

**PALOMAR COLLEGE**  
**COURSE OUTLINE OF RECORD FOR**  
**DEGREE CREDIT COURSE**

  x   Transfer course      x   A.A. degree applicable course  
(check all that apply)

**COURSE NUMBER AND TITLE:** Biology 101 General Biology (Lecture)

**UNIT VALUE:** 3

**MINIMUM NUMBER OF SEMESTER HOURS:** 48

**BASIC SKILLS REQUIREMENTS:** Appropriate language and computational skills

**ENTRANCE REQUIREMENTS** None

**PREREQUISITE:**

**COREQUISITE:**

**RECOMMENDED PREPARATION:**

**SCOPE OF COURSE:**

Basic principles of general biology as they relate to the cellular, organismic, and population levels of organization. Includes cell ultrastructure and function, energy transfer, reproduction, genetics, evolution, diversity of organisms, and ecology. *Not open to students with prior credit in BIOL 100.*

**SPECIFIC COURSE OBJECTIVES:** The successful student will:

1. use metric units and readily convert between units;
2. properly use and maintain the compound microscope;
3. describe the difference between science and non-science
4. discuss the characteristics of experimentation and observation;
5. design simple experiments;
6. describe the structure of an atom;
7. describe chemical bonds (covalent and ionic);
8. discuss the pH scale and the characteristics of acids and bases;
9. compare proteins, lipids, carbohydrates and nucleic acids;
10. compare prokaryotic and eukaryotic cells;
11. discuss transport of materials across biological membranes;
12. discuss the Laws of Thermodynamics;
13. compare mitosis and meiosis;
14. predict patterns of inheritance based on Mendel's Laws;
15. discuss human genetic disorders;
16. compare DNA and RNA;
17. describe the process of protein synthesis;
18. compare the regulation of genes in eukaryotic and prokaryotic cells;
19. compare aerobic cellular respiration and photosynthesis;

20. discuss mechanisms of evolution;
21. compare the five kingdoms in the Whittaker Classification System;
22. compare phylogenetic trends in the plant kingdom;
23. compare phylogenetic trends in the animal kingdom;
24. describe energy flow and nutrient cycling in ecosystems;
25. describe ecological succession;
26. compare aquatic and terrestrial ecosystems;
27. compare exponential and logistic growth;
28. discuss the impact of humans on ecosystems.

## CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:

- I. Introduction
  - A. Course Overview
  - B. Characteristics of Living Things
  - C. The Nature of Science Compared to Non-Science
  - D. Scientific Method
  - E. Experimental vs. Observational Science
  
- II. Chemistry
  - A. Atomic Structure: Subatomic Particles, Electron Shells
  - B. Chemical Bonding: Covalent, Ionic, Hydrogen Bonds
  - C. Biologically Important Compounds and Molecules
    1. Properties of Water
    2. Acids, Bases, Buffers
    3. Macromolecule Structure and Function: Carbohydrates, Lipids, Proteins, Nucleic Acids
  
- III. Cell Biology
  - A. Comparison of Prokaryotic and Eukaryotic Cell Structures
  - B. Eukaryotic Cell Structure
    1. Functions of Organelles
      - Nucleus
      - Ribosome
      - Endoplasmic Reticulum
      - Mitochondrion
      - Chloroplast
      - Lysosome
      - Golgi Complex
      - Peroxisome (Microbody)
      - Centriole
      - Cilium/Flagellum
      - Cytoskeleton
    2. Membrane Structure and Function
    3. Movement Across Membranes
      - Diffusion/Osmosis
      - Facilitated Diffusion
      - Active Transport
      - Endocytosis and Exocytosis
  - C. Energy Conversion in Eukaryotic Cells
    1. Laws of Thermodynamics
    2. Energy Flow: Photosynthesis, Cell Respiration

- a. Photosynthesis
  1. Structure of the Chloroplast
  2. Light Reaction of Photosynthesis
    - aa. Location
    - ab. Photosystems and Their Pigments
    - ac. The Role of H<sub>2</sub>O
    - ad. The Role of NADP
    - ae. The Role of Electron Transport
    - af. Chemiosmotic Phosphorulation
  3. Light independent Reaction - Calvin Cycle
    - aa. The Role of RuBP
    - ab. The Role of CO<sub>2</sub>
    - ac. The Role of NADPH<sub>2</sub>
    - ad. The Role of Rubisco Enzyme
    - ae. The Role of ATP
  4. How Are Cycles Dependent On One Another
  5. Overall Equation
- b. Cellular Oxidation of Glucose
  1. Mitochondrion Structure
  2. Glycolysis
    - aa. Where is ATP Required
    - ab. Where is ATP Produced
    - ac. What is Net Gain in ATP
    - ad. Compare Aerobic and Anaerobic Glycolysis
    - ae. What is the Role of NAD
    - af. What is the Purpose of Anaerobic Glycolysis
  3. Conversion of Pyruvate to AcCoA.
  4. Kreb's Cycle and the Role of AcCoA
    - aa. Role of NAD
    - ab. Role of FAD
    - ac. Net Gain of ATP
  5. Electron Transport System
    - aa. What is the Role of FADH<sub>2</sub> and NADH
    - ab. What are its Components
    - ac. What is the Role of O<sub>2</sub>
    - ad. How Much ATP is Produced Per NADH, FADH<sub>2</sub>
  6. Overall Equation For Cellular Oxidation of Glucose
  7. Net ATP Production Per Glucose

