

Curriculum Guide

Course 525: Advanced Placement Biology

Level: Grade 11 & 12

1. Course Structure

This full-year course meets six class periods per week. Two of these class periods are scheduled back-to-back for laboratory purposes.

2. Intended Audience

AP Biology is an elective course intended for seniors who have completed Introductory Biology and Introductory Chemistry with a minimum grade of B (Honors) or A (Enriched) and have been recommended by their previous science teacher.

3. Course Goals

Students in this course will develop an introductory college-level foundation in general biological principles in the areas of molecular biology, cellular biology, heredity, evolution, organisms, and populations. They will strengthen laboratory skills, and also written and oral communication skills.

Although not required, students are encouraged to complete the Advanced Placement Exam offered in biology. Upon successful completion of this course and the exam, some students may receive college credit and choose to enroll in a second-year biology course as a college freshman or in a course where introduction to biology is a prerequisite.

4. Course Objectives

Content:

I. Molecules and Cells

- Chemistry of Life
- Cells
- Cellular Energetics

II. Heredity and Evolution

- Heredity
- Molecular Genetics
- Evolutionary Biology

III. Organisms and Populations

- Diversity of Organisms
- Structure and Function of Plants and Animals
- Ecology

Skills

- Students will demonstrate an understanding of the relationship between structure and function of living organisms.
- Students will consistently demonstrate safe laboratory practices.

- Students will become proficient in observing, recording, analyzing, and reporting laboratory experiments.
- Students will demonstrate an understanding of scientific methods through observational inquiry and designing and implementing experiments.

5. Essential Questions

I. Molecules and Cells

- How do the unique physical and chemical properties of water make life on earth possible?
- What is the role of carbon in the molecular diversity of life?
- How can cells synthesize and break down macromolecules?
- How do the structures of biologically important macromolecules account for their functions?
- How do enzymes regulate the rate of chemical reactions?
- How is the activity of an enzyme regulated?
- What are the similarities and differences between prokaryotes and eukaryotes?
- What is the evolutionary relationship between prokaryotes and eukaryotes?
- How does the structure of membranes relate to their functions?
- How does compartmentalization organize a cell's functions?
- How are the structures of subcellular organelles related to their functions?
- How do organelles function together in cellular processes?
- What factors limit cell size?
- How does the cell cycle assure genetic continuity?
- How does mitosis allow for the even distribution of genetic information to new cells?
- How is the cell cycle regulated?
- How can aberrations in the cell cycle lead to tumor formation?
- What is the role of ATP in coupling the cell's anabolic and catabolic processes?
- How are organic molecules broken down by catabolic pathways?
- What is the role of oxygen in energy-yielding pathways?
- How do cells generate ATP in the absence of oxygen?
- How does photosynthesis convert light energy into chemical energy?
- What kinds of photosynthetic adaptations have evolved in response to different environmental conditions?
- What interactions exist between photosynthesis and cellular respiration?

II. Heredity and Evolution

- What features of meiosis are important in sexual reproduction?
- How is meiosis related to gametogenesis?
- What are the similarities and differences in the sexual life cycles of plants and animals?
- How is genetic information organized in the eukaryotic chromosome?
- How does this organization contribute to both continuity of and variability in the genetic information?
- What are the principle patterns of inheritance?

- How do the structures of DNA and RNA relate to their functions of information storage and protein synthesis?
- What are the similarities and differences between prokaryotic and eukaryotic genomes?
- What are some mechanisms that regulate gene expression?
- In what ways can genetic information be altered?
- What are some of the effects of these alterations?
- What is the structure of viruses, and how does this structure aid in viral reproduction?
- What are some practical applications of current recombinant DNA technologies and nucleic acid technologies?
- What are some legal and ethical problems associated with DNA technology?
- What are the current models for the origins of biological macromolecules?
- What are the current models for the origins of prokaryotic and eukaryotic cells?
- What types of evidence support an evolutionary view of life?
- What is the role of natural selection in the process of evolution?
- What mechanisms account for speciation and macroevolution?
- What patterns of evolution have been identified and what are the mechanisms responsible for these patterns?

III. Organisms and Populations

- What are the major body plans of plants and animals?
- What are the representative organisms from the Bacteria, Archaea, and Eukarya domains?
- What are the representative members of the major animal phyla and plant divisions?
- How can we study evolutionary relationships among organisms, and how is this information used in the classification of organisms?
- What patterns of reproduction and development are found in plants and animals and how are they regulated?
- How does the organization of cells, tissues, and organs determine structure and function in plants and animals and how are they regulated?
- How are structure and function related in the various organ systems?
- What adaptive features have contributed to the success of various plants and animals on land?
- What are the responses of plants and animals to environmental cues, and how do hormones mediate them?
- What models are useful in describing the growth of a population?
- How is population size regulated by abiotic and biotic factors?
- How is energy flow through an ecosystem related to trophic structure?
- How does matter cycle through ecosystems, and how do humans affect these cycles?
- How do biotic and abiotic factors affect community structure and ecosystem function?

6. Course Outline/ Curriculum Map

Quarter 1

1. Chemistry of Life
2. Cells
3. Cellular Energetics
4. Heredity

Quarter 2

5. Molecular Genetics
6. Gene Expression and Genetic Technologies
7. Evolutionary Biology
8. Evolutionary Patterns
9. Diversity of Life

Quarter 3

10. Animals Form & Function
11. Animal Reproduction, Growth & Development
12. Plant Form & Function
13. Plants Reproduction, Growth & Development

Quarter 4

14. Ecology
15. AP Biology Exam Review
16. Bioethics

7. Course Text and Other Materials

The text for this course is:

- Campbell. **Biology**. 6th Ed. (2002).

8. Instructional Methods and Course Activities

Content will be conveyed through:

- Class dialogue and discussion
- Laboratory investigations
- Topic lectures and demonstrations
- Independent research papers and projects
- Group projects
- Guest speakers

9. Learning Strategies

- The primary instructional modes will include topic lecture and class discussion, laboratory experiments selected by the Advanced Placement Board, and independent reading.
- Students will be encouraged to approach each learning experience with an objective and critical attitude.

10. Assessment

The assessment of students will occur through:

- Daily evaluation of class preparation and participation
- Laboratory performance, including organization, analysis, and reporting of observations and data
- Formal testing
- Independent research papers
- Group projects

11. Course Evaluation

The assessment of this course will occur through:

- On-going feedback from current students
- Reviews of student performance on AP examinations
- A formal student evaluation