

# Syllabus

**Course Code: BIOL 101**

**Title: General Biology I**

**Institute: STEM**

**Department: Biology**

**Course Description:** This introductory level course is designed for science majors and for students in other majors that require a laboratory science course. Through exercises in the laboratory and classroom experiences, the student will demonstrate the ability to identify, describe and interpret basic biological concepts. These concepts include the chemical basis of life, levels of organization, photosynthesis, cellular respiration, metabolism, and genetic continuity and heredity. Scientific inquiry utilizing the scientific method is emphasized throughout the course.

**Prerequisites:** HS Biology or a grade of "C" or higher in BIOL 105; HS Chemistry or a grade of "C" or higher in CHEM 100 or CHEM 136; a grade of "C" or higher in MATH 021, MATH 025, or satisfactory completion of the College's foundational studies requirement in algebra; READ 095 or satisfactory completion of the College's foundational studies requirement in reading; ENGL 095 or satisfactory completion of the College's foundational studies requirement in writing.

**Corequisites:**

**Prerequisites or corequisites:**

**Credits: 4**

**Lecture Hours: 3**

**Lab/Studio Hours: 3**

---

**Required Textbook/Materials:** CAMPBELL BIOLOGY; LA Urry, ML Cain, SA Wasserman, PV Minorsky, RB Orr Twelfth Edition, 2021 Pearson.

**Additional Time Requirements:** Additional weekly lab time may be required to practice lab skills. (See instructor)

**Additional Support/Labs:**

See <https://www.brookdalecc.edu/academic-tutoring/>

**Course Learning Outcomes:**

- Demonstrate comprehension and application of basic biological concepts:
  - properties of life chemistry of life
  - cell structure and function
  - photosynthesis, cellular respiration and metabolism
  - genetics and heredity
- Employ the **scientific method** of inquiry to gather and use information for the express purposes of critical thinking, information analysis, and problem solving; (SC)
- Use appropriate technology.

*Learning Outcome(s) support the following General Education Knowledge Areas:*

- (SC) Sciences

**Course Content:**

Unit One:	Introduction and Philosophy of Life Sciences
Unit Two:	Chemistry of Life – An Introduction
Unit Three:	Cell Structure and Function
Unit Four:	Cellular Respiration and Photosynthesis
Unit Five:	Principles of Heredity
Unit Six:	Human Genetics
Unit Seven:	Nucleic Acids – Protein Synthesis

**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 instructional assistants. Exams and practicals must be taken at the times designated by the instructor or instructional 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 provided by the instructional assistant. Requirements for course completion are listed in individual instructor syllabi.

**Grading Standard:**

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

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

<b>A</b>	<b>=</b>	<b>92 - 100%</b>
<b>A-</b>	<b>=</b>	<b>89 - 91%</b>
<b>B+</b>	<b>=</b>	<b>86 - 88%</b>
<b>B</b>	<b>=</b>	<b>82 - 85%</b>
<b>B-</b>	<b>=</b>	<b>79 - 81%</b>
<b>C+</b>	<b>=</b>	<b>76 - 78%</b>
<b>C</b>	<b>=</b>	<b>70 - 75%</b>
<b>D</b>	<b>=</b>	<b>65 - 69%</b>
<b>F</b>	<b>=</b>	<b>&lt;65%</b>

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.

**College Policies:**

As an academic institution, Brookdale facilitates the free exchange of ideas, upholds the virtues of civil discourse, and honors diverse perspectives informed by credible sources. Our College values all students and strives for inclusion and safety regardless of a student's disability, age, sex, gender identity, sexual orientation, race, ethnicity, country of origin, immigration status, religious affiliation, political orientation, socioeconomic standing, and veteran status. For additional information, support services, and engagement opportunities, please visit [www.brookdalecc.edu/support](http://www.brookdalecc.edu/support).

