**AP Biology Concept Checklists**

**UNIT 1: Nature of Science**

**# CONCEPT**

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| **1.1** | The student can *pose, refine, and evaluate scientific questions*. |
| **1.2** | The student can *justify the selection of the kind of data* needed to answer a particular scientific question. |
| **1.3** | The student can *design a plan* for collecting data to answer a particular scientific question. |
| **1.4** | The student can *collect data* to answer a particular scientific question. |
| **1.5** | The student can *evaluate sources of data* to answer a particular scientific question. |
| **1.6** | The student can *analyze data* to identify patterns or relationships. |
| **1.7** | The student can *justify the selection of a mathematical routine* to solve problems. |
| **1.8** | The student can *apply mathematical routines* to quantities that describe natural phenomena. |

**UNIT 2: Evolution**

**# CONCEPT**

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| **2.1** | **Natural selection is a major mechanism of evolution.**  **Natural selection acts on phenotypic variations in populations.** |
| **2.2** | **Evolutionary change is also driven by random processes.** |
| **2.3** | **Biological evolution is supported by scientific evidence from many disciplines, including mathematics.** |
| **2.4** | **Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.** |
| **2.5** | **Speciation and extinction have occurred throughout the Earth’s history.**  **Speciation may occur when two populations become reproductively isolated from each other.** |
| **2.6** | **Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.**  **Populations of organisms continue to evolve.** |
| **2.7** | **There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence.**  **Scientific evidence from many different disciplines supports models of the origin of life.** |

**UNIT 3: Biochemistry**

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| **3.1** | Structure and function of polymers are derived from the way their monomers are assembled. **NUCLEIC ACIDS, LIPDS, CARBOHYDRATES, PROTEINS** |  |
| **3.2** | Directionality influences structure and function of the polymer. |
| **3.3** | Change in the structure of a molecular system may result in a change of the function of the system. |
| **3.4** | Molecules and atoms from the environment are necessary to build new molecules. |
| **3.5** | Living systems depend on properties of water that result from its polarity and  hydrogen bonding. |
| **3.6** | Surface area-to-volume ratios affect a biological system’s ability to obtain necessary resources or eliminate waste products. |

**UNIT 4: The Cell**

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| **4.1** | **Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.** |  |
| **4.2** | **The structure and function of subcellular components, and their interactions, provide essential cellular processes.** |
| **4.3** | **Cell membranes are selectively permeable due to their structure.** |
| **4.4** | **Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes.** |
| **4.5** | **Cell communication processes share common features that reflect a shared evolutionary history.** |
| **4.6** | **Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.** |
| **4.7** | **Signal transduction pathways link signal reception with cellular response.** |

**UNIT 5: Metabolism**

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| **5.1** | **All living systems require constant input of free energy.** |  |
| **5.2** | **Interactions between molecules affect their structure and function (enzymes).** |
| **5.3** | **Organisms capture and store free energy for use in biological processes.** |
| **5.4** | **Cellular respiration in eukaryotes involves a series of coordinated enzyme-catalyzed reactions that harvest free energy from simple carbohydrates.** |

**UNIT 6: Mendelian Genetics**

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| **6.1** | **In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization.** |
| **6.2** | **Biological systems have multiple processes that increase genetic variation.** |
| **6.3** | **Changes in genotype can result in changes in phenotype.** |
| **6.4** | **The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.** |
| **6.5** | **The inheritance pattern of many traits cannot be explained by simple Mendelian genetics.** |
| **6.6** | **Variation in molecular units provides cells with a wider range of functions.** |
| **6.7** | **Environmental factors influence the expression of the genotype in an organism.** |

**UNIT 7: Molecular Genetics**

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| **7.1** | **DNA, and in some cases RNA, is the primary source of heritable information.** |
| **7.2** | **A variety of intercellular and intracellular signal transmissions mediate gene expression.** |
| **7.3** | **Changes in genotype can result in changes in phenotype.** |
| **7.4** | **Biological systems have multiple processes that increase genetic variation.** |
| **7.5** | **Viral replication results in genetic variation, and viral infection can introduce genetic variation into the hosts.** |
| **7.6** | **Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues and organs.**  **Variation in molecular units provides cells with a wider range of functions.** |

**UNIT 8: Plants**

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| **8.1** | **Organisms capture and store free energy for use in biological processes.** |
| **8.2** | **Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.** |
| **8.3** | **Timing and coordination of physiological events are regulated by multiple mechanisms.** |
| **8.4** | **Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.** |
| **8.5** | **Organisms exhibit complex properties due to interactions between their constituent parts.** |

**Unit 9: Organismal Physiology Unit Guide**

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| **9.1** | **Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.** |
| **9.2** | **Organisms respond to changes in their external environments.** |
| **9.3** | **Homeostatic mechanisms reflect common ancestry and divergence due to adaptation in different environments.** |
| **9.4** | **Biological systems are affected by disruptions to their dynamic homeostasis.** |
| **9.5** | **Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.** |
| **9.6** | **Timing and coordination of physiological events are regulated by multiple mechanisms.** |
| **9.7** | **Cell communication processes share common features that reflect a shared evolutionary history.** |
| **9.8** | **Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.** |
| **9.9** | **Changes in signal transduction pathways can alter cellular response.** |
| **9.10** | **Animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses.** |
| **9.11** | **Organisms exhibit complex properties due to interactions between their constituent parts.** |
| **9.12** | **Cooperative interactions within organisms promote efficiency in the use of energy and matter.** |
| **9.13** | **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.** |
| **9.14** | **Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.** |

**UNIT 10: Ecology/Animal Behavior**

**# CONCEPT**

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| **10.1** | **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.**  **All living systems require constant input of free energy.**  **Interactions among living systems and with their environment result in the movement of matter and energy.** |
| **10.2** | **Biological systems are affected by disruptions to their dynamic homeostasis.**  **Distribution of local and global ecosystems changes over time.** |
| **10.3** | **Communities are composed of populations of organisms that interact in complex ways.**  **The level of variation in a population affects population dynamics.**  **Interactions between and within populations influence patterns of species distribution and abundance.** |
| **10.4** | **Individuals can act on information and communicate it to others.** |
| **10.5** | **The diversity of species within an ecosystem may influence the stability of the ecosystem.** |