

---

**CODE:** BIOL 105

**TITLE:** Life Sciences

**DIVISION:** Science & Health Science

**DEPARTMENT:** Biology

**COURSE DESCRIPTION:** This course is intended to meet a laboratory science requirement for the non-science major. Through laboratory exercises and classroom experiences the student will demonstrate an appreciation of life phenomena and the diversity of living organisms. Topics include basic metabolic functions that create and sustain life, reproduction, growth, development behavior and adoption of selected life forms and the interactions among living organisms.

**PREREQUISITES:** A grade of “C” or higher in MATH 012, MATH 015 or passing score in computation on Basic Skills Test and READ 095 or passing score on reading on Basic Skills Test, ENGL 095 or passing score in writing on Basic Skills test

**PREREQUISITES OR COREQUISITES:**

**COREQUISITES:**

**CREDITS:** 4

**LECTURE HOURS:** 3

**LAB/STUDIO HOURS:** 2

---

**REQUIRED MATERIALS:**

**BIOLOGY:** Concepts and Connections by Neil Campbell, Jane Reece, Larry Mitchell and Martha Taylor, Sixth Edition, 2009  
Pearson Education, Inc. (Pearson Benjamin Cummings Publishing Company)

**Laboratory Manual:** Life Sciences – BIOL 105

**ADDITIONAL TIME REQUIREMENTS:**

Additional weekly lab time is required. (See instructor)

**COURSE LEARNING OUTCOMES:**

The student will be able to:

- Demonstrate comprehension and application of basic biological concepts: (Mathematical/Scientific Reasoning/Information Literacy)
  - properties of life
  - chemistry of life
  - cell structure & function
  - genetics and heredity
  - reproduction & development
- Employ the scientific method of inquiry to gather and use information for the express purposes of critical thinking, information analysis, and problem solving. (Mathematical/Scientific Reasoning/Information Literacy)
- Use appropriate technology. (Mathematical/Scientific Reasoning/Information Literacy)

**GRADING STANDARD:**

A student must have an average of 65% or better for the classroom component and an average of 65% or better for the laboratory component of the course in order to earn a passing grade for the course.

Upon completion of the course, grades will be assigned as follows:

A = 92 – 100%  
A- = 89 - 91%  
B+ = 86 - 88%  
B = 82 - 85%  
B- = 79 - 81%  
C+ = 76 - 78%  
C = 70 - 75%  
D = 65 - 69%  
F = <65%

**Unit examination results will be reported as the grade assigned by the faculty calculated to the first decimal place. These grades will be weighed according to course grading policy. In calculating the course grade, 0.5 will round up to the next numerical grade and 0.4 will round down to the next lower numerical grade.**

A grade of C or better is required in all pre-requisite courses. Career studies courses must have a grade of C or better to count toward the Mathematics / Science Program – Biology Option.

Students are permitted to withdraw from the course without penalty until approximately 80% of the semester is complete. Please see term schedule for the exact deadline.

At the end of the semester, application for an Incomplete may be made if a student with proper documentation needs to complete no more than one lecture exam and/or one laboratory practical. The granting of an Incomplete is at the discretion of the instructor.

**COURSE CONTENT:**

UNIT ONE:	INTRODUCTION TO LIFE SCIENCES
UNIT TWO:	CHEMICAL BASIS OF LIFE
UNIT THREE:	CELLULAR BASIS OF LIFE
UNIT FOUR:	CELLULAR RESPIRATION AND PHOTOSYNTHESIS
UNIT FIVE:	REPRODUCTION AND GENETICS
UNIT SIX:	DNA STRUCTURE, FUNCTION AND PROTEIN SYNTHESIS
UNIT SEVEN:	EVOLUTION AND DIVERSITY

**DEPARTMENT POLICIES:**

**Attendance** during class and laboratory sessions is strongly recommended for optimum performance in biology courses.

**Laboratory practicals** will be given during laboratory sessions, in accordance with schedules provided by the learning assistants. Exams and practicals must be taken at the times designated by the instructor or learning assistant. A student who misses a lecture exam or laboratory practical must provide prior notification and proper documentation in order to take the exam or laboratory practical. The acceptance of said prior notification and proper documentation will be determined by the instructor.