For information regarding:

- Academic Integrity Code
- Student Conduct Code
- Student Grade Appeal Process

Please refer to the [student handbook](#) and [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 Accessibility Services Office at 732-224-2730 (voice) or 732-842-4211 (TTY) to 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.

**Mental Health:**

24/7/365 Resources:

- Monmouth Medical Center Psychiatric Emergency Services at **(732) 923-6999**
- 2nd Floor Youth Helpline – Available to talk with you about any problem, distress, or hardship you are experiencing. Call or text at **888-222-2228** or visit the website at <https://www.2ndfloor.org/>

Faculty Counselors:

- Students who need to make an appointment with a faculty counselor can do so by calling 732-224-1822 (non-emergency line) during business hours. Faculty counselors are licensed mental health professionals who can assist students and refer them to other mental health resources.

**Diversity Statement:**

Brookdale Community College fosters an environment of inclusion and belonging. We promote a safe and open culture, encourage dialogue respecting diverse perspectives informed by credible sources, and uphold the virtues of civil discourse. We celebrate all identities with the understanding that ultimately, diversity, equity, and inclusion cultivate belonging and make us a stronger Brookdale community.

**Additional Support/Labs:**

Course Website:

**Biology Department information and BIOL 101 resources are available on the Brookdale website:**

**<https://www.brookdalecc.edu/stem-institute/biology/>**

*\*The syllabus is intended to give student guidance in what may be covered during the semester and will be followed as closely as possible. However, the faculty member reserves the right to modify, supplement, and make changes as the need arise.*

Name of Unit: **INTRODUCTION AND PHILOSOPHY OF LIFE SCIENCES**

Unit Objective: Describe the philosophy of science, discuss the characteristics that distinguish living from the non- living and list and briefly describe the levels of organization. Demonstrate an ability to use three "biological tools": scientific problem solving, the compound microscope, and the dissection microscope. Demonstrate an understanding of the significance of the investigation of life phenomena.

Textbook: CAMPBELL BIOLOGY by Urry et.al., 12<sup>th</sup> edition - Chapter 1

Method of Evaluation: Unit Test and Lab Practical

Estimated Time To Achieve: One Week

---

Learning Objectives

---

The Student Will Be Able To:

1. Identify aims as well as limitations of science.
2. Define the scientific method as a process and list in sequence the probable steps of this procedure. Utilize a scientific approach to problem solving, by successfully applying this approach to the solution of a hypothetical problem provided by your instructor.
3. List and briefly describe at least five characteristics that distinguish living organisms from non-living things.
4. Compare and contrast the living and non-living characteristics of a virus and relate to the definition of "life".
5. List and define each of the levels of organization (hierarchy of levels). Explain the relationship of the number of units, size of each unit, complexity, energy requirements, order and stability changes as one progresses from the level of sub-atomic particles to the biosphere, from the non-living to the living.
6. Name and distinguish the five kingdoms within the biological system of classification. These taxonomic groups are useful in understanding unity and diversity of life forms.

7. Successfully complete assigned laboratory experiences.

Name of Unit: **CHEMISTRY OF LIFE - AN INTRODUCTION**

Unit Objective: Understand the basic concepts of chemistry that are related directly to the function of the cell as a living system. Identify the structure and function of macromolecules common to all organisms and the chemical processes of synthesis and dehydration utilized to synthesize and decompose these complex molecules.

Textbook: CAMPBELL BIOLOGY by Urry et.al., 12<sup>th</sup> edition - Chapters 2 - 5

Method of Evaluation: Unit Test and Lab Practical

Estimated Time To Achieve: Two Weeks

---

Learning Objectives

---

The Student Will Be Able To:

1. Define matter. Discuss the role of protons, neutrons and electrons in the atom, the fundamental unit of all matter. Include a comparison of the mass, charge and location of each subatomic particle.
2. Differentiate between weight and mass.
3. Define and differentiate the terms: electron shell, energy level & orbital.
4. Define valence electrons and calculate the number of electrons in the valence shells of the biologically significant atoms.
5. Compare and contrast an atom with an ion, element, and isotope.
6. Using the periodic table, determine atomic number, atomic mass, and numbers of subatomic particles in one atom of a given element.
7. Compare and contrast ionic, covalent, polar covalent, and hydrogen bonding in molecules using examples and stating the biological significance of each type of bond.

