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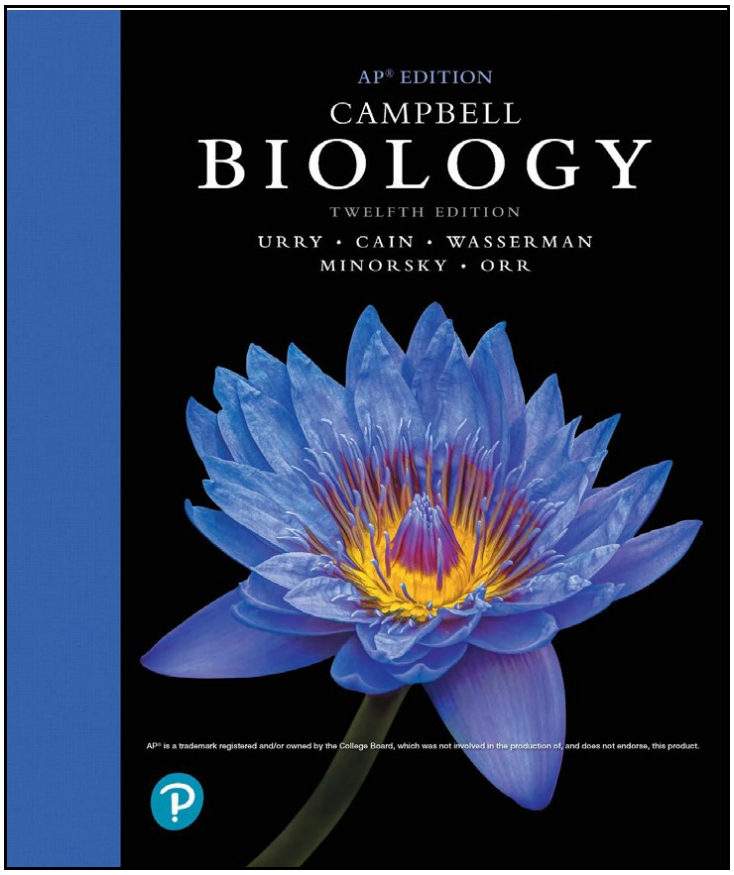

To the

AP® Biology Curriculum Framework
Effective Fall 2019

A Correlation of Campbell Biology 12th Edition, AP® Edition ©2021 (Key Concepts)
to the
College Board AP® Biology Curriculum Framework

Table of Contents

The units above reflect the College Board's AP® Biology Curriculum Framework.

Big Idea Summary

Big Idea 1: Evolution (EVO)
Description: The process of evolution drives the diversity and unity of life.
Evolution is a change in the genetic makeup of a population over time, with natural selection as its major driving mechanism. Darwin's theory, which is supported by evidence from many scientific disciplines, states that inheritable variations occur in individuals in a population. Due to competition for limited resources, individuals with more favorable genetic variations are more likely to survive and produce more offspring, thus passing traits to future generations. A diverse gene pool is vital for the survival of species because environmental conditions change. The process of evolution explains the diversity and unity of life, but an explanation about the *origin* of life is less clear.

In addition to the process of natural selection, naturally occurring catastrophic and human-induced events, as well as random environmental changes can result in alteration in the gene pools of populations. Scientific evidence supports that speciation and extinction have occurred throughout Earth's history and that life continues to evolve within a changing environment, thus explaining the diversity of life.

Big Idea 2: Energetics (ENE)
Description: Biological systems use energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.
Cells and organisms must exchange matter with the environment. Organisms respond to changes in their environment at the molecular, cellular, physiological, and behavioral levels. Living systems require energy and matter to maintain order, to grow, and to reproduce. Organisms employ various strategies to capture, use, and store energy and other vital resources. Energy deficiencies are not only detrimental to individual organisms; they also can cause disruptions at the population and ecosystem levels. Homeostatic mechanisms that are conserved or divergent across related organisms reflect either continuity due to common ancestry or evolutionary change in response to distinct selective pressures.

Big Idea 3: Information Storage and Transmission (5 EUs)-IST
Description: Living systems store, retrieve, transmit, and respond to information essential to life processes.
Genetic information provides for continuity of life and, in most cases, this information is passed from parent to offspring via DNA. Nonheritable information transmission influences behavior within and between cells, organisms, and populations. These behaviors are directed by underlying genetic information, and responses to information are vital to natural selection and evolution. Genetic information is a repository of instructions necessary for the survival, growth, and reproduction of the organism. Genetic variation can be advantageous for the long-term survival and evolution of a species.

