
Since causes of complex phenomena and systems are not always immediately or physically visible to students, the need to develop abstract thinking skills is a significant outcome for Grade 8. Explaining patterns and making predictions based on an understanding of cause and effect allows students to conceptualize and describe the relationships among natural phenomena. In Grade 8, some examples of the relationships include the role of genetics in reproduction and heredity, the biology that explains unity and diversity, the transfer of energy, the result of dynamic changes to the Earth's surface, and human impact on the biosphere.

Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. The process of passing genetic information to offspring is inheritance. During sexual reproduction, genetic information is passed to offspring resulting in similarities and differences between parental organisms and their offspring. There are advantages and disadvantages of the two types of reproduction.

Obtain and communicate information about the relationship of genes, chromosomes, and DNA, and construct explanations comparing their relationship to inherited characteristics.

Create a diagram of mitosis and explain its role in asexual reproduction, which results in offspring with identical genetic information.

Construct explanations of how genetic information is transferred during meiosis.

Engage in discussion using models and evidence to explain that sexual reproduction produces offspring that have a new combination of genetic information different from either parent.

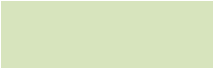
Compare and contrast advantages and disadvantages of asexual and sexual reproduction.

Inheritance is the key process causing similarities between parental organisms and their offspring. Organisms that reproduce sexually transfer genetic information (DNA) to their offspring. This transfer of genetic information through inheritance leads to greater similarity among individuals within a population than between populations. Genetic changes can accumulate through natural selection or mutation that can lead to the evolution of species. Humans can manipulate genetic information using technology.

Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms.

Use various scientific resources to research and support the historical findings of Gregor Mendel to explain the basic principles of heredity.





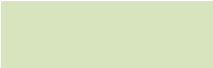
Analyze and interpret data (e.g. pictures, graphs) to explain how natural selection may lead to increases and decreases of specific traits in populations over time.

Construct written and verbal explanations to describe how genetic variations of traits in a population increase some organisms' probability of surviving and reproducing in a specific environment.

Obtain and evaluate scientific information to explain that separated populations, that remain separated, can evolve through mutations to become a new species (speciation).

Analyze displays of pictorial data to compare and contrast embryological and homologous/analogous structures across multiple species to identify evolutionary relationships.

Waves have energy that is transferred when they interact with various types of matter. A repeating pattern of motion allows the transfer of energy from place to place without overall displacement of matter. All types of waves have some features in common. When waves interact, they affect each other resulting in changes to the resonance. Many modern technologies are based on waves and their interactions with matter.



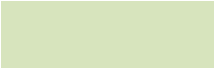
Fossils are preserved remains or traces of organisms that lived in the past. Thousands of layers of sedimentary rock not only provide evidence of the history of Earth itself but also of changes in organisms whose fossil remains have been found in those layers. The collection of fossils and their placement in chronological order (e.g., through the location of rock layers or through radioactive dating) is collectively known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.

Use scientific evidence to create a timeline of Earth's history that depicts relative dates from index fossil records and layers of rock (strata).

Create a model of the processes involved in the rock cycle and relate it to the fossil record.

Construct and analyze scientific arguments to support claims that most fossil evidence is an indication of the diversity of life that was present on Earth and that relationships exist between past and current life forms.

Use research and evidence to document how evolution has been shaped both gradually and through mass extinction by Earth's varying geological conditions (e.g., climate change, meteor impacts, and volcanic eruptions).



Use models that demonstrate convergent and divergent plate movements that are responsible for most landforms and the distribution of most rocks and minerals within Earth's crust.

Design and conduct investigations to evaluate the chemical and physical processes involved in the formation of soils.

Explain the interconnected relationship between surface water and groundwater.