

Overview of AP Biology Curriculum Framework Big Ideas and *CAMPBELL BIOLOGY 9e AP* Edition*

Big Idea 1: The process of evolution drives the diversity and unity of life

This section of the AP Biology Curriculum Framework follows closely what has traditionally been taught on evolution. The framework includes almost all of Unit 4, “Mechanisms of Evolution” (Chapters 22-25), as well as several concepts in Chapters 26 and 27 of Unit 5, “The Evolutionary History of Biological Diversity.” The Curriculum Framework is relatively logical in its sequence and should provide no particular difficulties for teachers of AP Biology.

One area that has been gaining time in biology classrooms is the teaching of phylogenetic trees and cladograms. This trend will continue with the new curriculum. For teachers who have not been working with cladograms, Concepts 26.1 and 26.3 and the “Test Your Understanding” questions at the end of Chapter 26, “Phylogeny and the Tree of Life,” will be invaluable. Teachers will also see the term *horizontal gene transfer* used in the framework. As our understanding of the three-domain system has improved, the concept of horizontal gene transfer has become increasingly important. Horizontal gene transfer is discussed in Chapter 26, “Phylogeny and the Tree of Life,” in Concept 26.6. As always, in addition to this unit on evolution, the concepts of evolution will be taught throughout the year. To make this easier, every chapter of *CAMPBELL BIOLOGY 9e* now includes a section on evolution.

Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis

Energy flow and the laws of thermodynamics, like evolution, apply to every aspect of biology. Unlike most curricula, the AP Biology Curriculum Framework provides the scope of the course, but not the sequence of topics. However, we can make some general observations. The heart of this Big Idea is the series of chapters on Cell Biology that include Chapter 6, “A Tour of the Cell;” Chapter 7, “Membrane Structure and Function;” Chapter 8, “An Introduction to Metabolism;” Chapter 9, “Cellular Respiration and Fermentation;” and Chapter 10, “Photosynthesis.” This list is what most teachers would expect in a section dealing with energy.

The rest of the Big Idea is taken from applying the concept more broadly. Major chapters include Chapter 43, “The Immune System,” and Chapter 18, “Regulation of Gene Expression.” Other pieces of the material include three concepts from Unit 6, “Plant Form and Function,” five concepts from animal behavior and ecology, two concepts from Chapter 40, “Basic Principles of Animal Form and Function,” and three concepts from Unit 1, “The Chemistry of Life.”

All of the material in this Big Idea will be familiar, although the emphasis on energy utilization may prompt new teaching and learning scenarios. For example, framing some of the behavior topics clearly in the realm of providing more energy efficiency and thus allowing for increased fitness could clarify the relationship between behavior and its evolution. The final take on this section is that it may be scattered with topics, but they are the topics we have traditionally taught in AP Biology. We may add a new emphasis to areas, but that can be a positive force in our teaching.

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Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes

The kernel of this Big Idea is Genetics, both Mendelian and molecular. Eventually the Framework encompasses most of the following: Chapter 13, “Meiosis and Sexual Life Cycles;” Chapter 14, “Mendel and the Gene Idea;” Chapter 15, “The Chromosomal Basis of Inheritance;” Chapter 16, “The Molecular Basis of Inheritance;” Chapter 17 “From Gene to Protein;” Chapter 18, “Regulation of Gene Expression;” Chapter 19, “Viruses;” and one concept from Chapter 20, “Biotechnology.” The AP Biology Curriculum Framework includes most of the material that has traditionally been taught in genetics. This Big Idea also includes Chapter 11, “Cell Communication” and Chapter 12, “The Cell Cycle.”

The inclusion of “respond to information” in the Big Idea could have led to many different areas of biology, but only the following were included: all of Chapter 48, “Neurons, Synapses, and Signaling,” and one concept on the brain from Chapter 49, “Nervous Systems,” plus most of Chapter 51, “Animal Behavior.” A few other chapters have single concepts thrown into the mix.

Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties

With an emphasis on interaction in this Big Idea, it is not surprising that this section of the framework centers on ecology: all of Chapter 53, “Population Ecology;” the first two concepts of Chapter 54, “Community Ecology;” and all of Chapter 55, “Ecosystems and Restoration Ecology.” A few additional concepts from the other ecology chapters complete the framework’s coverage of ecology.

The idea of interactions is expanded to also include the properties of biological models and cellular organelles. This will include Chapter 5, “The Structure and Function of Large Biological Molecules,” and Chapter 6, “A Tour of the Cell.” This very broad Big Idea also hits assorted areas of genetic diversity and its effect on cell structure, gene expression, and ecosystem stability. Most of these ideas have already been covered in previous sections on evolution and genetics. This section will give the teacher an opportunity to reinforce these concepts in what might be a new learning paradigm for the student.

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