Big Idea 4: Systems Interactions (3 EUs)-SYI
Description: Biological systems interact, and these systems and their interactions exhibit complex properties.
All biological systems comprise parts that interact with one another. These interactions result in characteristics and emergent properties not found in the individual parts alone. All biological systems from the molecular level to the ecosystem level exhibit properties of biocomplexity and diversity. These two properties provide robustness to biological systems, enabling greater resiliency and flexibility to tolerate and respond to changes in the environment.

Unit 1: Chemistry of Life (6 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Energetics (ENE)	ENE-1: The highly complex organization of living systems requires constant input of energy and the exchange of macromolecules.	Chapter 8, An Introduction to Metabolism 143-163 Chapter 9, Cellular Respiration and Fermentation, 164-186 Chapter 10, Photosynthesis, 187-211 Background Chapter 5 The Structure and Function of Large Biological Molecules 66-91 Key Concept 5.1, Molecules of Life, 67-68 Key Concept 5.2, Carbohydrates serve as fuel and building material, 68-72 Key Concept 5.3, Lipids are a diverse group of hydrophobic molecules, 72-75 Key Concept 5.4, Proteins include a diversity of structures, resulting in a wide range of functions, 75-83
Information Storage and Transmission (IST)	IST-1: Heritable information provides for continuity of life.	Chapters 15, The Chromosomal Basis of Inheritance, 294-313 Chapter 16, The Molecular Basis of Inheritance, 314-334 Chapter 17, Gene Expression: From Gene to Protein, 335-364
Systems Interactions (SYI)	SYI-1: Living systems are organized in a hierarchy of structural levels that interact.	Chapter 40, Basic Principles of Animal Form and Function 873-897 Key Concept 40.1, Animal form and function are correlated at all levels of organization, 874-881 Key Concept 40.2, Feedback control maintains the internal environment in many animals, 881-883 Key Concept 40.3, Homeostatic processes for thermoregulation involve form, function, and behavior, 884-889

Unit 2: Cell Structure and Function (11 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Evolution (EVO)	EVO-1: Evolution is characterized by a change in the genetic makeup of a population over time and is supported by multiple lines of evidence.	Chapter 22, Decent with Modification: A Darwinian View of Life, 468-485 Key Concept 22.3, Evolution is supported by an overwhelming amount of scientific evidence, 476-484 Chapter 23, The Evolution of Populations, 486-505 Key Concept 23.1, Genetic variation makes evolution possible, 487-489 Key Concept 23.2, The Hardy-Weinberg equation can be used to test whether a population is evolving, 489-493 Key Concept 23.3, Natural selection, genetic drift, and gene flow can alter allele frequencies in a population, 493-497
Energetics (ENE)	ENE-1: The highly complex organization of living systems requires constant input of energy and the exchange of macromolecules.	Chapter 8, An Introduction to Metabolism, 143-163 Key Concept 8.1, An organism's metabolism transforms matter and energy, subject to the laws of thermodynamics, 144-147 Key Concept 8.2, The free-energy change of a reaction tells us whether or not the reaction occurs spontaneously, 147-150 Key Concept 8.3, ATP powers cellular work by coupling exergonic reactions to endergonic reactions, 150-153 Key Concept 8.4, Enzymes speed up metabolic reactions by lowering energy barriers, 153-159 Key Concept 8.5, Regulation of enzyme activity helps control metabolism, 159-161 Chapter 9, Cellular Respiration and Fermentation, 164-186 Chapter 10, Photosynthesis, 187-211

	ENE-2: Cells have membranes that allow them to establish and maintain internal environments that are different from their external environments.	Chapter 7, Membrane Structure and Function, 126-142 Key Concept 7.1, Cellular membranes are fluid mosaics of lipids and proteins 127-131 Key Concept 7.2, Membrane structure results in selective permeability, 131-132 Key Concept 7.3, Passive transport is diffusion of a substance across a membrane with no energy investment, 132-136 Key Concept 7.4, Active Transport uses energy to move solutes against their gradients, 136-139 Key Concept 7.5, Bulk transport across the plasma membrane occurs by exocytosis and endocytosis, 139-141
Systems Interactions (SYI)	SYI-1: Living systems are organized in a hierarchy of structural levels that interact.	Chapter 40, Basic Principles of Animal Form and Function 873-897 Key Concept 40.1, Animal form and function are correlated at all levels of organization, 874-881 Key Concept 40.2, Feedback control maintains the internal environment in many animals, 881-883 Key Concept 40.3, Homeostatic processes for thermoregulation involve form, function, and behavior, 884-889

Unit 3: Cellular Energetics (7 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Energetics (ENE)	ENE-1: The highly complex organization of living systems requires constant input of energy and the exchange of macromolecules.	Chapter 8, An Introduction to Metabolism 143-163 Chapter 9, Cellular Respiration and Fermentation, 164-186 Chapter 10, Photosynthesis, 187-211 Background Chapter 5 The Structure and Function of Large Biological Molecules 66-91 Key Concept 5.1, Molecules of Life, 67-68 Key Concept 5.2, Carbohydrates serve as fuel and building material, 68-72 Key Concept 5.3, Lipids are a diverse group of hydrophobic molecules, 72-75 Key Concept 5.4, 75-83
Systems Interactions (SYI)	SYI-3: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.	Chapter 54, Community Ecology, 1214-1237 Key Concept 54.2, Diversity and trophic structure characterize biological communities, 1222-1228 Key Concept 54.3, Disturbance influences species diversity and composition, 1228-1231 Key Concept 54.4, Biogeographic factors affect community diversity, 1231-1233

Unit 4: Cell Communication and Cell Cycle (7 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Energetics (ENE)	ENE-3: Timing and coordination of biological mechanisms involved in growth, reproduction, and homeostasis depend on organisms responding to environmental cues.	Chapter 35, Vascular Plant Structure, Growth, and Development, 758-783 Key Concept 35.2 Different meristems generate new cells for primary and secondary growth 766-767 Key Concept 35.3 Primary growth lengthens roots and shoots, 768-771 Key Concept 35.4 Secondary growth increases diameter of stems and roots in woody plants, 772-774 Chapter 45, Hormones and the Endocrine Systems, 999-1018 Key Concept 45.3, Endocrine glands respond to diverse stimuli in regulating homeostasis, development, and behavior, 1011-1016
Information Storage and Transmission (IST)	IST-1: Heritable information provides for continuity of life.	Chapters 15, The Chromosomal Basis of Inheritance, 294-313 Chapter 16, The Molecular Basis of Inheritance, 314-334 Chapter 17, Gene Expression: From Gene to Protein, 335-364
	IST-3: Cells communicate by generating, transmitting, receiving, and responding to chemical signals.	Chapter 11, Cell Communication 212-233 Key Concept 11.1, External signals are converted to responses within the cell, 213-217 Key Concept 11.2, Reception: A signaling molecule binds to a receptor protein, causing it to change shape, 217-221 Key Concept 11.3, Transduction: Cascades of molecular interactions transmit signals from receptors to relay molecules in the cell 221-225

Unit 5: Heredity (8 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Evolution (EVO)	EVO-2: Organisms are linked by lines of descent from common ancestry.	Chapter 26, Phylogeny and the Tree of Life 553-572 Key Concept 26.1, Phylogenies show evolutionary relationships, 554-558 Key Concept 26.2, Phylogenies are inferred from morphological and molecular data, 558-559 Key Concept 26.3, Shared characters are used to construct phylogenetic trees, 559-565 Key Concept 26.6, Our understanding of the tree of life continues to change based on new data, 568-570
Information Storage and Transmission (IST)	IST-1: Heritable information provides for continuity of life.	Chapter 13, Meiosis and Sexual Life Cycles 254-268 Key Concept 13.1, Offspring acquire genes from parents by inheriting chromosomes, 255-256 Key Concept 13.2, Fertilization and Meiosis alternate in sexual life cycles, 256-259 Meiosis reduces the number of chromosomes from diploid to haploid Key Concept 13.4, Genetic variation produced in sexual life cycles contributes to evolution 265-267 Chapter 16, The Molecular Basis of Inheritance 314-334 Key Concept 16.1, DNA is the genetic material, 315-320 Key Concept 16.2, Many proteins work together in DNA replication and repair, 320-329 Key Concept 16.3, A chromosome consists of a DNA molecule packed together with proteins, 330-332

