Indiana Science/Computer Science Content Connectors

Biology

From Molecules to Organisms: Structures and Processes

1. Match different cell types to the specific functions they perform. (E) HS-LS1-1A
2. Identify evidence to support an explanation of the relationship among DNA and genes in making the different proteins needed for cells to function. (E) HS-LS1-1B
3. Use a model to identify a part of a multicellular organism and the process it performs. HS-LS1-2A
4. Identify the components in a model of interacting hierarchical systems that perform specific functions within multicellular organisms. HS-LS1-2B
5. Conduct an investigation and use evidence to describe how positive and negative feedback mechanisms maintain homeostasis. HS-LS1-3A
6. Given a model, describe that cellular division (mitosis) and/or differentiation leads to producing and/or maintaining complex organisms. (E) HS-LS1-4A
7. Use a model to describe how photosynthesis results in the transformation of light energy to stored chemical energy. (E) HS-LS1-5A
8. Use evidence or a model to show that organisms take in matter and rearrange elements and molecules for growth and/or maintenance of large carbon-based molecules. (E) HS-LS1-6A
9. Use a model to illustrate the chemical processes in cellular respiration. HS-LS1-7A

Ecosystems: Interactions, Energy, and Dynamics

1. Use a graphical representation to explain changes in the population size of an animal species over time. HS-LS2-1A
2. Connect the limits of an ecosystem's carrying capacity (the number of organisms it can support) to the availability of living and nonliving resources and other challenges (e.g., predation, competition, disease). HS-LS2-1B
3. Use mathematical representations (e.g., trends, averages, graphs) to support how biodiversity is dependent on the resources available in its ecosystem. HS-LS2-2A
4. Explain the expected effect on the number and/or types of organisms in an ecosystem given a modest versus an extreme change/disturbance. HS-LS2-2B
5. Use evidence to explain that energy is the driving force in the cycling of matter in aerobic or anaerobic conditions. (E) HS-LS2-3A

	6 **Identify the changes in the amount of matter (biomass) as it travels through a food web.** HS-LS2-4A
	7 **Identify the changes in the amount of energy as it travels through an ecosystem using a model (e.g., energy pyramid, food chains, food webs, and biomass pyramids).** HS-LS2-4B
	8 **Illustrate the path of carbon as it is exchanged between living and nonliving systems (biosphere, atmosphere, hydrosphere, geosphere) using a model.(E)** HS-LS2-5A
	9 **Identify relevant components (i.e., inputs and outputs of photosynthesis; inputs and outputs of cellular respiration) of a model of the exchange of carbon between organisms and the environment.** HS-LS2-5B
	10 **Explain how living things in an ecosystem are affected by changes in the environment based on provided data.** HS-LS2-6A
	11 **Support or refute a claim regarding how a modest change versus an extreme change will affect stability of an ecosystem using evidence.** HS-LS2-6B
	12 **Describe how human activity affects Earth's environment and biodiversity and how people can help reduce their impact. [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.] (E)** HS-LS2-7A
	13 **Identify evidence supporting the outcome of group (flocking, schooling, herding) or cooperative (hunting, migrating, and swarming) behavior on species' chances to survive and reproduce.** HS-LS2-8A
Heredity: Inheritance and Variation of Traits	1 **Explain that DNA molecules in all cells contain the instructions (genes) for traits passed from parents to offspring.** HS-LS3-1A
	2 **Use evidence to defend a claim that parents and offspring may have different traits as a result of genetic combinations, errors during replication, or mutations caused by environmental factors.** HS-LS3-2A
	3 **Classify examples of variations of traits in a population (mutations in DNA) caused by new genetic combinations (meiosis), errors during replication, and/or mutations caused by environmental factors.** HS-LS3-2B
	4 **Calculate the probability of a particular trait in an offspring or the occurrence of a variation in a population.** HS-LS3-3A
Biological Evolution: Unity and Diversity	1 **Identify patterns of (homologous) structures (e.g., fossil records, DNA sequences, amino acid sequences, anatomical and embryological evidence) as evidence to a claim of common ancestry and biological evolution.** HS-LS4-1A

2 **Identify evidence that biological evolution results from (1) potential for a species to increase in number, (2) heritable genetic variation of individuals in a species, (3) competition for limited resources, and (4) organisms with advantageous traits are better able to survive and reproduce in the environment. (E)** HS-LS4-2A

3 **Use data to explain how organisms' traits that allow them to survive better in a specific environment are more common in the population.** HS-LS4-3A

4 **Use calculations to explain how the population of organisms with advantageous heritable traits will increase over time to organisms without these traits.** HS-LS4-3B

5 **Explain the cause-and-effect relationship between natural selection due to specific biotic and abiotic differences in ecosystems (e.g., ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, evolution of other organisms) that leads to an increasing proportion of individuals within a population with advantageous characteristics (adaptation).** HS-LS4-4A

6 **Use evidence to describe the cause-and-effect relationship of changes in the environment to the emergence of a new species or changes in the number, survival, or extinction of some species.** HS-LS4-5A

7 **Generate a solution addressing adaptation to reduce the effects of a human activity that decreases biodiversity.** HS-LS4-6A

8 **Determine which human actions help versus harm a threatened or endangered species.** HS-LS4-6B