#### IV. Genetics: Heredity

- A. Mendel's Laws and Modern Genetic Terminology
- B. Monohybrid Crosses and Dihybrid Crosses
- C. Patterns of Inheritance
  1. Dominant/Recessive
  2. Sex-linked
  3. Incomplete Dominance
  4. Co-dominance
  5. Polygenic Inheritance
  6. Multiple Alleles
- D. The Genetics of ABO and Rh Blood Groups

- V. Genetics: Molecular
  - A. Structure and Replication of DNA
  - B. Structure of RNA
  - C. Transcription and Translation
  - D. Control of Expression
  - E. Techniques of Molecular Genetics
    - 1. DNA Fingerprint
    - 2. PCR
    - 3. Techniques For Inserting Genes Into Cells
  
- VI. Origin of Life
  - A. Spontaneous Generation
  - B. Chemosynthetic Origin
    - 1. Inorganics to Organics
    - 2. Organics to Macromolecules
    - 3. Protocells
    - 4. Other Considerations (RNA World?) As Time Permits
  
- VII. Evolution (Origin of Species)
  - A. History of Development of Evolutionary Principle
    - 1. Lamarck
    - 2. Cuvier
    - 3. Malthus
    - 4. Darwin
    - 5. Lyell
  - B. Mechanisms of Evolution
    - 1. Genetic Change
    - 2. Natural Selection
    - 3. Genetic Drift
  - C. Other Evolutionary Topics
    - 1. Adaptation
    - 2. Fitness
    - 3. Co-evolution/Co-adaptation
    - 4. Convergent vs. Parallel Evolution
  - D. Evidence For a Common Ancestry of Organisms (Evolution)
  - E. Speciation
    - 1. Allopatric
    - 2. Sympatric
    - 3. Parapatric
  - F. Human Evolution
  
- VIII. Diversity of Nature Survey
  - A. Kingdom Survey Monera
  - B. Kingdom Survey Protista
  - C. Kingdom Survey Fungi
  - D. Kingdom Survey Plantae
  - E. Kingdom Survey Animalia
  
- IX. Population Dynamics
  - A. General Population Characteristics
    - 1. Linear Growth

2. Exponential Growth
  3. Logistic Populations
  4. Carrying Capacity
  5. Limiting Factors
- B. Human Population Dynamics
1. Statistical Measures, eg., Birth Rate, Death Rate, Annual Percentage Growth Rate, etc.
  2. Differences Between More Developed Countries and Less Developed Countries
  3. Methods and Ethics of Human Population Control
- X. Ecology
- A. Ecosystem Structure
- A. Abiotic Factors
  - B. Biotic Factors
- B. The Flow of Energy in Ecosystems
1. Food Chains
  2. Food Webs
  3. Energy Pyramids
  4. Symbiotic Relationships
    - a. Communalism
    - b. Mutualism
    - c. Parasitism
- C. Major Ecosystems
1. Marine
  2. Aquatic
  3. Estuarine
  4. Terrestrial
- D. Biogeochemical Cycles
1. Nitrogen
  2. Phosphorus
  3. Carbon/Oxygen
  4. Soil
  5. Water
- E. Succession
1. Primary
  2. Secondary
- F. Others Topics in Ecology
1. Biological Magnification
  2. Feedback Loops
- G. Controversies in Ecology
1. Greenhouse Warming
  2. Ozone Depletion
  3. Endangered Species List

## REQUIRED READING:

Campbell, N., L. Mitchell, & J. Reese, Biology Concepts and Connections. 2nd Edition. Menlo Park: Benjamin Cummings Publishing Company, 1997.

Ebert, Robert. General Biology Television Notes. 2nd Edition. Vista: Reinhardt Publishers, 1991.

## SUGGESTED READING:

None

## REQUIRED WRITING:

During each unit of study, each student will answer about twenty essay questions designed to promote critical thinking and to integrate concepts. Each student also completes about twenty genetics problems designed to use principles of genetics and problem solving skills. The responses typically range from one to several paragraphs.

## OUTSIDE ASSIGNMENTS:

**Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.**

Outside assignments include readings, preparation for examinations, and problem solving assignments such as genetics problems. Additionally, reading of selected published articles may be required.

## INSTRUCTIONAL METHODOLOGY:

### Check all that apply:

- lecture
- laboratory
- lecture-laboratory combination
- directed study

**This course may be offered as a distance learning course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380.**

Yes  No

**If yes, check all that apply.**

- Television Course (Video one-way, e.g. ITV, video cassette, etc.)
- Online Course (Text one-way, e.g. newspaper, correspondence, electronic file, etc.)
- Two-Way Video Conferencing (Two-way interactive video and audio)
- One-Way Video Conferencing (One-way interactive video and two-way interactive audio)
- Computer Assisted Instruction (A specialized form of mediated instruction relying primarily on student access to information and prepared lessons or teaching materials through a computer terminal, but not under immediate supervision of a qualified instructor.)

**GRADING POLICY AND STANDARDS** (include methods of determining whether the stated objectives have been met by students):

The course grade may be evaluated by examinations, reports and other assignments. At least 70% of the course grade is determined by examinations and quizzes, and up to 30% of the course grade may be determined by other assignments.

**IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?**

Yes  No  Number of times course may be taken for credit: 1

If yes, identify specific provision of Title 5 Division 2 section(s), 55761-55763 and 58161 which qualifies course as repeatable:

**CONTACT PERSON:** Daniel Sourbeer, x2775

**SIGNATURES:**

**SIGNATURES ON FILE**

October 6, 2000  
\\new-bio101.course outline  
9/00