Systems Interactions (SYI)	SYI-3: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.	Chapter 56, Conservation Biology and Global Change 1260-1287 Key Concept 56.1, Human activities threaten Earth's biodiversity, 1261-1266 Key Concept 56.2, Population conservation focuses on population size, genetic diversity, and critical habitat, 1266-1270
Unit 6: Gene Expression and Regulation (9 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Information Storage and Transmission (IST)	IST-1: Heritable information provides for continuity of life.	Chapter 13, Meiosis and Sexual Life Cycles 254-268 Key Concept 13.1, Offspring acquire genes from parents by inheriting chromosomes 255-256 Key Concept 13.2, Fertilization and Meiosis alternate in sexual life cycles 256-259 Key Concept 13.3 Meiosis reduces the number of chromosomes from diploid to haploid 259-265 Key Concept 13.4, Genetic variation produced in sexual life cycles contributes to evolution 265-267 Chapter 16, The Molecular Basis of Inheritance 314-334 Key Concept 16.1, DNA is the genetic material 315-320 Key Concept 16.2, Many proteins work together in DNA replication and repair 320-329 Key Concept 16.3, A chromosome consists of a DNA molecule packed together with proteins 330-332

	IST-2: Differences in the expression of genes account for some of the phenotypic differences between organisms.	Chapter 17, Gene Expression: From Gene to Protein 335-364 Key Concept 17.1, Genes specify proteins via transcription and translation, 336-342 Key Concept 17.2, Transcription is the DNA-Directed synthesis of RNA: A closer look, 342-344 Chapter 18, Regulation of Gene Expression 365-397 Key Concept 18.1, Bacteria often respond to environmental change by regulating transcription, 366-370 Key Concept 18.2, Eukaryotic gene expression is regulated at many stages, 370-379 Key Concept 18.4, A program of differential gene expression leads to different cell types in a multicellular organism, 381-388 Key Concept 18.5, Cancer results from genetic changes that affect cell cycle control, 388-395
	IST-4: The processing of genetic information is imperfect and is a source of genetic variation.	Chapter 13, Meiosis and Sexual Life Cycles 254-268 13.4, Genetic variation produced in sexual life cycles contributes to evolution, 265-267 Chapter 15, The Chromosomal Basis of Inheritance 294-313 Key Concept 15.3, Linked genes tend to be inherited together because they are located near each other on the same chromosome, 301-306

Unit 7: Natural Selection (13 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Evolution (EVO)	EVO-1: Evolution is characterized by a change in the genetic makeup of a population over time and is supported by multiple lines of evidence.	Chapter 22 Decent with Modification: A Darwinian View of Life, 468-485 Key Concept 22.3, Evolution is supported by an overwhelming amount of scientific evidence, 476-484 Chapter 23, The Evolution of Populations, 486-505 Key Concept 23.1, Genetic variation makes evolution possible, 487-489 Key Concept 23.2, The Hardy-Weinberg equation can be used to test whether a population is evolving, 489-493 Key Concept 23.3, Natural selection, genetic drift, and gene flow can alter allele frequencies in a population, 493-497
	EVO-2: Organisms are linked by lines of descent from common ancestry.	Chapter 26, Phylogeny and the Tree of Life 553-572 Key Concept 26.1, Phylogenies show evolutionary relationships, 554-558 Key Concept 26.2, Phylogenies are inferred from morphological and molecular data, 558-559 Key Concept 26.3, Shared characters are used to construct phylogenetic trees, 559-565 Key Concept 26.6, Our understanding of the tree of life continues to change based on new data, 568-570

	EVO-3: Life continues to evolve within a changing environment.	Chapter 22 Decent with Modification: A Darwinian View of Life, 468-485 Figure 22.13, Can a change in a population's food source result in evolution by natural selection? 477 Chapter 24, The Origin of Species, 506-524 Key Concept 24.2, Speciation can take place with or without geographic separation, 511-516 Chapter 29, Plant Diversity I: How Plants Colonized Land, 618-635 Key Concept 29.1, Plants evolved from green algae, 619-623 Key Concept 29.3, Ferns and other seedless vascular plants were the first plants to grow tall, 628-634 Chapter 52, An Introduction to Ecology and the Biosphere, 1164-1189 Key Concept 52.5, Ecological change and evolution affect one another over long and short periods of time, 1187
Systems and Interactions (SYI)	SYI-3: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.	Chapter 56, Conservation Biology and Global Change 1260-1287 Key Concept 56.1, Human activities threaten Earth's biodiversity1261-1266 Key Concept 56.2, Population conservation focuses on population size, genetic diversity, and critical habitat, 1266-1270

