

Tenth Grade

Enduring Understanding

Life:

CELLS:

At the high school level, students' understanding of the principles of cell theory will continue as they learn about the similarities and differences among cells in the different kingdoms. A student will be able to observe a cell and make inferences that the cell is either plant, animal, or bacteria, based on general cell structure.

Students will continue to learn and recognize specialized cell types and their functions. Students should also be aware that many different types of cells cooperate in human body systems in order to perform certain major functions.

Scientifically literate high school students will be able to reason that cells specialize in order to efficiently divide or share the work necessary to keep the organism alive. This understanding can be used to explain the difference in structure and function between plant and animal cells. Students will begin to understand that differences in cell type form basic divisions in the way that scientists classify living things.

At the high school level, the concept of growth needs to be addressed. When cells take in simple food molecules from the bloodstream, some are used as an energy source by the cell and others are incorporated into the cell itself. Cell growth occurs until a certain capacity is reached; then the cell nucleus signals when cell division needs to take place. Growth of multicellular organisms is the result of an increase in the number of cells rather than the size of the cells.

Students at the high school level also need to know about the chemical composition of cells. Inorganic and organic molecules are components common to many types of cells and are used as building blocks in cells as more complex chemicals are synthesized.

The scientifically literate high school student will be able to describe how cells use energy and food to grow and reproduce. They will also be able to distinguish between cellular respiration and photosynthesis.

ORGANIZATION OF LIVING THINGS:

Students will be able to group common organisms according to their characteristics into kingdoms.

The "life cycle" is, perhaps, the most commonly known of the biological cycles. Birth, growth, reproduction, and death are all stages within the life cycle. High school students should be able to describe how the life cycles of certain organisms may affect human health.

The scientifically literate high school student will be able to make connections between the processes of food production, storage and use in a variety of living things. Foods used by living things are the direct or indirect products of food making organisms (autotrophs). Energy is transferred in ecosystems via food chains and webs.

Multicellular organisms show levels of organization that work together to maintain internal stability. Students should recognize how each system functions and interacts with other systems within the organism.

Students will learn modern methods and technology related to health and disease, and how they impact the human body.

HEREDITY:

Students at the high school level will understand that genes occur or act in pairs, one of which will usually be dominant over, or control, the other recessive gene. One of these genes is inherited from the mother, one from the father. If a certain trait is controlled by one gene pair, it can be represented by a box-like diagram called a Punnett square.

High school students will understand the differences between sexual and asexual reproduction. The scientifically literate high school student will be able to state that the genetic material, DNA, replicates during cell division. They will also understand that genes of the parents are randomly distributed to sex cells and passed on to the young, so that genetic variations within species become the raw material for evolution.

Genetic variety within a species is an important principle of heredity and also fundamental to evolutionary change. Genetic variety results from combination and recombination of material within the genetic pool. Some genes are expressed as traits, others are blended to form "in-between" traits, and some are not expressed at all. Sexually reproducing organisms have genetic material constantly mixed, resulting in new expressions of traits; this is an advantage over asexually reproducing organisms.

Scientifically literate students will be able to explain how the genetic code in DNA produces proteins. In addition, they should be able to explain how scientists are able to manipulate the genetic code to alter characteristics of organisms. In some cases these changes may have positive effects for humans, such as the production of insulin or the potential for developing cures for hereditary diseases. However, students will also be able to explain the risks involved in altering genetic makeup of organisms, and that newly created organisms may have a negative impact on ecosystems.

EVOLUTION:

Students at the high school level will be able to extend their concept of common ancestry to a study of the possible origin of humans. Specifically they should be able to relate what biologists consider to be evidence that humans evolved from more primitive ancestral animals. They could do this through comparisons of analogous human skeletal

parts and hominid fossils.

Students will need to be familiar with examples of common ancestral structures that scientists generally cite as prime instances of evolutionary change. They should also be able to provide an explanation as to why a given structural change is more advantageous in a given environment.

At the high school level, students will come to understand the critical roles that adaptation and natural selection play in evolutionary change. Although new genetic traits arise in a population through chance events (mutation and sexual recombination), organisms with adaptive traits are more likely to survive and pass these traits on to their offspring.

ECOSYSTEMS:

Every organism in an ecosystem is directly or indirectly linked with other organisms. Students will understand how changes in the environment that affect one organism or population could affect others. The stability of an ecosystem is maintained by interdependence of organisms within that ecosystem.

Students will be able to explain the energy transformations in a food web in great detail; as well as understand and construct simple energy pyramids. Students should be able to see the links between energy transformations and matter cycling. They will be able to predict the effects (changes) in energy in an ecosystem.

Ecosystems follow the principle of conservation of matter and energy. Materials move among living things and between living things and the environment, often being transformed in the process. Students will be able to describe the path of selected materials through an ecosystem.

Students will learn how decisions that impact the environment are made, and identify and analyze pros and cons of environmental issues.

Physical:

Earth:

Benchmarks

Life:

CELLS:

- 1.Explain how multicellular organisms grow, based on how cells grow and reproduce.
- 2.Compare and contrast ways in which selected cells are specialized to carry out particular life functions.

ORGANIZATION OF LIVING THINGS:

1. Classify major groups of organisms to the kingdom level.
2. Describe the life cycle of an organism associated with human disease.
3. Explain the process of food storage and food use in organisms.
4. Explain how living things maintain a stable internal environment.
5. Describe technology used in the pre-vention, diagnosis, and treatment of diseases and explain its function in terms of human body processes.

HEREDITY:

1. Explain how characteristics of living things are passed on from generation to generation.
2. Describe how genetic material is passed from parent to young during sexual and asexual reproduction.
3. Explain how new traits may arise in individuals through changes in genetic material (DNA).

EVOLUTION:

1. Describe what biologists consider to be evidence for human evolutionary relationships to selected animal groups.
2. Explain how a new species or variety may originate through the evolutionary process of natural selection.

ECOSYSTEMS:

1. Describe common ecological relationships between and among species and their environments.
2. Explain how energy flows through familiar ecosystems.
3. Describe general factors regulating population size in ecosystems.
4. Describe responses of an ecosystem to events that cause it to change.
5. Describe how carbon and soil nutrients cycle through selected ecosystems.
6. Explain the effects of agriculture and urban development on selected ecosystems.

Physical:

Earth: