

AP Biology Organization by Questions

→ Please help me by commenting on the following:

1. My Topic/Unit Order
2. The Essential Knowledge standard assigned for each lesson - in **BOLD**
3. Lesson Question for each topic - **Highlighted**
4. Any suggestions for **Unit questions** and/or overall **Course questions**
5. Once you have view and/or commented, please take this [short survey](#).

Course Question - Questions will be created when Unit questions are complete.

Unit Question - Question will be created when Lesson questions are complete.

Lesson Question (topic listed in blue)

#.Letter.# = AP Biology Essential Knowledge Standard

1st SEMESTER:

1. **Introduction:**

- **What causes something to be considered living?** (characteristics of life)
 - **1.B.1:** Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.
 - **3.A.1:** DNA, and in some cases RNA, is the primary source of heritable information.
- **What does the study of life (biology) look like?** (lab skills, bias, controls, etc)
 - Investigations to practice performance standards

2. **Evolution:**

- **What can cause changes in a population's genetic makeup over time?** (natural selection)
Divide into two questions/lessons?
 - **1.A.1:** Natural selection is a major mechanism of evolution.
 - **1.A.2:** Natural selection acts on phenotypic variations in populations.
 - **1.A.3:** Evolutionary change is also driven by random processes.
 - **1.A.4:** Biological evolution is supported by scientific evidence from many disciplines, including mathematics.
 - **1.C.3:** Populations of organisms continue to evolve.
 - **2.E.3:** Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.
 - **3.C.1:** Changes in genotype can result in changes in phenotype.
 - **3.C.2:** Biological systems have multiple processes that increase genetic variation.
 - **4.C.3:** The level of variation in a population affects population dynamics.
- **How can shared traits be used to link organisms and determine common ancestry.** (phylogeny)
 - **1.A.4:** Biological evolution is supported by scientific evidence from many disciplines, including mathematics.

- **1.B.1:** Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.
- **1.B.2:** Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.
- **How are new species formed? (speciation)**
 - **1.C.1:** Speciation and extinction have occurred throughout the Earth's history.
 - **1.C.2:** Speciation may occur when two populations become reproductively isolated from each other.
 - **1.C.3:** Populations of organisms continue to evolve.
- **What is the origin of life on Earth? (origin of life)**
 - **1.A.4:** Biological evolution is supported by scientific evidence from many disciplines, including mathematics.
 - **1.C.1:** Speciation and extinction have occurred throughout the Earth's history
 - **1.D.1:** There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence.
 - **1.D.2:** Scientific evidence from many different disciplines supports models of the origin of life.

3. BioChemistry:

- **How do atoms interact to form molecules? (chem of life)**
 - **2.A.3:** Organisms capture and store matter with the environment to grow, reproduce and maintain organization.
- **How does what we eat & our DNA (macromolecules) allow organisms to grow and respond? (macromolecules)**
 - **3.A.1:** DNA, and in some cases RNA, is the primary source of heritable information.
 - **4.A.1:** The subcomponents of biological molecules and their sequence determine the properties of that molecule.
- **How do biological reactions occur quickly enough to sustain life? (energy & enzyme)**
 - **2.A.1:** All living systems require constant input of free energy.
 - **4.B.1:** Interactions between molecules affect their structure and function.

4. Cells (divided into three or four parts - Cells & Their Membranes, Cell Signalling, Cellular Energy, and The Cell Cycle - and expanded Cell Signalling to include endocrine, immune and nervous systems):

a. Cells & Their Membranes:

- **What are cells and why are they so small? (cells & cell size)**
 - **1.B.1:** Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.
 - **2.A.3:** Organisms capture and store matter with the environment to grow, reproduce and maintain organization.
- **Why do Eukaryotic cells contain "tiny organs" called organelles? (organelles)**

- **2.B.3:** Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.
- **4.A.2:** The structure and function of subcellular components, and their interactions, provide essential cellular processes.
- **How do cells eat and poop?** (cell membrane & transport)
 - **2.B.1:** Cell membranes are selectively permeable due to their structure.
 - **2.B.2:** Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes.
 - **4.C.1:** Variations in molecular units provides cells with a wider range of functions.

b. **Cell Signalling:**

- **How do cells talk with other cells?** (cell signalling)
 - **3.B.2:** A variety of intercellular and intracellular signal transmissions mediate gene expression.
 - **3.D.1:** Cell communication processes share common features that reflect a shared evolutionary history.
 - **3.D.2:** Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.
 - **3.D.3:** Signal transduction pathways link signal reception with cellular response.
 - **3.D.4:** Changes in signal transduction pathways can alter cellular response.
- **How do humans maintain homeostasis?** (endocrine, immune, nervous systems)
 - **2.C.1:** Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.
 - **2.D.3:** Biological systems are affected by disruptions to their dynamic homeostasis.
 - **2.D.4:** Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.
 - **3.E.2:** Animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses.

c. **Cellular Energy:**

- **How do cells use energy?** (energy & ATP)
 - **2.A.1:** All living systems require constant input of free energy.
- **Why do we eat and breathe?** (cellular respiration)
 - **2.A.2:** Organisms capture and store free energy for use in biological processes.
 - **4.A.2:** The structure and function of subcellular components, and their interactions, provide essential cellular processes.
- **How do plants create food out of water and CO₂?** (photosynthesis)
 - **2.A.2:** Organisms capture and store free energy for use in biological processes.
 - **4.A.2:** The structure and function of subcellular components, and their interactions, provide essential cellular processes.
 - **4.C.1:** Variations in molecular units provides cells with a wider range of functions.

d. **The Cell Cycle:**

- **How does the cell know when to divide (and how does it do it)? (cell cycle & mitosis)**
 - **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.
- **What advantages does sexual reproduction include? (meiosis)**
 - **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.
 - **3.C.1:** Changes in genotype can result in changes in phenotype.
 - **3.C.2:** Biological systems have multiple processes that increase genetic variation.