Unit 8: Ecology (7 Topics) AP® Biology Curriculum Framework		
Big Ideas	**Enduring Understandings**	**Campbell Biology, 12th Edition, AP® Edition Chapters and Key Concepts**
Evolution (EVO)	EVO-1: Evolution is characterized by a change in the genetic makeup of a population over time and is supported by multiple lines of evidence.	Chapter 22 Decent with Modification: A Darwinian View of Life, 468-485 Key Concept 22.3, Evolution is supported by an overwhelming amount of scientific evidence, 476-484 Chapter 23, The Evolution of Populations, 486-505 Key Concept 23.1, Genetic variation makes evolution possible, 487-489 Key Concept 23.2, The Hardy-Weinberg equation can be used to test whether a population is evolving, 489-492 Key Concept 23.3, Natural selection, genetic drift, and gene flow can alter allele frequencies in a population, 493-497
Energetics (ENE)	ENE-1: The highly complex organization of living systems requires constant input of energy and the exchange of macromolecules.	Chapter 8, An Introduction to Metabolism 143-163 Chapter 9, Cellular Respiration and Fermentation, 164-186 Chapter 10, Photosynthesis, 187-211 Background Chapter 5 The Structure and Function of Large Biological Molecules 66-91 Key Concept 5.1, Molecules of Life, 67-68 Key Concept 5.2, Carbohydrates serve as fuel and building material, 68-72 Key Concept 5.3, Lipids are a diverse group of hydrophobic molecules, 72-75 Key Concept 5.4, Proteins include a diversity of structures, resulting in a wide range of functions, 75-83

	ENE-3: Timing and coordination of biological mechanisms involved in growth, reproduction, and homeostasis depend on organisms responding to environmental cues.	Chapter 35, Vascular Plant Structure, Growth, and Development, 758-783 Key Concept 35.2 Different meristems generate new cells for primary and secondary growth 766 Key Concept 35.3 Primary growth lengthens roots and shoots, 768-771 Key Concept 35.4 Secondary growth increases diameter of stems and roots in woody plants, 772-775 Chapter 45, Hormones and the Endocrine Systems, 999-1018 Key Concept 45.3, Endocrine glands respond to diverse stimuli in regulating homeostasis, development, and behavior, 1011-1016
	ENE-4: Communities and ecosystems change on the basis of interactions among populations and disruptions to the environment.	Chapter 52 An Introduction to Ecology and the Biosphere, 1164-1189 Key Concept 52.2, The distribution of terrestrial biomes is controlled by climate and disturbances,1171-1172 Key Concept 52.4, Interactions between organisms and the environment limit distribution of species, 1178-1187 Key Concept 52.5, Ecological change and evolution affect one another over long and short periods of time, 1187
Information Storage and Transmission (IST)	IST-5: Transmission of information results in changes within and between biological systems.	Chapter 51, Animal Behavior, 1139-1162 Key Concept 51.1, Discrete sensory inputs can stimulate both simple and complex behaviors, 1140-1143

Systems Interactions (SYI)	SYI-1: Living systems are organized in a hierarchy of structural levels that interact.	Chapter 40, Basic Principles of Animal Form and Function, 873-897 Key Concept 40.1, Animal form and function are correlated at all levels of organization, 874-881 Key Concept 40.2, Feedback control maintains the internal environment in many animals, 881-883 Key Concept 40.3, Homeostatic processes for thermoregulation involve form, function, and behavior, 884-889
	SYI-2: Competition and cooperation are important aspects of biological systems.	Chapter 54, Community Ecology, 1214-1237 Key Concept 54.1, Community Interactions are classified by whether they help, harm, or have no effect on the species involved, 1215-1221
	SYI-3: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.	Chapter 54, Community Ecology, 1214-1237 Key Concept 54.2, Diversity and trophic structure characterize biological communities, 1222-1228 Key Concept 54.3, Disturbance influences species diversity and composition, 1228-1231 Key Concept 54.4, Biogeographic factors affect community diversity, 1231-1233