Physical Science ²	0
B2	Life Forms ²	0
B3	Lab (Note: Lab experience to be taken with one of the following: B1, B2 or B5) ²	0
B4	Math Concepts ²	0
B5	Additional Course (Any B to reach 12 units) - Take upper-division course to complete Area & upper division requirements. ²	0
Area C: Arts and Humanities (12 Units)		
C1	Arts	3
C2	Humanities	3
C1/C2	Area C Course	3
C1/C2	Area C Course - Take upper-division course to complete Area & upper division requirements.	3
Area D: The Individual and Society (9 Units)		
Area D Course		3
Area D Course		3
Area D Course	- Take upper-division course to complete Area & upper division requirements.	3
Area E: Understanding Personal Development (3 Units)		
Area E Course		3
Area F: Ethnic Studies (3 Units)		
Area F Course		3
Total Units		36

¹ To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (<https://catalog.csus.edu/colleges/academic-affairs/general-education/>).

Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (<http://www.csus.edu/acad/>), by phone (916) 278-1000, or email (advising@csus.edu).

² Required in Major; also satisfies GE.

Graduation Requirements ¹

Code	Title	Units
Graduation Requirements (required by CSU) (9 Units)		
American Institutions: U.S. History		3
American Institutions: U.S. Constitution & CA Government		3

Writing Intensive (WI)	3
Graduation Requirements (required by Sacramento State) (12 Units)	
English Composition II	3
Race and Ethnicity in American Society (RE)	3
Foreign Language Proficiency Requirement ²	6

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² If not satisfied before entering Sacramento State, it may be satisfied in General Education Area C2 (Humanities). "C- or better required." The alternative methods for satisfying the Foreign Language Proficiency Requirement are described here: <https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html> (<https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html>)

The following roadmaps are sample planning resources. Please consult your academic advisor and Academic Catalog for graduation requirements as you develop your individualized academic plan.

Biological Science (Clinical Laboratory Sciences), BS: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
STAT 1	Introduction to Statistics	3
GE Area 1A - English Composition ²		3
GE Area 3B - Humanities ²		3
GE Area 6 - Ethnic Studies ²		3
GR American Institutions (US History) ²		3
Units		15
Second Semester		
CHEM 1A	General Chemistry I	5
MATH 26A or MATH 30	Calculus I for the Social and Life Sciences ³ or Calculus I	3 - 4
GE Area 1B - Critical Thinking ²		3
GE Area 1C - Oral Communication ²		3
Units		14-15
Year 2		
First Semester		
BIO 1	Biodiversity, Evolution and Ecology	5
CHEM 1B	General Chemistry II	5
GE Area 3A - Arts ²		3
GR American Institutions (GOVT) ²		3
Units		16
Second Semester		
BIO 2	Cells, Molecules and Genes	5
CHEM 31	Quantitative Analysis	4
ENGL 20	College Composition II	3
PHYS 5A	General Physics: Mechanics, Heat, Sound	4
Units		16

Year 3		
First Semester		
BIO 100	Introduction to Scientific Analysis	3
BIO 184	General Genetics	4
CHEM 20 or CHEM 24 or CHEM 124	Organic Chemistry Lecture– Brief Course ³ or Organic Chemistry Lecture I or Organic Chemistry Lecture II	3
PHYS 5B	General Physics: Light, Electricity and Magnetism, Modern Physics	4
Foreign Language Semester 1 ²		4
Units		18
Second Semester		
BIO 121	Molecular Cell Biology	3
BIO 139	General Microbiology	4
CHEM 161	General Biochemistry	3
Foreign Language Semester 2 ²		4
Units		14
Year 4		
First Semester		
BIO 144	Pathogenic Bacteriology	4
BIO 149A	Immunology	3
CHEM 162	General Biochemistry Laboratory	3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Elective of Choice		3
Units		16
Second Semester		
BIO 124	Clinical Hematology	3
BIO 131	Systemic Physiology	4
BIO 152	Human Parasitology	3
Upper Division GE Area 3 - Arts or Humanities ²		3
Units		13
Total Units		122-123

Biological Science (Clinical Laboratory Sciences), BS: 2-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
BIO 100	Introduction to Scientific Analysis	3
BIO 184	General Genetics	4
Foreign Language Semester 1 ²		4
GR American Institutions (US History) ²		3
Units		14
Second Semester		
BIO 121	Molecular Cell Biology	3
BIO 139	General Microbiology	4
CHEM 161	General Biochemistry	3
Foreign Language Semester 2 ²		4
Units		14
Year 2		
First Semester		
BIO 144	Pathogenic Bacteriology	4
BIO 149A	Immunology	3
CHEM 162	General Biochemistry Laboratory	3

Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Elective of Choice		3
Units		16
Second Semester		
BIO 124	Clinical Hematology	3
BIO 131	Systemic Physiology	4
BIO 152	Human Parasitology	3
GR American Institutions (GOVT) ²		3
Upper Division GE Area 3 - Arts or Humanities ²		3
Units		16
Total Units		60

- Any course not completed in the first semester should be taken in the second or a later semester.
- Please see General Education/Graduation Requirement **course options** (https://www.csus.edu/academic-affairs/curriculum-%20workflow/_internal/_documents/program-road-maps/als_2yr/art_transfer-%20roadmap-2024-25.pdf).
- Please see an academic advisor for elective options.