

# BIOL 10: GENERAL BIOLOGY: BASIC PRINCIPLES

## Foothill College Course Outline of Record

Heading	Value
<b>Effective Term:</b>	Summer 2022
<b>Units:</b>	5
<b>Hours:</b>	4 lecture, 3 laboratory per week (84 total per quarter)
<b>Degree &amp; Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Area III: Natural Sciences
<b>Transferable:</b>	CSU/UC
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

## Student Learning Outcomes

- Explain the scientific method and demonstrate an ability to use this method of study.
- Explain the concept of evolution and the mechanism of natural selection.
- Recognize the role of human activities in environmental problems and solutions.

## Description

Methods of science and basic principles of biology. Special emphasis on genetics, ecology, overpopulation, nutrition and disease prevention.

## Course Objectives

The student will be able to:

- explain the scientific method and demonstrate its application to problem solving.
- critically evaluate scientific information.
- relate methods of science and the role science plays in today's world.
- describe basic principles and processes common to all forms of life.
- explain the cell theory and describe the structure and function of cells.
- relate basic nutrition concepts to cell function and disease prevention.
- understand the risk factors associated with cardiovascular disease and cancer.
- describe basic genetic principles unifying past and present life forms.
- describe human genetic diseases and disorders.
- describe the evidence that supports the theory of evolution.
- explain the central role of evolution as a theory in biology.
- describe basic ecological principles and relate them to current environmental issues.
- discuss the importance of each human in preserving, protecting and improving the quality of life for all organisms.
- use basic laboratory skills to explore topics in biology.
- use library and internet facilities to explore topics in biology.
- use basic mathematic, communication and critical thinking skills in the study of biology.

## Course Content

- Scientific method

- Attributes of science
- Steps in the scientific method
- Inductive and deductive reasoning
- Importance of controls, repeatability and peer review
- Limits to the scientific method
- Basic biological concepts
  - Characteristics common to all life forms; the virus debate
  - Importance of evolution as a central theory in biology
  - Hierarchical levels of organization in nature
  - Binomial nomenclature and taxonomy
    - Domains
    - Kingdoms
    - Classification of human beings
  - Important elements and molecules
    - The elements of life (CHNOPS)
    - Water
    - Macromolecules of life
      - Carbohydrates
      - Lipids
      - Proteins
      - Nucleic Acids
    - Cells
      - Characteristics common to all cells
      - Cell theory
      - Possible origin(s)
      - Prokaryotes and eukaryotes
      - Plasma membrane
        - Fluid Mosaic theory
        - Transport mechanisms
      - Eukaryotic organelles and functions
    - Energy metabolism and homeostasis
      - Physics background information
        - Definitions of energy, work and calories
        - Laws
          - Conservation of matter
          - Conservation of energy
          - Entropy
        - Synthesis and hydrolysis
        - Activation energy, enzymes, ATP
        - Cellular respiration
          - Glycolysis
          - Citric acid cycle
          - Oxidative phosphorylation
        - Photosynthesis
          - Light reaction
          - Calvin cycle
          - Environmental issues
            - Global warming
            - Ozone depletion
      - Nutrition
        - Water
        - Organic macromolecules: carbohydrates, lipids, and proteins
        - Recommendations for preventing cardiovascular disease
        - Vitamins and minerals
        - Eating disorders, including malnutrition and obesity
        - Dietary recommendations for cancer prevention
      - Molecular genetics
        - History, research and discoveries
        - DNA structure and reproduction
        - Protein synthesis: RNA, transcription, and translation
      - Reproduction
        - Cell cycle - interphase, mitosis and cytokinesis

2. Sexual reproduction and meiosis
3. Human gametogenesis
- I. Inheritance
  1. Phenotype as controlled by genotype
  2. Mendelian principles
  3. Non-mendelian inheritance
    - a. Sex-linked and sex influenced characteristics
    - b. Incomplete and co-dominance
    - c. Multifactorial inheritance
  4. Chromosome abnormalities
  5. Allele frequencies in different cultures
- J. Mutations and cancer
  1. Basic definitions - tumor, benign, malignant, metastasis
  2. Carcinogens
  3. Cancer's warning signals and safeguards
- K. Evolution
  1. Historical perspective
  2. Central theory in the study of biology
  3. Evidence for evolution
  4. Microevolution and macroevolution
  5. Coevolution
- L. Ecology
  1. Populations
  2. Human population growth: history and prospects for the future
  3. Communities
  4. Ecosystems
  5. Biosphere
  6. Environmental issues and global concerns

## Lab Content

- A. Scientific method
  1. Generating and testing hypotheses
  2. Identifying dependent, independent and controlled variables
  3. Critique experimental design
  4. Recording quantitative and qualitative observations
  5. Data analysis, including reporting and drawing conclusions
- B. Basic skills
  1. Critical thinking
  2. Mathematical calculations
  3. Generating and interpreting graphs
  4. Basics of probability theory applied to transmission genetics
  5. Use of library and internet sources
  6. Written and oral reports
- C. Biology lab skills
  1. Microscopy
  2. Weights and measures
  3. Field observations
- D. Basic principles
  1. Cell structure
  2. Homeostasis with emphasis on osmosis and pH
  3. Photosynthesis
  4. DNA structure and DNA profiling
  5. Inheritance and human genetic disorders
  6. Mitosis, meiosis and karyotypes
  7. Evolution and natural selection
  8. Ecology and conservation
  9. Applying scientific concepts to daily life issues

## Special Facilities and/or Equipment

- A. Fully-equipped biology laboratory, lecture room, microscopes, computer facilities, and audio visual equipment.

- B. When taught via Foothill Global Access, on-going access to computer with email software and hardware; email address.

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Instructors may use three or more of the following:

- A. One or more objective written midterm exam(s).
- B. Frequent laboratory quizzes that include both short essay and objective questions.
- C. Short essays.
- D. Genetic problems.
- E. Use of nutritional database.
- F. Written objective comprehensive final exam.

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

- A. Lecture
- B. Discussion
- C. Cooperative learning exercises
- D. Laboratory activities
- E. Field trips

## Representative Text(s) and Other Materials

Campbell, Neil A., L. G. Mitchell, and J. B. Reece. Biology: Concepts & Connections. 9th ed. San Francisco, CA: Benjamin Cummings, 2018. OpenStax Concepts of Biology: [openstax.org/details/books/concepts-biology](https://openstax.org/details/books/concepts-biology)

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Reading Assignments:

1. Weekly reading assignments from text
2. Supplemental reading assignments from web source relevant to course material

B. Writing Assignments:

1. Weekly assignments to answer questions and define vocabulary
2. 300-500 word essays: discuss previous interactions with nature, reflect on the impact these interactions to personal development, identify other individuals that should be introduced to this experience and consider the preservation of the habitat in which the experience took place
3. 500 word essay: summarize a critical evaluation of a daily menu discussing protein content, cardiovascular risk analysis, and cancer risk analysis

C. Computation and Writing Assignments:

1. Maintain and analyze a diet and exercise diary for one day
2. Construct and interpret graphs
3. Complete genetic analysis of DNA profile data
4. Calculate and critically evaluate inheritance problems using Mendelian principles

## **Discipline(s)**

Biological Sciences