**Documentation** must be provided within one week of the student's return to the classroom for a make-up exam or laboratory practical to be scheduled. A student who is unable to provide proper documentation for a missed exam or laboratory practical will be given a grade of zero for that exercise. Students may not re-take exams or laboratory practicals on which they perform poorly. Requirements for the completion of laboratory are listed in the laboratory responsibility sheets for individual courses. Requirements for course completion are listed in individual instructor syllabi.

**COLLEGE POLICIES:**

For information regarding:

- ◆ Brookdale's Academic Integrity Code
- ◆ Student Conduct Code
- ◆ Student Grade Appeal Process

Please refer to the **STUDENT HANDBOOK AND BCC CATALOG.**

**NOTIFICATION FOR STUDENTS WITH DISABILITIES:**

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify must contact the Disabilities Services Office at 732-224-2730 or 732-842-4211 (TTY), provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

**ADDITIONAL SUPPORT/LABS:**

Course Website:

Biology Department information and BIOL 105 resources are available on the Brookdale website:

<http://www.brookdalecc.edu/pages/802.asp>

Name of Unit: **Introduction to Life Sciences**

Textbook: Chapter 1

Method of Evaluation: Exams, quizzes, assignments, laboratory exercises and practicals

Recommended Learning Experiences: Class discussion, textbook readings, computer laboratory assignments, laboratory experiences

<b>Learning Objectives:</b>	<b>Textbook Readings:</b>
-----------------------------	---------------------------

The student will be able to:

- |   |                                     |
|---|-------------------------------------|
| 1. Describe how a scientist would investigate a problem using the scientific method.  | pages 9-11                          |
| 2. List and describe the characteristics of living organisms.   | pages 4-5                           |
| 3. Describe life's hierarchy of organization.   | pages 2-3                           |
| 4. Identify the biological system of classification, describing the grouping of organisms into three domains and five kingdoms. | pages 6-7                           |
| 5. Discuss Darwin's Theory of Natural Selection and its implication for diversity of life.                                      | pages 8-9                           |
| 6. Discuss bioethics and relate to various examples found throughout current events.  | pages 221-223, 232-241, & 248-249   |
| 7. Successfully complete assigned laboratory experiences: <ul style="list-style-type: none"> <li>• Microscopy</li> </ul>        | Laboratory manual – Lab Exercise #1 |

<u>Name of Unit:</u>	<b>Chemical Basis of Life</b>
<u>Textbook:</u>	Chapters 2 and 3
<u>Method of Evaluation:</u>	Exams, quizzes, assignments, laboratory exercises and practicals
<u>Recommended Learning Experiences:</u>	Class discussion, textbook readings, computer laboratory assignments, laboratory experiences

**Learning Objectives:****Textbook Readings:**

The student will be able to:

1. Define the following terms: pages 18-23
  - subatomic particles
  - atom
  - atomic number
  - atomic mass
  - valence
  - orbital
  - element
  - molecule
  - compound
  - matter – 3 states
  - isotope
  - ion
2. Use the periodic table to determine atomic number and atomic mass for the following atoms: page 22

carbon, hydrogen, nitrogen and oxygen

Draw the atomic structure for each.
3. Describe the following chemical bonds and give an example of a molecule where each is found: pages 22-25
  - hydrogen bond
  - ionic bond
  - covalent bonds
4. Describe the properties of water and their importance to biological systems. pages 24-26
  - Temperature stability
  - Polarity
  - Cohesion and Adhesion
  - Solvent properties
  - Density

5. Define acids and bases and give examples for each. page 27
6. Define pH and draw a simple pH scale indicating the range for acid and basic solutions. pages 27

