

## Course Number and Title: BIO 150 Biology I

**Campus Location:**

Georgetown, Stanton

**Effective Date:**

2021-52

**Prerequisite:**

SSC 100 or concurrent

**Co-Requisites:**

None

**Course Credits and Hours:**

4.00 credits

3.00 lecture hours/week

2.00 lab hours/week

**Course Description:**

This course introduces the cell as the basis of life. Topics include an introduction to the chemistry of life, cell structure and function, cellular metabolism, cell division, evolution, molecular genetics, and patterns of inheritance.

**Required Text(s):**

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

**Additional Materials:**

Lab coat

**Schedule Type:**

Classroom Course

**Disclaimer:**

None

**Core Course Performance Objectives (CCPOs):**

1. Explain the organization, characteristics, taxonomy, and basic chemistry of life. (CCC 2, 6)
2. Describe the structure-function relationship of cellular membranes, prokaryotic, and eukaryotic cell structures. (CCC 2, 6)
3. Identify and describe the basic processes of metabolism and compare the pathways of cellular respiration and fermentation. (CCC 2, 6)
4. Analyze the processes and pathways of photosynthesis. (CCC 2, 6)
5. Compare the different types of cell division. (CCC 2, 6)
6. Analyze genetic problems using the Punnett square and probability, and explain the principles of genetic inheritance. (CCC 2, 6)
7. Examine the relationship between replication, transcription, and translation, and evaluate the effects of mutations on phenotype. (CCC 2, 6)
8. Describe the evidences, mechanisms, and biodiversity for the theory of evolution. (CCC 2, 6)
9. Perform and analyze the various lab activities related to biology. (CCC 1, 2, 3, 6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

**Measurable Performance Objectives (MPOs):**

Upon completion of this course, the student will:

1. Explain the organization, characteristics, taxonomy, and basic chemistry of life.
  1. List and explain the seven characteristics of life.
  2. Describe the hierarchy of biological organization.
  3. Discuss taxonomy and the classification of living things.
  4. Identify the characteristics of the three domains of life and the four kingdoms of Eukarya.
  5. Describe the scientific method including observations, hypothesis, and theory.
  6. Define *matter* and differentiate between the three forms of matter.
  7. Define *molecule* and briefly describe how atoms form molecules and compounds.
  8. Define *ion* and explain how atoms form ions and ionic bonds.
  9. List the biologically important elements.
  10. Describe the physical and chemical properties of water that influence life processes.
  11. Explain the meaning of the potential of hydrogen (pH) scale and the role of buffers.
  12. Compare covalent, ionic, and hydrogen bonds.
  13. Explain how macromolecules are formed and broken down in cells.
  14. Describe the four biologically important macromolecules of cells, including the basic unit, structure, function(s), and examples.
2. Describe the structure-function relationship of cellular membranes, prokaryotic, and eukaryotic cell structures.
  1. Describe the biochemical structure of the plasma membrane.
  2. Explain how membrane proteins interact with and respond to changes in the extracellular environment.

