



# BROWARD COMMUNITY COLLEGE COURSE OUTLINE

**LAST REVIEW: 2002-2003**

*(i.e. 2003-2004)*

**NEXT REVIEW: 2007-2008**

*(i.e. 2008-2009)*

**STATUS: A**

*(A, I, D)*

**COURSE TITLE: General Biology**

**COMMON COURSE NUMBER: BSC 1005**

**CREDIT HOURS: 3**

**CONTACT HOUR BREAKDOWN**

*(per 16 week term)*

**CLOCK HOURS:**

*(Voc. Course ONLY)*

Lecture: **48**

Lab:

Clinic:

Other:

**PREREQUISITE(S): None**

**COREQUISITE(S): None**

**PRE/COREQUISITE(S): None**

**COURSE DESCRIPTION** *(750 characters, maximum):*

Course designed to give students an understanding of biological principles, while focusing on the nature and activities of living organisms. Course primarily for non-science majors (see BSC 1005L).

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): 4A

General Education Requirements – Associate in Science Degree (AS), meets Area(s): 4A

## UNIT TITLES

1. Introduction
2. Atoms, Chemical Bonding, and Compounds
3. Cell Structure and Function
4. Energetics
5. Transmission Genetics
6. Molecular Genetics
7. Selected Additional Topics Included at Discretion of Instructor



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## ASSESSMENT:

Please provide a brief description (250 characters maximum) that details how students will be assessed on the course outcomes.

*\*\*\* Complete the following only if course is seeking general education status \*\*\**

## GENERAL EDUCATION Competencies and Skills \*:

Please highlight in green font all Competencies/Skills from the list below that apply to this course. In the box to the right of the Competency/Skill, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 5.12) that apply.

1. Read with critical comprehension	7.0
2. Speak and listen effectively	
3. Write clearly and coherently	
4. Think creatively, logically, critically, and reflectively (analyze, synthesize, apply, and evaluate)	1.2; 3.1; 4.13; 5.13; 5.15; 6.1; 6.2
5. Demonstrate and apply literacy in its various forms: (highlight in green ALL that apply) (1. technological, 2. informational, 3. mathematical, 4. scientific, 5. cultural, 6. historical, 7. aesthetic and/or 8. environmental )	(1) 7.1.5 (2) 7.1.10 (3) 5.8, 5.15, 5.16 (4) 1.1 – 1.4; 2.1 – 2.13; 3.1 – 3.13; 4.1 – 4.13; 5.1 – 5.18; 6.1 – 6.12 (8) 4.1
6. Apply problem solving techniques to real-world experiences	
7. Apply methods of scientific inquiry	1.2, 1.4, 3.1, 6.1, 6.2
8. Demonstrate an understanding of the physical and biological environment and how it is impacted by human beings	
9. Demonstrate an understanding of and appreciation for human diversities and commonalities	
10. Collaborate with others to achieve common goals.	
11. Research, synthesize and produce original work	
12. Practice ethical behavior	
13. Demonstrate self-direction and self motivation	
14. Assume responsibility for and understand the impact of personal behaviors on self and society	
15. Contribute to the welfare of the community	

*\* General Education Competencies and Skills endorsed by '05-'06 General Education Task Force*



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## UNITS

### Unit 1 Introduction

#### General Outcome:

- 1.0 The students will be able to recognize the basic characteristics of life and describe the nature of science.

#### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 1.1 List the major characteristics of life.
- 1.2 Explain how science is distinguished from other ways of seeking understanding of life.
- 1.3 Analyze the significance of major unifying principles of modern biology.
- 1.4 Evaluate the limitations of science.



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### Unit 2 Atoms, Chemical Bonding, and Compounds

#### General Outcome:

- 2.0 The students will be able to explain the structure of atoms, chemical bonding, properties of water, and the groups of organic molecules associated with life.

#### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 2.1 Explain how the structure of an atom determines its chemical properties and the kinds of bonds it can form.
- 2.2 Describe and explain ionic and covalent bonding.
- 2.3 Name the elements that make up the majority of all living matter.
- 2.4 Recognize the structure of the water molecule, showing areas of positive and negative charge.
- 2.5 Describe a hydrogen bond.
- 2.6 List the major chemical and physical properties of water which result from the hydrogen bonding between water molecules.
- 2.7 Describe the ionization of water and describe the pH scale.
- 2.8 Explain why the carbon atom plays a central role in the formation of organic molecules.
- 2.9 Describe the condensation and hydrolysis of carbohydrates. List examples of monosaccharides, disaccharides, and polysaccharides.
- 2.10 Describe the condensation and hydrolysis of triglycerides and other lipids such as steroids, phospholipids, and waxes.



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- 2.11 Describe the structure of an amino acid and how polypeptides are formed. Explain protein variety in terms of amino acid arrangement.
- 2.12 Define primary, secondary, tertiary and quaternary structure of proteins and relate the structures to protein function.
- 2.13 Describe nucleic acid structure and function.



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### Unit 3 Cell Structure and Function

#### General Outcome:

- 3.0 The students will be able to describe a theory of the origin of cells, distinguish prokaryotic and eukaryotic cells, list cell organelles and their functions, describe membrane function, and detail the phases of mitosis and their significance.

#### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 3.1 Compare theories and significant experiments that explain the origin of life on earth.
- 3.2 Define the terms heterotroph, autotroph, prokaryote and eukaryote.
- 3.3 Describe the structure of a cell membrane and a cell wall. Explain how they differ in function.
- 3.4 Describe the structure and function of the nucleus and the following cell organelles: ribosome, endoplasmic reticulum, Golgi body, lysosome, chloroplast, mitochondrion, and vacuole.
- 3.5 Describe microtubules and microfilaments and their role in support and movement.
- 3.6 Discuss the biological importance of maintaining a chemical composition that is different from that of the surrounding medium.
- 3.7 Explain the fluid mosaic model of membrane structure.
- 3.8 Compare and contrast movement through the cell membrane by diffusion, osmosis, facilitated diffusion, and active transport.
- 3.9 Describe endocytosis and exocytosis.
- 3.10 List essential life processes that depend on production of new cells identical to the parent cell.



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- 3.11 Diagram the life cycle of a cell, describing major events which occur in each phase —  $G_1$ , S,  $G_2$ , M.
- 3.12 List the phases of mitosis and describe the significant events occurring in each.
- 3.13 Contrast cytokinesis in plant and animal cells.



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### Unit 4 Energetics

#### General Outcome:

- 4.0 The students will be able to explain the energy requirements of cells, the central role of ATP, the generation of ATP during cellular respiration, the production of food by photosynthesis, and the role of enzymes in controlling chemical processes in cells.

#### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 4.1 Explain how most living things are dependent upon the radiant energy of the sun.
- 4.2 Relate the laws of thermodynamics to the constant energy requirement of cells.
- 4.3 Describe an oxidation-reduction reaction.
- 4.4 Describe the biological importance of enzymes and coenzymes and explain how they work.
- 4.5 Explain why ATP is often called the "universal currency" of the cell and describe how it performs its important function.
- 4.6 Recognize the summary equation for the oxidation of glucose to form carbon dioxide and water.
- 4.7 Detail the anaerobic process of fermentation in microorganisms and the production of lactic acid in human muscle during vigorous exercise.
- 4.8 Describe glycolysis, Krebs's cycle, and the electron transport chain; list where each occurs, relative energy yield, and major events of each phase.
- 4.9 Recognize the overall equation for photosynthesis
- 4.10 Recognize that life depends upon the visible portion of the electromagnetic spectrum and the chemical process of photosynthesis.
- 4.11 Describe the events of the light dependent and light independent reactions of photosynthesis, explaining how the latter reactions depend on the



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products of the former reactions, and list where each occurs within the chloroplast.