8. Describe and provide examples of properties of and different types of chemical reactions.
9. Describe the characteristics of water and state the significance of water to living organisms.
10. Define pH; describe how it is measured and cite examples of substances which act as acids and others which act as bases.  
Identify and discuss the role of buffers.
11. Define the following terms and state how they are related: chemical formula, structural formula and isomer.
12. Identify and describe the structure, functional groups (identifying subunits) and chemical bonds found in the four basic types of biological macromolecules.
13. Distinguish between dehydration (condensation) and hydrolysis reactions and state their roles in altering the structure of organic molecules.
14. Describe the structure and function of simple and complex carbohydrates, giving examples of biologically important molecules.
15. Describe the structure and function of various types of biologically important lipids.
16. Describe the structure and function of biologically important proteins.
17. Describe the primary, secondary, tertiary, and quaternary structure of proteins. Cite examples of each, state cellular functions and discuss their relative levels of stability.
18. Describe the role of enzymes as catalysts for chemical reactions in the cell.



19. Describe structures and functions of nucleic acids.

Describe the structure of ATP and discuss its role as the source of chemical energy in the cell.

20. Successfully complete assigned laboratory experiences.

Name of Unit: **CELL STRUCTURE AND FUNCTION**

Unit Objective: Identify and describe the structures and functions of the parts of a typical animal cell and a typical plant cell. Identify specific types of plant and animal cells and relate their functions and/or behaviors to their structural variations. Discuss the process of cell division. Describe the role of cell division in asexual reproduction and organismic growth and repair.

Textbook: CAMPBELL BIOLOGY by Urry et.al., 12<sup>th</sup> edition - Chapters 1, 6, 7 & 12

Method of Evaluation: Unit Test and Lab Practical

Estimated Time To Achieve: Two Weeks

---

Learning Objectives

---

The Student Will Be Able To:

1. Describe the cell theory. Discuss the importance of the microscope in the study of cell structure and cell fractionation in the study of cell function.
2. Distinguish between prokaryotic and eukaryotic cells.
3. Describe the various proposed models of cellular membranes, their locations, probable origin and functions.
4. Define and explain the roles of diffusion, osmosis, facilitated diffusion, and active transport in the movement of materials through cell membranes using the terms: hypotonic, hypertonic, isotonic and plasmolysis.
5. Locate the following structures on a cell model, diagram or electron micrograph:

basal body	gap junction
plasma membrane	Golgi complex
cell wall	grana
centriole	lysosome
centrosome	mitochondria
centromere	nuclear envelope
chloroplast	nucleolus
chromatin	nucleoplasm
chromosome	nucleus
chromatid	peroxisome

cristae	plasmodesmata
cilia & flagella	pseudopodia
cytoplasm	ribosomes
cytoskeleton	stroma
desmosomes	tight junctions
endoplasmic reticulum	vacuoles

6. State the functions of the preceding cell structures or organelles.
7. Compare and contrast the structures of a "typical" plant and animal cell as to their component parts.
8. Compare endocytosis and exocytosis. Define and explain the role of pinocytosis, phagocytosis, and receptor mediated endocytosis in terms of vesicle formation.
9. State the significance of the cell cycle as it applies to asexual reproduction, growth and repair.
10. Identify the role of cellular structures involved in mitosis: chromosomes, chromatids, centromeres, centrioles, asters, kinetochores and spindle fibers
11. Describe the significant steps in the process of cell division: interphase ( $G_1$ , S, and  $G_2$  phases), mitosis (prophase, metaphase, anaphase, telophase) and cytokinesis, (cleavage furrow, cell plate) in both plant and animal cells.
12. Briefly describe regulation of the cell cycle.
13. Successfully complete assigned laboratory experiences.