3. Relate membrane structure to the role of the membrane in selective permeability.
4. Explain passive transport mechanisms: simple diffusion and facilitated diffusion.
5. Define *osmosis* and explain the effects of solute concentration on cell function.
6. Explain active transport and cotransport.
7. Discuss endocytosis and exocytosis.
8. Describe the structure and function of the nucleus of the eukaryotic cell.
9. Describe the structure and function of ribosomes.
10. Describe the structure and function of the endomembrane system: endoplasmic reticulum, Golgi apparatus, lysosomes, and vacuoles.
11. Compare and contrast the structure and function of mitochondria and chloroplasts.
12. List the components of the cytoskeleton and related organelles of movement and describe the structure and function of each.
13. Describe the composition and function of a plant cell wall.
14. List and describe animal and plant cell junctions.
3. Identify and describe the basic processes of metabolism and compare the pathways of cellular respiration and fermentation.
  1. Define *metabolism* and differentiate between anabolism and catabolism.
  2. Define *endergonic* and *exergonic reactions*.
  3. Describe the structure of adenosine triphosphate (ATP).
  4. Discuss the breakdown and regeneration of ATP.
  5. Explain a coupled reaction.
  6. Describe a metabolic pathway.
  7. Describe the structure and function of enzymes.
  8. Define *coenzyme* and explain their roles in metabolism.
  9. Describe the mechanism of an enzyme reaction.
  10. List the factors that affect the yield of enzymatic reactions.
  11. Define *feedback mechanisms*.
  12. Discuss glycolysis and state the substrates and products of the pathway.
  13. Define *fermentation*.
  14. State the overall equation for cellular respiration and explain the general function of cellular respiration.
  15. Discuss the ways in which ATP is generated by the cell.
  16. Describe the Krebs's cycle and give the substrates and products of the cycle.
  17. Discuss the electron transport system, chemiosmosis and oxidative phosphorylation.
  18. Calculate and compare the yield of ATP per glucose molecule for fermentation versus cellular respiration.
4. Analyze the processes and pathways of photosynthesis.
  1. State the overall equation for photosynthesis.
  2. Review the structure and function of a chloroplast.
  3. Describe the structure of a leaf.
  4. Relate the electromagnetic spectrum to photosynthesis.
  5. Describe the role of pigments in photosynthesis.
  6. Describe a photosystem and explain how it harvests light.
  7. Differentiate between the light dependent and the light independent processes of photosynthesis.
  8. Compare and contrast cyclic and noncyclic electronic flow.
  9. Explain the process of photophosphorylation.
  10. Explain the Calvin cycle.
  11. Explain alternative pathways of carbon dioxide (CO<sub>2</sub>) fixation and relate them to the Calvin cycle.
  12. Compare and contrast photosynthesis and cellular respiration.
5. Compare the different types of cell division.
  1. Define *chromosome*, *chromatin*, *diploid*, and *haploid*.
  2. Describe the cell cycle.
  3. Explain the events in mitosis.
  4. Differentiate between mitosis and cytokinesis.
  5. Compare and contrast mitosis in plant and animal cells.
  6. Explain the events in meiosis.
  7. Discuss crossing over and its role in genetic variation.
  8. Compare and contrast mitosis and meiosis.
6. Analyze genetic problems using the Punnett square and probability, and explain the principles of genetic inheritance.
  1. Define *allele*, *recessive*, *dominant*, *homozygous*, *heterozygous*, *genotype*, and *phenotype*.
  2. Perform one-trait and two-trait genetic problems using a Punnett square and the laws of probability.
  3. Explain segregation and independent assortment using examples of a dihybrid cross.
  4. Describe a testcross.
  5. Define *multiple alleles*, *incomplete dominance*, *codominance*, *epistasis*, and *polygenic inheritance*, and list an example of each.
  6. State the normal sex chromosome makeup of human males and females and compare to other organisms.
  7. List examples of X-linked genetic traits.
  8. Define *polyploidy* and *aneuploidy* and list an example of each.
  9. Define *inversion*, *deletion*, *translocation*, and *duplication of genes*.
7. Examine the relationship among replication, transcription, and translation, and evaluate the effects of mutations on phenotype.
  1. Describe the structure of deoxyribonucleic acid (DNA).
  2. Describe the replication of DNA.
  3. Describe the structure of ribonucleic acid (RNA) and list the three types of RNA.
  4. Explain the process of DNA to messenger RNA (mRNA) to protein to trait.
  5. Explain transcription and translation.
  6. Given a DNA sequence, use the genetic code to determine the amino acid sequence of the protein.
  7. Define *mutation* and list several causes of mutations.
  8. Compare frameshift and point (substitution) mutations.

9. Explain the *lac* operon as an example of the control of gene expression.
10. Describe the pathways of viral replication.
8. Describe the evidences, mechanisms, and biodiversity for the theory of evolution.
  1. Explain the mechanisms of evolution that result in descent with modification.
  2. Identify the various examples of evidence for evolution and their relationship to biodiversity.
  3. Describe how microevolution and macroevolution result in changes to populations over time.
  4. Describe the factors that can contribute to the development of new species.
9. Perform and analyze various lab activities related to biology.
  1. Perform various physiological laboratory activities related to the cell, cellular metabolism, photosynthesis, and cell division.
  2. Perform various laboratory activities related to taxonomy, protein synthesis, genetics, and biodiversity.

**Evaluation Criteria/Policies:**

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

**Core Curriculum Competencies (CCCs are the competencies every graduate will develop):**

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

**Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):**

1. Apply knowledge of biology and chemistry to solve problems in biotechnology.
2. Integrate biological knowledge with the regulatory, ethical and business perspectives relevant to the biotechnology industry.
3. Apply quantitative and computational skills and tools to analyze problems in biology and chemistry.
4. Demonstrate good laboratory practices that are required by a person working as a biotechnology technician including laboratory safety and documentation.
5. Demonstrate laboratory skills relevant to biotechnology including recombinant DNA techniques, PCR, DNA sequence analysis, and current analytical chemistry techniques.
6. Work independently and collaboratively to create scientific oral presentations and written documents that are standard to the discipline.

**Disabilities Support Statement:**

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.