- 4.12 Recognize PGAL as the key building block molecule produced in photosynthesis.
- 4.13 Compare and contrast photosynthesis and respiration.



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### Unit 5 Transmission Genetics

#### General Outcome:

- 5.0 The students will be able to understand the principles of heredity as first worked out by Gregor Mendel and extended by others both in regard to chromosome behavior and to the statistical ratios of traits among offspring.

#### Specific Measurable Learning Outcomes:

**Upon successful completion of this unit, the student shall be able to:**

- 5.1 Discuss the two divisions of meiosis and their effect on the chromosome number.
- 5.2 Describe the important events of meiosis I and II: prophase, metaphase, anaphase, telophase.
- 5.3 Compare meiosis to mitosis, especially with regard to centromeres and homologues.
- 5.4 Compare spermatogenesis and oogenesis in humans.
- 5.5 Explain the connection between meiosis and trisomy-21.
- 5.6 State Mendel's first principle of inheritance and give examples.
- 5.7 Define: dominant, recessive, allele, homozygous, heterozygous, genotype, phenotype, segregation, recombination.
- 5.8 Explain Mendel's ratios in terms of probability.
- 5.9 Recount Mendel's second principle of inheritance involving two traits, giving an example.
- 5.10 Define and give examples of incomplete dominance and codominance.
- 5.11 Define and give examples of multiple allele inheritance.
- 5.12 Define and give examples of polygenic inheritance.



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- 5.13 Explain Mendel's principles of segregation and independent assortment in terms of chromosome behavior during meiosis.
- 5.14 Give a chromosomal explanation of sex determination.
- 5.15 Analyze the genetics of sex-linked traits.
- 5.16 Contrast the effect of gene linkage on the ratio expected in a dihybrid test cross.
- 5.17 Describe the use of genetic recombination to construct chromosome maps.
- 5.18 Give examples of chromosome mutations.



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### Unit 6 Molecular Genetics

#### General Outcome:

- 6.0 The students will be able to understand the chemical and physical structure of the gene and its operation in the synthesis of polypeptides.

#### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 6.1 Chronicle the experimental evidence by key researchers leading to the Watson/Crick Model of DNA.
- 6.2 Chronicle the experimental evidence leading to an understanding of gene function.
- 6.3 Describe the Watson and Crick Model of DNA and the Central Dogma of molecular biology.
- 6.4 Describe DNA replication.
- 6.5 Define gene amplification, introns, and exons.
- 6.6 Contrast an RNA nucleotide with one of DNA.
- 6.7 Describe the transcription of RNA.
- 6.8 Discuss the structure and function of tRNA, mRNA, and rRNA.
- 6.9 Define codon and grasp the significance of the tabulated genetic code.
- 6.10 Characterize the three stages of polypeptide synthesis with regard to the structure of the ribosome.
- 6.11 Discuss gene control.
- 6.12 Discuss mutation and give examples such as point mutation, substitution, insertion, deletion and illustrate with appropriate examples.



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## Unit 7 Selected Additional Topics Included at Discretion of Instructor

### General Outcome:

- 7.0 The students will be able to demonstrate reading with critical comprehension by completing a variety of classroom assessments selected by the instructor.

### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 7.1 Demonstrate reading with critical comprehension by completing a variety of instructor selected classroom assessments from the following list:
- 7.1.1 Animal Behavior
  - 7.1.2 Ecology
  - 7.1.3 Reproduction and Development
  - 7.1.4 Human Evolution
  - 7.1.5 Genetic Engineering
  - 7.1.6 Human Anatomy and Physiology
  - 7.1.7 Human Diseases
  - 7.1.8 Evolution
  - 7.1.9 Diversity of Life
  - 7.1.10 Current Topics in Biology
  - 7.1.11 Bioethical Issues