Name of Unit: **CELLULAR RESPIRATION AND PHOTOSYNTHESIS**

Unit Objective: Discuss and diagram the events that occur during aerobic and anaerobic cellular respiration as means of producing usable energy in the form of ATP. Describe and/or diagram aerobic and anaerobic respiration and photosynthetic processes (photophosphorylation and the Calvin Cycle). Include required conditions, site of activity, raw materials, products formed, relative efficiency and overall importance in producer organisms where applicable.

Textbook: CAMPBELL BIOLOGY by Urry et.al., 12<sup>th</sup> edition - Chapters 8, 9 & 10

Method of Evaluation: Unit Test and Lab Practical

Estimated Time To Achieve: Two Weeks

---

Learning Objectives

---

The Student Will Be Able To:

1. Define reaction, catalyst, enzyme, substrate, active site, and energy of activation. Relate these terms to the theory of enzyme action.
2. Define competitive, non-competitive and irreversible inhibition; state methods of action and biological significances of chemical reactions.
3. Explain the inter-relationships of the energy of activation, free energy, pressure, temperature and concentration on the rate of cellular chemical reactions which involve oxidation and reduction.
4. State the relationship of free energy change (endergonic and exergonic reactions) and the laws of thermodynamics to synthesis and decomposition of glucose and ATP.
5. Discuss the importance of phosphorylation reactions as the key to understanding the role of ATP as a universal energy source.
6. State the significance of cellular respiration and cite examples of organisms using aerobic and anaerobic respiration.

7. Summarize the process of glycolysis and state its relationship to fermentation, lactic acid synthesis and aerobic respiration.
8. Compare and contrast alcohol fermentation and lactic acid synthesis to include the products formed, site of activity, and the conditions under which each will occur.
9. Diagram and indicate the inter-relationships between the major reactions of glycolysis, the bridge reaction, the Krebs Cycle, electron transport system, and oxidative phosphorylation to include the sites of activity and final end products.
10. Identify the sources and respective numbers of ATP molecules produced during the complete aerobic oxidation of glucose to carbon dioxide and water and the possible uses of these ATP molecules.
11. Briefly describe the chemiosmotic theory as a process which enables mitochondria to produce ATP.
12. Describe various mechanisms of control of cellular respiration.
13. Identify how and where lipids and proteins may enter the overall process of cellular respiration.
14. Compare and contrast the overall summary equations for photosynthesis and respiration.
15. Describe the internal structure of the chloroplast.
16. Compare reflected, transmitted and absorbed light with regard to its influence on photosynthesis and the coloration of leaves.
17. State the relationship of light wavelength and energy to the absorption spectrum of chlorophyll and to the action spectrum of photosynthesis.
18. Diagram and explain the steps and products formed as a result of photosystems I & II.

19. Explain the mechanism and significance of cyclic electron flow.
20. Diagram and discuss the Calvin Cycle to include the raw materials and end products.
21. Describe the main function of photosynthesis using the following terms: light energy, chlorophyll, accessory pigments, photophosphorylation, coenzyme, ATP and G3P.
22. Describe the alternate mechanism of carbon fixation in C<sub>4</sub> plants.
23. Successfully complete assigned laboratory experiences.

Name of Unit: **PRINCIPLES OF HEREDITY**

Unit Objective: Demonstrate an understanding of the transmission and expression of hereditary information from generation to generation based on the conclusions of Gregor Mendel's experiments. Discuss the processes involved in sexual and asexual reproduction, and the advantages and disadvantages of both.

