BIOL G180: CELL AND MOLECULAR BIOLOGY

Item	Value
Curriculum Committee Approval Date	10/20/2020
Top Code	040100 - Biology, General
Units	5 Total Units
Hours	126 Total Hours (Lecture Hours 72; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)
Local General Education (GE)	• GWC Physical Universe*** (GB1)
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

Formerly: Principles of Biology. This course is designed as the first in a three-course sequence for students desiring to major in biology. The topics to be covered in this course are among those which serve to unify the science of biology. Included in these concepts are: prokaryotic and eukaryotic cell structure, function and homeostasis, cell reproduction and metabolism, cell communication, classical and molecular genetics, molecular biology, biotechnology, and evolution. PREREQUISITE: Course taught at the level of intermediate algebra or appropriate math placement and CHEM G180 or CHEM G185 or CHEM G220 or CHEM G225. ADVISORY: ENGL G090 or ENGL G099. Transfer Credit: CSU; UC. C-ID: BIOL 190, BIOL 135S. **C-ID:** BIOL 190, BIOL 135S.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Describe the different steps of eukaryotic cell division.
3. Evaluate enzymatic data and associated graphs in a laboratory setting.
4. Describe the various functions of the organelles of a eukaryotic cell.
5. Prepare a diluted chemical solution using proper volumes of stock solution and diluents.
6. Draw a map of the restriction enzyme sites of a plasmid DNA molecule using RFLP analysis.
7. Assess current biological issues relevant to molecular biology such as stem cell research, cancer, gene therapy, epigenetic processes and genetic engineering.

Course Objectives

- 1. Describe those principles which permeate and consequently serve to unify the science of Biology.
- 2. Describe evolutionary processes as they relate to the origin of prokaryotic and eukaryotic cells.
- 3. Identify prokaryotic and eukaryotic cell structures and important biological molecules.
- 4. Discuss critical prokaryotic and eukaryotic cell processes, including metabolism, cell communication, DNA replication, cell reproduction and gene regulation, and describe the main differences between the two cell types regarding these processes.
- 5. Discuss the technical and ethical issues facing modern biology, biotechnology, and genetic engineering.
- 6. Use classical, population and molecular genetics to solve a variety of genetics problems.
- 7. Discuss recent advances and future goals in the areas of biotechnology and genetic engineering.
- 8. Gather experimental data to be included in a written laboratory report.
- 9. Cite experimental evidence to support or refute a proposed hypothesis.

Lecture Content

I. Introduction A. The Scientific Method of Inquiry B. Properties of Life C. Origin of Life D. Prokaryotic and Eukaryotic Cells II. Introduction to the Chemistry of Biology A. Importance and Properties of Water B. Importance and Properties of Carbon C. Biological Molecules and Macromolecules III. Cell Structure and Function A. Microscopy and Histology B. Prokaryotic Cell Structure and Function C. Eukaryote Cell Structure and Function D. The Secretory Pathway E. Evolution of Eukaryotic Organelles IV. Membrane Structure and Function A. Membrane Proteins B. Transport Across Membranes C. Membrane ReceptorsV. nb Cell Communication A. Signal TransductionVI. Metabolism A. Energy, Thermodynamics and Enzymes B. Cellular Respiration C. PhotosynthesisVII. Cell Reproduction A. Mitosis and Cell Cycle Control B. Meiosis and Genetic DiversityVIII. Genetics A. Classical/Mendelian Genetics B. Chromosomal Basis for Heredity C. Molecular Genetics D. Population GeneticsIX. From Gene to Protein A. DNA Structure and Function B. Transcription and Control of Gene Expression C. Translation D. EpigeneticsX. Biotechnology A. Genetic Engineering s p; B. Stem Cell Research and EthicsXI. Evolution of Genomes

Lab Content

Introduction to laboratory technique and equipment, laboratory safety, tools of measurement, and the Scientific Method. Introduction to the spectrophotometer and graphing. Studies of enzyme reactions and variables that affect enzymes. Introduction to microscopy. Microscopic studies of the organelles of eukaryotic cells and tonicity. Photosynthesis, cellular respiration and fermentation. Determination of the molecular weight of a protein using polyacrylamide gel electrophoresis. Introduction to sterile technique. Preparing dilutions of bacterial cultures and isolation

of single colonies. Using Restriction Fragment Length Polymorphisms to generate a restriction map of circular plasmid. Preparation of competent bacterial cells and transformation of cells with a recombinant plasmid. Isolation of recombinant plasmids from transformed bacteria. Amplification of mitochondrial DNA by Polymerase Chain Reaction. Hardy-Weinberg studies and evolution.

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)

Reading Assignments

Textbook chapters (weekly) Scientific Journal articles

Writing Assignments

Laboratory reports Written project report

Out-of-class Assignments

Project report Laboratory reports Problem sets

Demonstration of Critical Thinking

During the course, students will be required to analyze laboratory data, evaluate hypotheses, and deduce valid conclusions from experimental evidence. They will also be required to discuss and critique current biological research.

Required Writing, Problem Solving, Skills Demonstration

Students will practice writing as they complete lab reports, take essay exams, submit a project report, and demonstrate laboratory proficiency with a practical exam.

Eligible Disciplines

Biological sciences: Masters degree in any biological science OR bachelors degree in any biological science AND masters degree in biochemistry, biophysics, or marine science OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Reece,J., Urry, L., Cain, M., Wasserman, S, Minorsky, P., Jackson, R.. Campbell Biology, 12th ed. Benjamin Cummings, 2020

Manuals Resources

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