**BIOL 105**

**LIFE SCIENCES**

**#2 OF 7 Units**

**4 credits**

<b>Learning Objectives:</b>	<b>Textbook Readings:</b>
7. Describe the role of buffers in biological systems.	page 27
8. Demonstrate an understanding of chemical reactions.	pages 29 & 36
9. Describe the role of carbon in organic molecules and distinguish between organic and inorganic molecules.	page 34
10. Define functional groups and describe their importance in macromolecules.	page 35
11. Define: <ul style="list-style-type: none"> <li>• macromolecules</li> <li>• monomers</li> <li>• polymers</li> <li>• dehydration synthesis and hydrolysis reactions.</li> </ul>	page 36
12. Demonstrate an understanding of the structures and functions of the four major types of macromolecules: <ul style="list-style-type: none"> <li>• carbohydrates</li> <li>• lipids</li> <li>• proteins</li> <li>• nucleic acids.</li> </ul>	pages 37-47
13. Successfully complete assigned laboratory experiences: <ul style="list-style-type: none"> <li>• Measurement</li> <li>• Chemical Composition of Cells</li> </ul>	Laboratory manual – Lab Exercise #2 Laboratory manual – Lab Exercise #3

Name of Unit:                      **Cellular Basis of Life**

Textbook:                      Chapters 4, 5 & 8

Method of Evaluation:                      Exams, quizzes, assignments, laboratory exercises and practicals

Recommended Learning Experiences:                      Class discussion, textbook readings, computer laboratory assignments, laboratory experiences

<b>Learning Objectives:</b>	<b>Textbook Readings:</b>
-----------------------------	---------------------------

The student will be able to:

- |  |             |
|--|-------------|
| 1. Describe The Cell Theory.   | pages 52    |
| 2. Compare light and electron microscopes and discuss their use in studying cell size, shape and complexity.   | pages 52-54 |
| 3. Describe the differences between eukaryotic and prokaryotic cells.  | pages 55-57 |
| 4. Compare the relative sizes of plant, animal and bacterial cells.  | page 54     |
| 5. Describe the major structural divisions of a typical eukaryotic cell: <ul style="list-style-type: none"><li>• plasma membrane</li><li>• cytoplasm with organelles</li><li>• nucleus</li></ul>   | pages 56-59 |
| 6. Define the term “organelle”. Identify and describe the structures and functions of the following: <ul style="list-style-type: none"><li>• Nucleus<br/>    Nucleolus, Chromatin, Nuclear envelope, Nuclear pore</li><li>• Cytoplasm</li><li>• Ribosome</li><li>• Endoplasmic reticulum – rough and smooth</li><li>• Golgi apparatus</li><li>• Lysosome</li><li>• Chloroplast</li><li>• Mitochondria</li><li>• Storage vesicles</li><li>• Central vacuole</li><li>• Cytoskeleton<br/>    Microtubules, Intermediate filaments, Microfilaments</li><li>• Centrioles</li><li>• Flagella and cilia</li><li>• Plasma membrane</li><li>• Cell wall</li></ul> | pages 56-67 |

**Learning Objectives:****Textbook Readings:**

7. List and describe the components of the plasma membrane: pages 74
- Phospholipids
  - Cholesterol
  - Proteins
  - Carbohydrates
8. Describe the “Fluid Mosaic Model” of the plasma membrane. pages 74
9. Describe the following transport processes: pages 75-79
- Passive
    - Simple diffusion
    - Osmosis
    - Facilitated diffusion
  - Active
    - Active transport
    - Bulk transport (exocytosis & endocytosis)
10. Use the following terms to describe transport processes: pages 75-77
- solute
  - solvent
  - concentration gradient
  - tonicity (hyper-, hypo-, and iso-)
  - lysis
  - crenation
  - plasmolysis
  - turgor pressure
11. Describe the stages of the cell cycle: page 129
- Interphase ( $G_1, S, G_2$ )
  - Mitotic phase (Mitosis and Cytokinesis)
12. Describe the chromosome and its structures: page 128
- centromere
  - chromatid
  - kinetochore
  - homologous chromosomes
13. Describe the stages of mitosis: pages 130-131
- Prophase
  - Metaphase
  - Anaphase
  - Telophase
14. Describe cytokinesis in animal cells and plant cells to include: page 132
- cleavage furrow formation
  - cell plate formation