Textbook: CAMPBELL BIOLOGY by Urry et.al., 12<sup>th</sup> edition - Chapters 12, 13, 14 & 15

Method of Evaluation: Unit Test and Lab Practical

Estimated Time To Achieve: Two Weeks

---

Learning Objectives

---

The Student Will Be Able To:

1. State the advantages and disadvantages of both sexual and asexual reproduction.
2. Review the stages of the cell cycle and significant events occurring in each stage.
3. Compare and contrast the outcome of mitosis to that of meiosis.
4. Describe the process of meiosis (gametogenesis).
5. Define the following terms:

hermaphroditism	gene
self-pollination	allele
parthenogenesis	dominance
genetics	recessiveness
heredity	homozygous
somatic cells	heterozygous
gametes	phenotype
parental generation (P)	genotype first filial generation (F <sub>1</sub> )
second filial generation (F <sub>2</sub> )	autosomes and sex chromosomes
6. Explain the results of Mendel's experiments involving pea plants and discuss his laws of segregation and independent assortment using crosses to illustrate these concepts.

7. Cite examples and genetic crosses involving complete dominance, incomplete dominance, sex-linkage, multiple alleles, epistasis, polygenic inheritance and test crosses.
8. Briefly describe techniques and applications of karyotyping, amniocentesis, and chorionic villi sampling in fetal testing for genetic abnormalities.
9. Define chromosome mapping, know how maps are developed, and state the significance of gene linkage and crossing over to mapping.
10. Describe the difference in the expression of visible traits according to the particular pattern of inheritance and the effects that genes have on each other and cell metabolism.
11. Successfully complete the assigned laboratory experiences.



BIOL 101  
Course No.

General Biology I  
Title

# 6 of 7 Units

4  
Credits

Name of Unit: **HUMAN GENETICS**

Unit Objective: Describe and compare the types of mutations resulting from chromosomal changes in humans to indicate the patterns of transmission and the possible changes in phenotype (genetic disorders).

Textbook: CAMPBELL BIOLOGY by Urry et.al., 12<sup>th</sup> edition - Chapters 13, 15, 17, 20, 21

Method of Evaluation: Unit Test and Lab Practical

Estimated Time To Achieve: One Week

---

### Learning Objectives

---

The Student Will Be Able To:

1. Describe a gene and its relationship to a chromosome.
2. Define mutation, cite examples of mutagens and state the relationship of mutations to the process of evolution.
3. Recall the importance of somatic and sex chromosomal mutations; state the relative advantages and disadvantages of mutation.
4. Compare and contrast point and chromosomal mutations and cite types of abnormalities which can result.
5. Relate sex linkage to humans using crosses to illustrate its importance in the transmission of abnormalities.
6. Define aneuploidy. Describe nondisjunction. Describe the effects of aneuploidy in humans.
7. Briefly describe how genes can be analyzed and manipulated. Identify several practical applications of recombinant DNA technology.
8. Discuss important goals and potential applications of the Human Genome Project.

1

9. Successfully complete the assigned laboratory experiences.

Name of Unit: **NUCLEIC ACIDS - PROTEIN SYNTHESIS**

Unit Objective: Identify and discuss the basic structures of nucleic acids and the functions each performs in the life and reproduction of cells.

Textbook: CAMPBELL BIOLOGY by Urry et.al., 12<sup>th</sup> edition - Chapters 5,16,17 & 18

Method of Evaluation: Unit Test and Lab Practical

Estimated Time To Achieve: Two Weeks

---

Learning Objectives

---

The Student Will Be Able To:

1. Compare and contrast the nucleotides present in DNA and RNA. Indicate which nitrogen bases are purines and which are pyrimidines
2. Demonstrate an understanding of the structure of DNA by properly labeling a diagram or describing its molecular structure and bonding.
3. Describe the process of DNA replication and state its significance to the mitotic process.
4. Describe the processes of transcription and translation, including the roles of DNA, messenger RNA, transfer RNA and ribosomal RNA.
5. Explain how various combinations of the four nucleotides of DNA can ultimately code for thousands of different proteins.
6. Discuss the operon hypothesis and indicate its significance to the further understanding of cellular functions.
7. Compare eukaryotic chromosomes with those of prokaryotes.
8. Successfully complete assigned laboratory experiences.