5. Energy: - **Now under 4c**

6. Cell Cycle: - **Now under 4d.**

2nd SEMESTER:

7. **Genetics** (divide into four parts):

a. **Mendelian Genetics:**

- **Why do family members look similar? (Mendel)**
 - **3.A.3:** The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.
- **Why don't all traits follow Mendel's model? (Beyond Mendel)**
 - **3.A.4:** The inheritance pattern of many traits cannot be explained by simple Mendelian genetics.
 - **4.C.2:** Environmental factors influence the expression of the genotype in an organism.

b. **Central Dogma:**

- **Why is DNA's structure so impressive? (DNA & Replication)**
 - **3.A.1:** DNA, and in some cases RNA, is the primary source of heritable information.
 - **4.A.1:** The subcomponents of biological molecules and their sequence determine the properties of that molecule.
- **How does DNA in the nucleus create proteins? (Protein Synthesis)**
 - **3.A.1:** DNA, and in some cases RNA, is the primary source of heritable information.
- **How do mutations change an organism? (Mutations)**
 - **3.C.1:** Changes in genotype can result in changes in phenotype.
 - **3.C.2:** Biological systems have multiple processes that increase genetic variation.

c. **Regulation:**

- **How do bacteria turn their genes on and off? (Operons)**
 - **2.C.1:** Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.
 - **3.B.1:** Gene regulation results in differential gene expression, leading to cell specialization.
 - **4.C.2:** Environmental factors influence the expression of the genotype in an organism.
- **How do eukaryotes turn their genes on and off? (Eukaryotic)**

- **3.B.1:** Gene regulation results in differential gene expression, leading to cell specialization.
- **4.C.2:** Environmental factors influence the expression of the genotype in an organism.

d. **BioTech:**

- **NOT SURE ABOUT WHAT QUESTIONS TO ASK ABOUT BIO TECH**

- **3.A.1:** DNA, and in some cases RNA, is the primary source of heritable information.
- **3.A.3:** The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.

8. **Diversity:**

- **Are all bacteria and viruses bad? (Bacteria and Viruses)**

- **1.B.1:** Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.
- **1.B.2:** Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.
- **3.C.3:** Viral replication results in genetic variation, and viral infections can introduce genetic variation into the hosts.

- **How do protists and fungi differ from the other kingdoms? (Protists and Fungi)**

- **1.B.2:** Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.

- **How have plants evolved? (Plants)**

- **1.B.2:** Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.
- **2.A.3:** Organisms capture and store matter with the environment to grow, reproduce and maintain organization.

- **How do plants survive?**

- **2.A.3:** Organisms capture and store matter with the environment to grow, reproduce and maintain organization.
- **2.C.2:** Organisms respond to changes in their external environments.
- **2.D.4:** Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.
- **3.D.2:** Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.
- **4.A.4:** Organisms exhibit complex properties due to interactions between their constituent parts.

- **What exactly is an animal? (Animals)**

- **1.B.2:** Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.

9. Animals & Their Systems: - **Most of this now under 4b. Animals themselves under 8.**

10. **Ecology:**

- **What does animal behavior mean?** (Animal Behavior)
 - **3.E.1:** Individuals can act on information and communicate it to others.
 - **2.E.3:** Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.
- **How and why do similar organisms interact?** (Populations)
 - **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.
 - **2.D.3:** Biological systems are affected by disruptions to their dynamic homeostasis.
 - **4.A.6:** Interactions among living systems and with their environment result in the movement of matter and energy.
 - **4.B.3:** Interactions between and within populations influence patterns of species distribution and abundance.
- **How do populations interact?** (Communities)
 - **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.
 - **2.D.3:** Biological systems are affected by disruptions to their dynamic homeostasis.
 - **4.A.5:** Communities are composed of populations of organisms that interact in complex ways.
 - **4.A.6:** Interactions among living systems and with their environment result in the movement of matter and energy.
 - **4.B.2:** Cooperative interactions within organisms promote efficiency in the use of energy and matter.
 - **4.B.3:** Interactions between and within populations influence patterns of species distribution and abundance.
- **How does the environment affect a community?** (Ecosystems)
 - **4.A.6:** Interactions among living systems and with their environment result in the movement of matter and energy.
 - **4.B.4:** Distribution of local and global ecosystems changes over time.
 - **4.C.4:** The diversity of species within an ecosystem may influence the stability of the ecosystem.

******PLEASE NOTE:** The following three AP Biology Essential Knowledge Standards are not listed above. I am not sure where they fit.

- **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.
- **2.E.2:** Timing and coordination of physiological events are regulated by multiple mechanisms.
- **4.A.3:** Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues and organs.

