

BIOL C180: CELL AND MOLECULAR BIOLOGY

Item	Value
Curriculum Committee Approval Date	10/25/2024
Top Code	049900 - Other Biological Sciences
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)
Local General Education (GE)	• Area 5B Life Sciences (CB2)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5B Biological Sciences (5B) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5B Biological Sciences (5B) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B2 Life Science (B2) • CSU B3 Laboratory Activity (B3)

Course Description

This course, intended for biological sciences and pre-health profession majors, explores principles and applications in cell and molecular biology. Topics include biological molecules; homeostasis; viruses; eukaryotic/prokaryotic cell structure and function; cell metabolism, including photosynthesis and respiration; cell communication; cell reproduction and its controls; classical (Mendelian) genetics; molecular genetics; and biotechnology. PREREQUISITE: CHEM C180. ADVISORY: Eligibility for ENGL C1000. Transfer Credit: CSU; UC: Credit Limitations: no credit for BIOL C100 & C100L if taken after BIOL C180; no credit for BIOL C100C if taken after BIOL C100 & BIOL C100L or BIOL C180. C-ID: BIOL 190, BIOL 135 S. C-ID: BIOL 190, BIOL 135 S.

Course Level Student Learning Outcome(s)

1. Describe the nature of biological molecules, cell structures, and principal cellular/molecular processes found in cells including metabolism, reproduction, communication, and transmission of genetic information.
2. Demonstrate the ability to formulate hypotheses, design reports to experiments, analyze data, and form conclusions.
3. Read, evaluate, and cite biology-related scientific literature.

Course Objectives

- 1. Identify and describe biological molecules and explain how they compose various cell structures.
- 2. Identify and describe cell structures and explain their functions.
- 3. Explain principles of enzyme structure and function.
- 4. Compare and contrast metabolism, genetic transmission, reproduction, and cell division between prokaryotes and eukaryotes.
- 5. Compare and contrast interactions and communication between prokaryotes and eukaryotes.
- 6. Apply the principles of classical and molecular genetics to solve problems in genetics.
- 7. Discuss strategies on how recombinant DNA technology can be used to develop biotechnology products.
- 8. Explain how DNA replicates and transmits genetic information within organisms.
- 9. Apply the processes of scientific inquiry and experimental design to the study of biological concepts.
- 10. Demonstrate common techniques used in the biology laboratory.
- 11. Critically analyze scientific journal articles.
- 12. Acquire, read, evaluate, apply, and cite scientific literature.
- 13. Practice scientific writing by producing written reports on experiments conducted in the laboratory.

Lecture Content

Characteristics of Life Characteristics of living organisms Cell theory Evolution by natural selection Scientific Inquiry Nature of Science Types of reasoning Hypothesis testing Use of peer-reviewed journals Chemical Principles Chemical reactions Properties of water Properties of organic molecules Properties of Biological Macromolecules Carbohydrates Lipids Proteins Nucleic acids Prokaryotic and Eukaryotic Cell Structure and Function Membrane structure and dynamics Composition and function Movement across membranes Cytoskeleton structure and dynamics Prokaryotic cells Structure/function of components external to the membrane Structure/function of components internal to the membrane Eukaryotic cells Structure/function of components external to the membrane Structure/function of organelles Cellular transport Viruses Component structure and function Cell-Cell Interactions Extracellular matrix Intracellular junctions Cell signaling and signal transduction Evolution Natural selection Cellular Metabolism Principles of metabolism Respiration Fermentation Photosynthesis Cell Reproduction and Its Control The cell cycle and its regulation Mitosis Meiosis Cancer Classical (Mendelian) Genetics Mono- and dihybrid crosses Molecular Genetics DNA structure and function DNA replication DNA mutation and repair Transcription Translation and gene expression Control of gene expression in Prokaryotes and Eukaryotes Biotechnology Recombinant DNA technology Gene cloning Polymerase Chain Reaction Emerging technologies Bioinformatics Genomics Biotechnology applications New developments Current Topics

Lab Content

The Scientific Method Obtaining and Evaluating Primary Literature Microscopy Cell Structure and Function Diffusion and Osmosis Enzymes Cell Respiration, Fermentation, and Photosynthesis Mitosis and Meiosis Genetics Gene Expression DNA Cloning, Restriction Analysis and PCR

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Instructional Techniques

This course is presented through lecture material and lab exercises. The lectures are supplemented with visual materials, most often PowerPoint slides, movies, podcasts, and demonstrations. The lecture is followed by lab work appropriate to the topic. Students will read the text, listen to podcasts, read and evaluate primary scientific research articles, carry out small group discussions, and give oral presentations. Students will also design and execute experiments in groups and practice relevant techniques in the laboratory.

Reading Assignments

Readings from text Reading biology-related articles from science websites Reading journal articles

Writing Assignments

Evaluation of biology-related news or journal articles Summary report on human disease based on cellular or molecular principles Lab reports Report on off-campus seminar

Out-of-class Assignments

Online quizzes Participation Forums Oral Journal Club presentation Attend off-campus seminar Vocabulary terms Homework Problems from text

Demonstration of Critical Thinking

Students will propose their own scientific questions, formulate hypothesis and predictions, and critically evaluate data.

Required Writing, Problem Solving, Skills Demonstration

Lab Reports Lab experiment notebook Written report and/or oral presentation on human disease Biology problems on quizzes and exams

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.

Textbooks Resources

1. Required Campbell, Neil A.; Reese, Jane. Biology, 11th ed. San Francisco: Benjamin-Cummings, 2016 Rationale: - Legacy Textbook Transfer Data: Legacy text 2. Required Freeman, S. Biological Science, 8th ed. Pearson Benjamin Cummings, 2024 3. Required Hardin, J.; Bertoni, G. Becker's World of the Cell, 9th ed. Pearson, 2015 Rationale: - Legacy Textbook Transfer Data: Legacy text 4. Required OER:Klymkowsky, Michael W. and Cooper, Melanie M. . Biofundamentals, ed. University of Colorado Boulder and Michigan State University: Department of Education Open Textbook Pilot Project, <https://status.libretexts.org>Links to an extern, 2021 5. Required E. V. Wong. Cells: Molecules and Mechanisms, ed. Axolotl Academica Publishing: Department of Education

Open Textbook Pilot Project, <https://status.libretexts.org>Links to an extern, 2022

Manuals Resources

1. Fauce, S. BIOL C180: Cell and Molecular Biology, Xanadu , 08-01-2019

Other Resources

1. Coastline Library