BIOLOGY 1

Key Features

Focus Areas

- structures and processes,
- ecosystems,
- DNA and heredity, and
- biological evolution.

By the end of the Biology 1 course, students can

- Explain how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
- Illustrate how nuclear division (mitosis), cellular division (cytokinesis), and differentiation allows an organism to grow and repair itself.
- Illustrate how photosynthesis uses light energy to convert carbon dioxide plus water into sugars plus released oxygen and how those products may be combined with other elements to form amino acids and other large carbon-based molecules necessary for life processes.
- Explain that cellular respiration is a chemical process whereby the bonds of food molecules are broken and the bonds of new molecules are formed, releasing energy.
- Understand the role of photosynthesis and cellular respiration in the cycling of carbon among Earth's systems.
- Explain how the variation and distribution of traits observed in a population depends on genetic and environmental factors and describe and explain the causes and effects of heritable genetic variations.
- Explain how natural selection leads to adaptations of populations of organisms.
- Describe that common ancestry and biological evolution are supported by evidence.

Home to School Connections

Questions you can ask your learner could include:

- What happens when cells divide out of control?
- Why do the cells in our bodies require cellular respiration?
- What are some biotic and abiotic factors in our local environment?
- What can we do as a family to reduce the impact of human activities on the environment?
- Plants can have variations in traits passed down from one generation to the next. What are some examples of plant variations?

Questions you can ask your learner's teacher could include:

- What resources in the community are helpful to gain a stronger understanding of Biology topics?
- What kind of post-secondary educational and career opportunities could this course inspire my learner to explore?

Activities and learning you can do outside of the classroom to support your learner could include:

- Genetic engineering can alter the DNA in a genetically modified organism (GMO). Identify GMO's in your daily life. Examples include a variety of crops such as corn and soy, livestock, insulin and some vaccines.
- Research the green fluorescent protein (GFP) obtained from jellyfish. Find out what other organisms have the GFP from alteration of their DNA.
- The cell cycle goes through checkpoints prior to the division of cells in mitosis. This is analogous to a thermostat in the home. Observe how the thermostat will continue heating or cooling until it reaches the threshold of temperature so that it does not continue running unless needed, just like cell division occurs for growth or cell replacement.
- Observe a plant over time, focusing on the orientation to light, amount of water required and soil composition.

- Look at ingredients in foods you have at home. Identify the different sources of energy our body uses including simple sugars, complex sugars, fats, and proteins.
- Aerobic exercise such as running or walking uses energy and oxygen in the body.
- The fermentation of yeast is an example of anaerobic respiration which does not require oxygen. Bakers yeast used for bread can be placed in a small container with sugar and warm water. Place a balloon on the top to gather carbon dioxide from the reaction.
- Identify other ways your body uses up energy during the day.
- Choose a population the learner is familiar with and identify limiting resources, both biotic and abiotic, that prevent the population from growing too large for their habitat.
- Locate an invasive species that has moved into a South Carolina ecosystem. Describe how the invasive species affects other organisms in their natural environment. Examples of invasive species not native to South Carolina: fire ants, the ambrosia beetle on peach trees, flathead catfish, lionfish, wild boar, kudzu, wisteria.
- Discover patterns in traits among family members. Traits to look at could be the widow's peak hairline, toe length, tongue rolling, earlobe attachment, or hair texture.
- Observe a variety of domestic dogs and compare their traits to those of wild wolves. Discuss how dogs and wolves possibly shared a common ancestor.
- Choose a local animal to observe in nature. Identify the resources that the individual needs in order to survive and reproduce.

Resources

- Bozeman Science (https://www.bozemanscience.com/)
- CK-12 Foundation (https://www.ck12.org/student/)
- Discus (https://www.scdiscus.org/)
- Exploratorium (https://www.exploratorium.edu/)
- Genetic Science Learning Center (https://learn.genetics.utah.edu/)
- Howard Hughes Medical Institute's BioInteractive (https://www.biointeractive.org/)
- Khan Academy (https://www.khanacademy.org/)
- PBS LearningMedia (https://scetv.pbslearningmedia.org/)
- SC Department of Natural Resources (https://www.dnr.sc.gov/)