

Las Positas College  
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**Course Outline for BIO 1C**  
**CELL AND MOLECULAR BIOLOGY**  
**Effective: Fall 2015**

**I. CATALOG DESCRIPTION:**

BIO 1C — CELL AND MOLECULAR BIOLOGY — 5.00 units

Principles of cell and molecular biology. Includes biochemistry, cell structure and function, cell homeostasis, cell metabolism, cell reproduction, cell communication, genetics, molecular biology, biotechnology, and evolution. Emphasis on scientific inquiry and experimental design. (Note: BIOL 1.)

3.00 Units Lecture 2.00 Units Lab

**Prerequisite**

BIO 1A - General Botany  
with a minimum grade of C  
or

BIO 1B - General Zoology  
with a minimum grade of C

MATH 55 - Intermediate Algebra for STEM

CHEM 1A - General College Chemistry I  
(May be taken concurrently)

- Eligibility for ENG 1A -

**Grading Methods:**

Letter Grade

**Discipline:**

	<b>MIN</b>
<b>Lecture Hours:</b>	54.00
<b>Lab Hours:</b>	108.00
<b>Total Hours:</b>	162.00

**II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1**

**III. PREREQUISITE AND/OR ADVISORY SKILLS:**

**Before entering the course a student should be able to:**

**A. BIO1A**

1. Recognize the evolutionary relationships among the major groups of plants, fungi, and photosynthetic protistan taxa
2. Make detailed and productive observations of plant structures, in both field and laboratory, and interpret their observations using principles learned in the course
3. Describe and contrast life cycles within and among major plant, fungal, and photosynthetic protistan taxa
4. Describe plant hormones and their uses in industrial agriculture.
5. Apply physiological principles learned in the course to the growth and maintenance of plants
6. Use a compound or dissecting microscope to identify organisms, tissues, and cell types.

**B. BIO1B**

1. Compare and contrast characteristics of major animal taxa
2. Explain, construct, and interpret phylogenies
3. Summarize the phylogenetic relationships among animal taxa
4. Explain diffusion and osmosis; explain and give examples of osmoregulation in different organisms;
5. Compare and contrast anatomy and physiology among different taxa, including digestive, respiratory, excretory systems, circulatory, muscular, nervous, and reproductive systems;
6. Explain mechanisms of evolutionary change
7. Explain examples of animal behavior and relate behaviors to evolutionary significance
8. Properly use and care for compound and dissecting microscopes for microscopic examination of biological structures
9. Apply scientific methodology and critical thinking through experimentation and experiences

**C. MATH55  
D. CHEM1A**

E. -Eligibility for ENG 1A

#### IV. MEASURABLE OBJECTIVES:

**Upon completion of this course, the student should be able to:**

- A. Identify and explain structure and function of biologically important molecules;
- B. Describe cell membrane structure, compare mechanisms of membrane transport, and discuss types of cell junctions;
- C. Summarize enzyme structure and relate to function;
- D. Identify and explain structure and function of cells and cell organelles;
- E. Compare and contrast cellular metabolic pathways
- F. Compare and contrast cell reproduction processes, including the cell cycle, mitosis, and meiosis;
- G. Compare and contrast cell communication processes, including cell signaling and signal transduction
- H. Explain how DNA replicates and transmits genetic information within organisms.
- I. Interpret genetic crosses and patterns of inheritance, explain examples of non-Mendelian inheritance, and solve genetics problems;
- J. Describe chromosome structure, explain the patterns of inheritance of sex chromosomes, and compare features of the prokaryotic and eukaryotic genomes;
- K. Explain examples of how gene expression is regulated.
- L. Apply classical and molecular genetics to solve problems in genetics or biotechnology
- M. Describe the molecular basis of the action potential, muscle contraction, and antibody action;
- N. Explain and apply the major tools and techniques used in biotechnology
- O. Relate evolutionary processes to the origin and evolution of cellular life
- P. Discuss microevolution, and explain and discuss the evidence for Darwin's Theory of Natural Selection
- Q. Discuss macroevolution, compare species concepts, and explain mechanisms for speciation.
- R. Perform, document, explain, and interpret a variety of biochemistry, cell, and molecular techniques and experiments.
- S. Apply methods of scientific inquiry and experimental design to the study of biological concepts
- T. Acquire, read, evaluate, apply, and cite scientific literature
- U. Practice scientific writing.