**Learning Objectives:****Textbook Readings:**

15. Describe cell cycle control systems and the relevancy of uncontrolled growth in cancer cells.

pages 133-135

16. Describe the purposes of cell division.

page 136

17. Successfully complete assigned laboratory experiences:

- Cell Structure and Function
- Diffusion and Osmosis
- Cell Division

Laboratory manual – Lab Exercise #4

Laboratory manual – Lab Exercise #5

Laboratory manual – Lab Exercise #6

**Name of Unit: Cellular Respiration and Photosynthesis**

**Textbook: Chapters 5, 6 & 7**

**Method of Evaluation: Exams, quizzes, assignments, laboratory exercises and practicals**

**Recommended Learning Experiences: Class discussion, textbook readings, computer laboratory assignments, laboratory experiences**

<b>Learning Objectives</b>	<b>Textbook Readings:</b>
----------------------------	---------------------------

The student will be able to:

- |   |               |
|---|---------------|
| 1. Discuss the Laws of Thermodynamics and how energy is converted through biological systems.   | pages 80-81   |
| 2. Define metabolism: <ul style="list-style-type: none"><li>• Endergonic reactions</li><li>• Exergonic reactions</li></ul>  | page 82       |
| 3. Discuss the role of ATP in the cell.   | pages 83      |
| 4. Describe the structure and functions of enzymes using the following terms: <ul style="list-style-type: none"><li>• Activation energy</li><li>• Active site</li><li>• Co-enzymes</li><li>• Denaturation</li><li>• Enzyme inhibitors</li><li>• Substrate</li></ul> | pages 84-85   |
| 5. State the summary equation for cellular respiration.   | pages 91      |
| 6. Describe the major pathways used in the process of cellular respiration: <ul style="list-style-type: none"><li>• Glycolysis</li><li>• Bridge reaction</li><li>• Citric Acid Cycle</li><li>• Electron Transport Chain</li></ul>                                   | pages 93-99   |
| 7. Compare and contrast aerobic respiration with fermentation.  | pages 100-101 |
| 8. Discuss the importance of carbohydrate, lipid and protein breakdown and how these molecules are utilized in aerobic respiration.   | page 102-103  |
| 9. State the summary equation for photosynthesis.   | page 107      |

**Learning Objectives:****Textbook Readings:**

10. Discuss the importance of plants as producers.	pages 107-108
11. Describe the basic structure of a leaf and its component parts: <ul style="list-style-type: none"> <li>• Epidermal layers – stomata and guard cells</li> <li>• Mesophyll layers – palisade and spongy</li> <li>• Vascular tissue – xylem and phloem</li> </ul>	pages 109 & 626-627
12. Describe the basic structure of a chloroplast: <ul style="list-style-type: none"> <li>• Granum</li> <li>• Thylakoid</li> <li>• Stroma</li> </ul>	pages 64 & 109
13. Describe the electromagnetic spectrum and the significance of visible light as an energy source for photosynthesis.	page 112
14. Describe the two stages of photosynthesis, including the location, raw materials and products of each: <ul style="list-style-type: none"> <li>• Light Reactions</li> <li>• Calvin Cycle</li> </ul>	pages 111 & 113-117
15. Describe the interrelationship between the Light Reactions and the Calvin Cycle.	page 111 & 117
16. Discuss C <sub>4</sub> and CAM plants in terms of adaptations and compare to C <sub>3</sub> plants.	page 118
17. Compare the processes of aerobic cellular respiration and photosynthesis to include locations, raw materials and products.	pages 90, 91, 110 & 117
18. Discuss the implications of the greenhouse effect and how photosynthesis moderates the effect.	page 119-120
19. Successfully complete assigned laboratory experiences: <ul style="list-style-type: none"> <li>• Enzymes</li> <li>• Photosynthesis</li> </ul>	Laboratory manual – Lab Exercise#7 Laboratory manual – Lab Exercise#8

Name of Unit:                      **Reproduction and Genetics**

Textbook:                              Chapters 8 and 9

Method of Evaluation:              Exams, quizzes, assignments, laboratory exercises and practicals

Recommended Learning Experiences:      Class discussion, textbook readings, computer laboratory assignments, laboratory experiences

