AP Biology
High School

1.0 Understands and applies the skills of scientific inquiry.

1.1 Uses scientific inquiry to design, conduct, and analyze scientific investigations.
1.2 Identifies questions and concepts that guide scientific investigations.
1.3 Understands that different kinds of questions suggest different kinds of investigations.
1.4 Uses appropriate models when necessary.
1.5 Develops hypothesis.
1.6 Identifies controls and variables.
1.7 Designs and executes scientific investigations.
1.8 Selects and uses appropriate tools, technology and techniques to gather data.
1.9 Makes appropriate qualitative and quantitative observations.
1.10 Recognizes the importance of multiple trials with reproducible results.
1.11 Organizes data and observations efficiently, including creating appropriate tables and graphs.
1.12 Analyzes and evaluates the data and observations.
1.13 Integrates data and observations to draw appropriate conclusions.
1.14 Accounts for errors in investigations.
1.15 Uses evidence to infer possible applications or extensions for further inquiry.
1.16 Uses various methods to communicate experimental methods, observations, results, and interpretations.
1.17 Uses appropriate safety procedures when conducting investigations.
1.18 Students use appropriate safety procedures when conducting investigations.
1.19 Recognizes that safety concerns change with different procedures.
1.20 Knows locations and appropriate uses of the safety equipment in the classroom.

3.0 Understands and applies concepts, principles and theories pertaining to life and its interactions.

3.1 Understands and applies concepts, principles and theories pertaining to life and its interactions.

Understands natural selection is a major mechanism of evolution.
Understands natural selection acts on phenotypic variations in populations.

Knows evolutionary change is also driven by genetic drift and artificial selection.

Understands biological evolution is supported by evidence from many scientific disciplines.

3.2 Understand organisms are linked by lines of descent from common ancestry.

Knows organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.

Understands a phylogenetic tree and/or a cladogram is a graphical representation (model) of evolutionary history that can be tested.

Knows non-eukaryotes can transfer genetic information laterally through the mechanisms of transformation, transduction and conjugation; most eukaryotes do not transfer information laterally.

3.3 Understands life continues to evolve within a changing environment.

Can explain speciation and extinction have occurred throughout the Earth's history.

Can explain speciation may occur when two populations become reproductively isolated from each other.

Understands how populations of organisms continue to evolve.

3.4 Understands that the origin of living systems is explained by natural processes.

Can explain there are causal models about the origin of life on Earth.

Provides evidence from many different scientific disciplines supports models of the origin of life.

3.5 Understands growth, reproduction, and maintaining organization of living systems require energy and matter.

Explains all living things require constant input of energy.

Understands that organisms capture, use, and store energy in biological processes such as growth, reproduction and maintaining homeostatic processes.

Understands that organisms must exchange matter with the environment to grow, reproduce, and maintain organization.

Describes how programmed cell death (apoptosis) plays a role in development and differentiation, allows molecules to be reused, and helps maintain homeostasis within a biological system.

3.6 Understands that growth, reproduction, and homeostasis require that cells create and maintain internal environments that are different from their external environments.

Diagrams how cell membranes are selectively permeable due to their structure.

Explains selective permeability is a direct consequence of membrane structure, as noted in the fluid mosaic model.

Understands how growth and homeostasis is maintained by the constant movement of molecules across membranes.

Demonstrates how eukaryotic cells maintain internal membranes that partition the cell into specialized regions.

3.7 Understands that organisms use feedback mechanisms to regulate growth and maintain homeostasis.

Diagrams examples of positive feedback mechanisms to amplify responses and processes in biological organisms.

Diagrams examples of negative feedback mechanisms to maintain their internal environments and respond to external environmental changes.

Understands organisms constantly respond to changes in their external environments.

3.8 Understands that growth and homeostasis of a biological system are influenced by changes in the system's environment.

Explains that all biological systems from cells to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions.

Homeostatic mechanisms reflect both continuity due to common ancestry and divergence due to adaptation in different environments.

Shows that biological systems are affected by disruptions to their homeostasis.

Lists examples of plants and animals that have a variety of chemical defenses against infections that affect homeostasis.

3.9 Identify many biological processes involved in growth, reproduction, and homeostasis including temporal aspects.

Demonstrates how timing and coordination of several events are necessary for the normal development of an organism, and these events require regulation by multiple mechanisms.

Demonstrates how timing and coordination of physiological events are regulated by multiple mechanisms.

Demonstrates how timing and coordination of behavior is regulated by several mechanisms.

3.10 Heritable information provides for continuity of life.

Knows that DNA, and in some cases RNA, is the primary source of heritable information.

Explains how in most eukaryotes, heritable information is passed to the next generation through mitosis or meiosis plus fertilization.

Demonstrates how Mendelian genetics provides a basic

understanding of the underlying causes of the pattern traits form parent to offspring.

Knows that the inheritance pattern of many traits cannot be explained by simple Mendelian genetics.

3.11 Understands the expression of genetic information involves cellular and molecular mechanisms.

Knows that cells can be activated, produce new products, and retain their activated state through gene regulation.

Recognizes that a variety of intercellular and intracellular signal transmissions mediate gene expression.

3.12 Explains how transfer of genetic information may produce variation.

Shows how changes in genotype can result in changes in phenotype.

Understands and explain how biological systems possess multiple mechanisms that increase genetic variation.

Explains how viruses' reproduce and can introduce genetic variation into their hosts.

3.13 Explains how cells communicate by generating, transmitting, and receiving chemical signals.

Knows that cell communication involves processes resulting from evolution that are shared common features.

Demonstrates that cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.

Recognizes signal transduction pathways link signal reception with cellular response.

Errors in normal signal transduction may alter cellular response.

3.14 Transmission of non-heritable information results in changes within and between biological systems.

Organisms exchange information with each other in response to internal changes and external cues, which may change behavior.

Multi-cellular animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses.

Individuals can act on information and communicate it to others.

The subcomponents of a biological polymer and their sequence determine the properties of that polymer.

Interactions of subcellular structures, including a repertory of eukaryotic organelles possessing specialized functions, provide essential cellular functions and activities.

Interaction between external stimuli and gene expression result in specialization of cells, tissues, and organs.

Organisms exhibit complex properties due to interactions between their constituent parts.
Communities are composed of populations or organisms that interact in complex ways.
Interactions among living systems and with their environment result in the movement of matter and energy.
Competition and cooperation are important aspects of biological systems.
Interactions between molecules affect their structure and function.
Interactions between cells affect the fitness or the organism.
Cooperative interactions within organisms increase efficiency in the use of energy and matter.
At the organism level, specialization of organs to exchange gases, circulate fluids, digest food, and excrete waste contribute to the overall functioning of the cell.
Global distribution of ecosystems changes substantially over time.

3.15 Variation within biological systems affects interactions with the environment.

Variation in molecular units provides cells with a wider range of functions.
Environmental factors influence the expression of the genotype in an organism.
The level of variation in a population affects population dynamics.
Diversity of species within an ecosystem may influence the stability of the ecosystem.