#### V. CONTENT:

- A. Lecture
  - 1. Cellular chemistry and biological molecules
  - 2. Structure and function of cells and organelles
  - 3. Structure and function of cell membranes; action potential
  - 4. Cellular transport across membranes
  - 5. Structure and function of enzymes
  - 6. Cell Reproduction and cell cycle regulation
  - 7. Cellular metabolism (cellular respiration, fermentation, photosynthesis)
  - 8. Cell communication
  - 9. Classical/Mendelian and non-Mendelian genetics
  - 10. Molecular genetics
  - 11. DNA structure and function
  - 12. Gene structure
  - 13. Gene expression and regulation of gene expression
  - 14. Biotechnology
  - 15. Origin and evolution of life and molecules
  - 16. Natural selection
  - 17. Microevolution and population genetics
  - 18. Macroevolution and speciation
  - 19. Scientific inquiry
- B. Laboratory
  - 1. Microscopy
  - 2. Spectroscopy
  - 3. Biologically important molecules
  - 4. Cell structure
  - 5. Membrane transport
  - 6. Enzyme function
  - 7. Cell reproduction
  - 8. Genetics
  - 9. DNA isolation
  - 10. Gel electrophoresis (DNA and protein)
  - 11. Chromosomes
  - 12. Transformation
  - 13. PCR
  - 14. Population Genetics

#### VI. METHODS OF INSTRUCTION:

- A. **Discussion** -
- B. **Lecture** -
- C. Laboratory exercises
- D. Articles from scientific literature
- E. **Field Trips** -
- F. **Projects** -
- G. Audio-visual presentations
- H. Laboratory experiments

#### VII. TYPICAL ASSIGNMENTS:

- A. Prepare samples for microscopy, including using various stains for visualization.
- B. Perform extraction of DNA.
- C. Prepare and run agarose gel electrophoresis.
- D. Write a scientific report on an experiment or independent research project, using proper scientific report format.

#### VIII. EVALUATION:

- A. **Methods**
  - 1. Exams/Tests
  - 2. Quizzes
  - 3. Research Projects
  - 4. Papers
  - 5. Oral Presentation

6. Projects
7. Field Trips
8. Group Projects
9. Class Participation
10. Class Work
11. Home Work
12. Lab Activities
13. Other:
  - a. Lecture quizzes and/or midterms, and final exam
  - b. Laboratory reports and/or assignments
  - c. Laboratory quizzes and/or practical exams
  - d. Field trip assignments
  - e. Independent Research Project

**B. Frequency**

1. Quizzes, as appropriate; at least 1 midterm; and 1 final exam
2. Laboratory quizzes, assignments, and/or reports, corresponding to each lab
3. At least one Laboratory practical examination
4. 1 or more field trip assignments, if applicable
5. 1 Independent research project

**IX. TYPICAL TEXTS:**

1. Reece, Jane, and et al. *Campbell Biology*. 9th ed., Benjamin Cummings, 2014.
2. Russell, Peter, Paul Hertz, and Beverly McMillan. *Biology: The Dynamic Science*. 2nd ed., Cengage, 2012.
3. Ho, Nan. Biology 1: Cell Biology Custom Lab Manual. Pearson Custom Publishing , 2014.
4. Custom lab manuals and handouts

**X. OTHER MATERIALS REQUIRED OF STUDENTS:**

- A. Laboratory manual and/or custom laboratory packages Personal Protective Equipment (PPE)