<b>Learning Objectives:</b>	<b>Textbook Readings:</b>
The student will be able to:	
1. Define asexual reproduction. Describe the following types of asexual reproduction: <ul style="list-style-type: none"> <li>• Binary fission</li> <li>• Budding</li> </ul>	pages 126-127, 136 & 534
2. Define sexual reproduction. Briefly describe the stages of sexual reproduction: <ul style="list-style-type: none"> <li>• meiosis</li> <li>• fertilization</li> </ul>	pages 126-127, 136-139
3. Describe advantages and disadvantages of sexual and asexual reproduction.	page 126
4. Describe meiosis and the following terms/concepts: <ul style="list-style-type: none"> <li>• haploid &amp; diploid</li> <li>• gamete &amp; somatic cell</li> </ul>	pages 136-140
5. Explain how fertilization restores the diploid number in offspring during sexual reproduction.	page 137
6. Explain how sexual reproduction produces genetic variation in offspring: <ul style="list-style-type: none"> <li>• crossing over</li> <li>• independent assortment</li> <li>• random fertilization</li> </ul>	pages 141-143 & 172-173
7. Describe Gregor Mendel's contributions to the study of genetics: <ul style="list-style-type: none"> <li>• Principle of Segregation</li> <li>• Principle of Independent Assortment</li> </ul>	pages 156-159
8. Relate the following terms to Mendelian Genetics: <ul style="list-style-type: none"> <li>• genes</li> <li>• alleles</li> <li>• locus</li> <li>• genotype</li> <li>• phenotype</li> <li>• homozygous/heterozygous</li> <li>• dominant/recessive</li> </ul>	pages 154-157

**Learning Objectives:****Textbook Readings:**

8. Relate the following terms to Mendelian Genetics (cont'd):	
<ul style="list-style-type: none"> <li>• traits and characters</li> <li>• monohybrid and dihybrid</li> <li>• cross fertilization</li> <li>• homologous chromosomes</li> </ul>	pages 154-159
9. Follow Mendelian principles to perform Punnett square analyses to predict the results of monohybrid and dihybrid crosses in Mendel's pea plants.	pages 156-159
10. Discuss the use of a testcross to determine an unknown genotype.	page 159
11. Describe extensions of Mendelian genetics:	pages 166-169, 172 & 174-177
<ul style="list-style-type: none"> <li>• incomplete dominance</li> <li>• codominance</li> <li>• polygenic inheritance</li> <li>• pleiotrophy</li> <li>• epistasis</li> <li>• multiple alleles</li> <li>• gene linkage</li> <li>• sex linkage</li> </ul>	
12. Explain the chromosomal theory of inheritance. Include a description of a karyotype.	pages 144 & 170-171
13. Describe and give examples of abnormalities in chromosome structure and number:	pages 145-148
<ul style="list-style-type: none"> <li>• deletion, duplication, translocation, inversion</li> <li>• aneuploidy due to nondisjunction: <ul style="list-style-type: none"> <li>-monosomy and trisomy: <ul style="list-style-type: none"> <li>○ Down Syndrome</li> <li>○ Turner Syndrome</li> <li>○ Klinefelter Syndrome</li> <li>○ XYY</li> <li>○ XXX</li> </ul> </li> </ul> </li> </ul>	
14. Describe and give examples of autosomal dominant and recessive inheritance.	Table 9.9 on page 163
15. Describe a pedigree and apply it to various examples of human genetic disorders.	pages 161-163 & 177
16. Successfully complete assigned laboratory experiences:	
<ul style="list-style-type: none"> <li>• Reproduction</li> <li>• Genetics</li> </ul>	Laboratory manual – Lab Exercise#9 Laboratory manual – Lab Exercise#10

<u>Name of Unit:</u>	<b>DNA Structure, Function and Protein Synthesis</b>
<u>Textbook:</u>	Chapters 8, 9, 10, 11, 12
<u>Method of Evaluation:</u>	Exams, quizzes, assignments, laboratory exercises and practicals
<u>Recommended Learning Experiences:</u>	Class discussion, textbook readings, computer laboratory assignments, laboratory experiences

<b>Learning Objectives:</b>	<b>Textbook Readings:</b>
-----------------------------	---------------------------

The student will be able to:

