

AP Biology Essential Knowledge Cards

BIG IDEA 1

Essential knowledge 1.A.1:

Natural selection is a major mechanism of evolution.

Essential knowledge 1.A.4:

Biological evolution is supported by scientific evidence from many disciplines, including mathematics.

Essential knowledge 1.A.2:

Natural selection acts on phenotypic variations in populations.

Essential knowledge 1.B.1:

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

Essential knowledge 1.A.3:

Evolutionary change is also driven by random processes.

Essential knowledge 1.B.2:

Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.

Essential knowledge 1.C.1:

Speciation and extinction have occurred throughout the Earth's history.

Essential knowledge 1.D.1:

There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence.

Essential knowledge 1.C.2:

Speciation may occur when two populations become reproductively isolated from each other.

Essential knowledge 1.D.2:

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

Essential knowledge 1.C.3:

Populations of organisms continue to evolve.

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BIG IDEA 2

Essential knowledge 2.A.1:

All living systems require constant input of free energy.

Essential knowledge 2.B.1: Cell membranes are selectively permeable due to their structure.

Essential knowledge 2.A.2:

Organisms capture and store free energy for use in biological processes.

Essential knowledge 2.B.2:

Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes.

Essential knowledge 2.A.3:

Organisms must exchange matter with the environment to grow, reproduce and maintain organization.

Essential knowledge 2.B.3:

Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.

Essential knowledge 2.C.1:

Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.

Essential knowledge 2.D.2:

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

Essential knowledge 2.C.2:

Organisms respond to changes in their external environments.

Essential knowledge 2.D.3:

Biological systems are affected by disruptions to their dynamic homeostasis.

Essential knowledge 2.D.1: All biological systems from cells and organisms to populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.

Essential knowledge 2.D.4:

Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.

Essential knowledge 2.E.1:

Timing and coordination of specific events are necessary for the normal development of an organism, and these events are regulated by a variety of mechanisms.

Essential knowledge 2.E.3:

Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.

Essential knowledge 2.E.2:

Timing and coordination of physiological events are regulated by multiple mechanisms.

AP Biology Essential Knowledge Cards

BIG IDEA 3

Essential knowledge 3.A.1:

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

Essential knowledge 3.A.4: The inheritance pattern of many traits cannot be explained by simple Mendelian genetics.

Essential knowledge 3.A.2: In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization.

Essential knowledge 3.B.1: Gene regulation results in differential gene expression, leading to cell specialization.

Essential knowledge 3.A.3: The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.

Essential knowledge 3.B.2: A variety of intercellular and intracellular signal transmissions mediate gene expression.

Essential knowledge 3.C.1:

Changes in genotype can result in changes in phenotype.

Essential knowledge 3.D.1: Cell communication processes share common features that reflect a shared evolutionary history.

Essential knowledge 3.C.2:

Biological systems have multiple processes that increase genetic variation.

Essential knowledge 3.D.2:

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

Essential knowledge 3.C.3:

Viral replication results in genetic variation and viral infection can introduce genetic variation into the hosts.

Essential knowledge 3.D.3:

Signal transduction pathways link signal reception with cellular response.

Essential knowledge 3.D.4:

Changes in signal transduction pathways can alter cellular response.

Essential knowledge 3.E.1:

Individuals can act on information and communicate it to others.

Essential knowledge 3.E.2:

Animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses.

AP Biology Essential Knowledge Cards

BIG IDEA 4

Essential knowledge 4.A.1:

The subcomponents of biological molecules and their sequence determine the properties of that molecule.

Essential knowledge 4.A.4:

Organisms exhibit complex properties due to interactions between their constituent parts.

Essential knowledge 4.A.2:

The structure and function of subcellular components, and their interactions, provide essential cellular processes.

Essential knowledge 4.A.5:

Communities are composed of populations of organisms that interact in complex ways.

Essential knowledge 4.A.3:

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

Essential knowledge 4.A.6:

Interactions among living systems and with their environment result in the movement of matter and energy.

Essential knowledge 4.B.1:

Interactions between molecules affect their structure and function.

Essential knowledge 4.B.4:

Distribution of local and global ecosystems changes over time.

Essential knowledge 4.B.2:

Cooperative interactions within organisms promote efficiency in the use of energy and matter.

Essential knowledge 4.C.1:

Variation in molecular units provides cells with a wider range of functions.

Essential knowledge 4.B.3:

Interactions between and within populations influence patterns of species distribution and abundance.

Essential knowledge 4.C.2:

Environmental factors influence the expression of the genotype in an organism.

Essential knowledge 4.C.3:

The level of variation in a population affects population dynamics.

Essential knowledge 4.C.4:

The diversity of species within an ecosystem may influence the stability of the ecosystem.