

# BIOL A180: INTRODUCTION TO BIOLOGY FOR MAJORS 1: CELL AND MOLECULAR BIOLOGY

Item	Value
Curriculum Committee Approval Date	10/16/2024
Top Code	040100 - Biology, General
Units	4 Total Units
Hours	108 Total Hours (Lecture Hours 54; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)
Associate Arts Local General Education (GE)	<ul style="list-style-type: none"> <li>Area 5 Physical and Biological Sciences, Scientific Inquiry, Life Science (OB)</li> </ul>
Associate Science Local General Education (GE)	<ul style="list-style-type: none"> <li>Area 5 Physical and Biological Sciences, Scientific Inquiry, Life (OSB)</li> </ul>
California General Education Transfer Curriculum (Cal-GETC)	<ul style="list-style-type: none"> <li>Cal-GETC 5B Biological Sciences (5B)</li> <li>Cal-GETC 5C Laboratory Activity (5C)</li> </ul>
Intersegmental General Education Transfer Curriculum (IGETC)	<ul style="list-style-type: none"> <li>IGETC 5B Biological Sciences (5B)</li> <li>IGETC 5C Laboratory Activity (5C)</li> </ul>
California State University General Education Breadth (CSU GE-Breadth)	<ul style="list-style-type: none"> <li>CSU B2 Life Science (B2)</li> <li>CSU B3 Laboratory Activity (B3)</li> </ul>

## Course Description

Designed for the major in the biological sciences and pre-health profession majors. Emphasizing central concepts of biology, including biochemistry, cell biology, membrane dynamics, molecular genetics, classical genetics, and biotechnology. PREREQUISITE: Completion of CHEM A130 or concurrent enrollment in one of the following: CHEM A180 or CHEM A185 or CHEM A220 or CHEM A225; CHEM A180 qualifying exam does not substitute for CHEM A130 prerequisite or CHEM A180 corequisite; Non-native speaking students must be eligible to enter ESL A031 and ESL A035. Transfer Credit: CSU; UC. C-ID: BIOL 190. C-ID: BIOL 190.

## Course Level Student Learning Outcome(s)

1. Differentiate among the major kinds of macromolecules found in living cells, discuss their roles in the cell, as well as describe the anabolic and catabolic pathways required for their production and breakdown.
2. Describe the regulation and transmission of genetic information at the molecular level.
3. Propose experimental predictions based on scientific hypotheses, test hypotheses, analyze data, and form conclusions based on the data using the scientific method.

## Course Objectives

- 1. Identify and describe biological molecules and cell structures and explain their functions.
- 2. Compare and contrast cellular processes and interactions between prokaryotes and eukaryotes (including metabolism, reproduction, communication).
- 3. Apply the principles of classical and molecular genetics to solve problems in genetics or biotechnology.
- 4. Relate evolutionary processes to the origin and evolution of cells.
- 5. Explain how DNA replicates and transmits genetic information within organisms.
- 6. Apply the processes of scientific inquiry and experimental design to the study of biological concepts.
- 7. Acquire, read, evaluate, apply and cite scientific literature.
- 8. Practice scientific writing.

## Lecture Content

Structure and Function of Prokaryotic and Eukaryotic Cells Origin and evolution of cellular life and molecular evolution Organelle structure and function Membrane structure and function Cellular transport Cellular chemistry and biomolecules Cellular metabolism (respiration and photosynthesis) Cell reproduction and its controls Cell communication Classical/Mendelian genetics Molecular genetics DNA structure and function Gene structure, gene expression and control of gene expression Biotechnology Scientific Inquiry

## Lab Content

The laboratory component must include greater than 80% hands-on activities that support the learning goals of the course. Laboratory Experiments: Introduction to measurement, pH, and the scientific method Molecular modeling of amino acids and polypeptides, protein purification, and analysis of proteins by spectrophotometry Osmosis and properties of biological membranes Microscopy of cellular structures Literature searches using online data bases (Highwire/Pubmed) Invertase secretion in yeast- student designed experiment Enzyme preparation from lima beans and analysis Fermentation rates in yeast Bacterial Transformation Plasmid DNA purification, restriction enzyme digestion and analysis by agarose gel electrophoresis Subcellular fractionation of nuclei, and microscopic analysis of mitotic cells, and chromosome spreads Genotyping using the polymerase chain reaction (PCR) Techniques used by the students: Pipetting (both serological and micropipetting) Electronic balance measurements Light microscopy (including sample preparation and staining) Spectrophotometry Molecular modeling Database searches Potentiometric titrations using pH meters Centrifugation Cell fractionation Serial dilutions Bacterial transformation (including

making competent cells and cell plating) Agarose gel electrophoresis  
Polymerase Chain Reaction

## Method(s) of Instruction

- Lecture (02)
- Lab (04)

## Instructional Techniques

1. Instructor demonstrations of computer graphing, use of a spectrophotometer, use of a microscope, use of a centrifuge, pipetting, aseptic microbiological techniques, use of electrophoresis equipment and pH meters. 2. Application of lecture concepts to laboratory activities. 3. Application of reading materials to lecture concepts and laboratory activities. 4. Small group laboratory exercises. 5. Individual student designed experiments. 6. Powerpoint and video presentation of lecture and laboratory concepts. 7. Students are provided with an environment that encourages participation with the instructor (office hours and in the laboratory during experiments), as well as with other students (discussion with members of their lab group to determine the approach to the experiment).

## Reading Assignments

Reading assignments from the textbook or other relevant sources. 3 hours per week.

## Writing Assignments

Weekly written laboratory reports. 2 hours per week.

## Out-of-class Assignments

Homework questions/problem sets and/or Mastering biology homework (or equivalent). 3 hours/week.

## Demonstration of Critical Thinking

Written laboratory reports requiring critical and analytical evaluation of data

## Required Writing, Problem Solving, Skills Demonstration

Written (short answer and essay) responses included in examinations. Lab practical that covers lab techniques, data analysis and background information of each lab.

## Eligible Disciplines

Biological sciences: Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent. Master's degree required. Biological sciences: Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent. Master's degree required.

## Textbooks Resources

1. Required Reece, et. al.. Campbell Biology, 11th ed. Boston, MA: Pearson, 2017

## Manuals Resources

1. Sogo, F.. Biology 180 Laboratory Manual: Cell and Molecular Biology, XanEdu , 01-15-2020