- |   |                         |
|---|-------------------------|
| 1. Describe important scientific events leading to the discovery of the DNA molecule and as the genetic material in living organisms.   | pages 182-183 & 186-187 |
| 2. Review the structure of DNA.   | pages 46-47 & 184-187   |
| 3. Demonstrate an understanding of the process of DNA replication.  | pages 188-189           |
| 4. Describe the process of protein synthesis: <ul style="list-style-type: none"> <li>• Transcription</li> <li>• Translation</li> </ul>  | page 190-198            |
| 5. Describe the events of transcription to include the following: <ul style="list-style-type: none"> <li>• DNA sense strand</li> <li>• triplet</li> <li>• RNA polymerase</li> <li>• mRNA</li> <li>• codon</li> </ul>            | pages 190-191 & 193-194 |
| 6. Describe the events of translation to include the following: <ul style="list-style-type: none"> <li>• mRNA</li> <li>• ribosome</li> <li>• tRNA</li> <li>• anticodon</li> <li>• amino acids</li> <li>• polypeptide</li> </ul> | pages 190 & 194-198     |
| 7. Given the sequence of nucleotides on the sense strand of DNA, use the dictionary of the genetic code to determine the correct amino acid sequence in a polypeptide.  | page 192                |
| 8. Describe the impact of the following mutations on protein synthesis: <ul style="list-style-type: none"> <li>• point (base substitution)</li> <li>• frameshift (base addition or deletion)</li> </ul>                         | page 199                |
| 9. Discuss the Human Genome Project and its impact.   | pages 248-249           |

<u>Name of Unit:</u>	<b>Evolution and Diversity</b>
<u>Textbook:</u>	Chapters 13, 15, 16, 17, 18
<u>Method of Evaluation:</u>	Exams, quizzes, assignments, laboratory exercises and practicals
<u>Recommended Learning Experiences:</u>	Class discussion, textbook readings, computer laboratory assignments, laboratory experiences

<b>Learning Objectives:</b>	<b>Textbook Readings:</b>
The student will be able to:	
1. Review Natural Selection as the mechanism of evolution. Cite evidence that supports the Theory of Evolution.	pages 8-9 pages 255-265
2. Demonstrate an understanding of a general geologic time scale, focusing on the following: <ul style="list-style-type: none"> <li>• origin of the earth</li> <li>• evolution of the prokaryotes</li> <li>• evolution of the first eukaryotes</li> <li>• oxygen accumulation in the atmosphere</li> <li>• evolution of the first animals</li> <li>• evolution of the land plants</li> </ul>	pages 294-299 & 318-319
3. Review the biological system of classification, describing the grouping of organisms into three domains and five kingdoms.	pages 6-7 page 308-309
4. Describe the characteristics of a virus and discuss whether or not viruses should be considered living.	pages 200-203
5. Describe the basic characteristics of prokaryotes classified in the kingdom Monera.	pages 320-327
6. Describe the characteristics of organisms within the kingdom Protista. Differentiate the following protists: <ul style="list-style-type: none"> <li>• algae</li> <li>• slime molds</li> <li>• protozoans</li> </ul>	pages 330-336
7. Discuss the general characteristics of fungi.	pages 355-361
8. Describe the characteristics of plants and distinguish between non-vascular and vascular plants and non-seed and seed plants.	pages 342-354

**Learning Objectives:****Textbook Readings:**

- |  |  |
|--|--|
| 9. Describe the general characteristics of organisms classified in the kingdom Animalia.   | pages 366-369  |
| 10. Demonstrate an understanding of 4 basic features of the animal body and explain how these features are used to classify animals: <ul style="list-style-type: none"><li>• symmetry</li><li>• tissue organization</li><li>• body cavity</li><li>• protostome versus deuterostome</li></ul> | page 368-369   |
| 11. Review the basic characteristics of animals classified into each of the nine major animal phyla while focusing on the difference between invertebrates and vertebrates.  | pages 370-383 & 390-399  |
| 12. Successfully complete assigned laboratory experiences: <ul style="list-style-type: none"><li>• Diversity of Life I &amp; II</li></ul>  | Laboratory manual – Lab Exercise#11<br>Laboratory manual – Lab Exercise#12 |