

Plymouth Public Schools' Science and Technology/Engineering Program

Advanced Placement Biology Course Syllabus

STE0021 Biology Advanced Placement

STEL021 AP Biology Lab Advanced Placement

Full year course intended for students in grades 10 through 12 worth 5 credits and accompanying one-semester lab course worth additional 2.5 credits

Course Description

This laboratory course is designed for talented students who are planning to major in one of the sciences in college, although not necessarily biology. Emphasis is placed on four big ideas with topics including how evolution drives the diversity of life, how biological systems maintain dynamic homeostasis, how living systems work with information essential to life processes, and how the interactions between biological systems possess complex properties. This course also emphasizes specific science practices outlined for AP Biology by the College Board. Please note that students are required to take the Advanced Placement Test. In order to meet the curriculum requirements of the Advanced Placement program, this course will be scheduled for two blocks in one semester and a single block in the other semester. Students should consider this additional time factor when planning their course selections. The prerequisites include successful completion of Biology, completion/enrollment in Chemistry, and departmental recommendation.

Instructional Objectives

Students will independently and collaboratively:

1. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to answer a question or solve a problem.
2. Draw evidence from literary or informational texts to support analysis, reflection, and research.
3. Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
4. Use representations and models to communicate scientific phenomena and solve scientific problems.
5. Use mathematics appropriately.
6. Engage in scientific questioning to extend thinking or to guide investigations within the context of AP Biology.
7. Plan and implement data collection strategies appropriate to a particular scientific question.
8. Perform data analysis and evaluation of evidence.
9. Work with scientific explanations and theories.
10. Connect and relate knowledge across various scales, concepts and representations in and across domains.

11. Demonstrate proficiency in biological concepts including, but not limited to the following big ideas:
 - A. The process of evolution drives the diversity and unity of life.
 - B. Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.
 - C. Living systems store, retrieve, transmit and respond to information essential to life processes.
 - D. Biological systems interact, and these systems and their interactions possess complex properties.

Themes and Topics

1. Nature of Science and the Chemistry of Life – introduction to the science of biology; water; carbon chemistry; macromolecules
2. DNA, From Gene to Polypeptide – DNA as hereditary material; structure of DNA; DNA replication; transcription and translation; RNA processing
3. DNA Technology and Genomics – restriction enzymes; cloning; recombinant DNA techniques; gene mapping; Human Genome Project; bioinformatics
4. Microbiology and Immunity – viral structure and function; viral life cycles; diseases; innate vs. acquired responses; self vs. non-self; bacterial structure and replication; prokaryotic gene regulation
5. The Eukaryotic Genome – redefining a gene; steps of gene regulation; genome organization; cancer genetics; genomes and evolution
6. Origin of Life, The Cell and Bioenergetics – origin of life; endosymbiont hypothesis; overview of classification; prokaryotic and eukaryotic cell structure; organelles; evolution of the eukaryotic cell; membrane structure; passive and active transport; membrane potential; endothermic and exothermic reactions; ATP structure; enzymes
7. Respiration and Photosynthesis – cellular respiration; photosynthesis; evolution of metabolic pathways; photosynthesis, respiration, the carbon-oxygen cycle, and global warming issues
8. Ecology – biomes; behavioral ecology; population ecology; exponential and logistic growth; communities; alien species; ecosystems; chemical cycles
9. Cell Cycle and Genetics – mitosis; cancer; meiosis; life cycles; Mendelian inheritance; genetic disorders; genetic problems; pedigrees; beyond Mendel
10. Evolution – Darwin’s voyage; natural selection; evidence for evolution; evolution of populations/microevolution; hardy-Weinberg equilibrium; Origin of Species; macroevolution; phylogeny and systematics
11. Animal Form and Function – tissues; animal nutrition; hormones; reproduction; development; nervous system
12. Plant Form and Function – plant structure; transport, xylem and phloem; transpiration; angiosperm reproduction; hormones; plant defenses
13. Bioethics – connecting biological and scientific knowledge to major social issues

Text and Instructional Materials

1. Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., and Reece, J. B. *Campbell Biology AP Edition*. Boston: Pearson, 11th ed., 2018.
2. *AP Biology Investigative Lab Manual: An inquiry-based approach*. 2012. New York, NY: The College Board.
3. [Web-based product that accompanies textbook](#); see teacher for access

Cheating/Plagiarism

The excerpt from the Plymouth Public Schools' Student Handbook on plagiarism and copyright infringement states, "Existing copyright law will govern the use of material accessed through network. The user will not plagiarize works found on the Internet. Plagiarism is taking the ideas or writings of others and presenting them as if they were yours. All copyrighted material used must have the express written permission of the person or organization that owns the copyright. Any student who has cheated on any academic exercise will receive no credit for that exercise. Plagiarism is a form of cheating. A parent/guardian will be notified by the involved teacher in all instances of cheating. The investigation of the claim of cheating and plagiarism will involve the student, teacher, and administration."

Grading Policy and Assessment

Levels of proficiency on various tasks and assignments determine student grades. During each grading term, students' grades will be based upon the following:

- 30% Homework
- 70% Assessments

The final year average will be calculated as follows:

- 22.5% Term 1 Grade
- 22.5% Term 2 Grade
- 22.5% Term 3 Grade
- 22.5% Term 4 Grade
- 10% Final Exam

Please note that a grade of pass or fail will be issued for the AP Biology Lab Advanced Placement (STEL021). This will not be included in the student's grade point average. Student performance will be based on Science and Engineering Practices outlined in the Massachusetts' Science and Technology/Engineering Curriculum Framework and College Board.