

Biology First Nine Weeks  
9<sup>th</sup> and 10<sup>th</sup> Grade

The Study of Life

Life Sciences

**10.21** Explain that natural selection provides the following mechanism for evolution; undirected variation in inherited characteristics exist within every species. These characteristics may give individuals an advantage or disadvantage compared to others in surviving and reproducing. The advantaged offspring are more likely to survive and reproduce. Therefore, the proportion of individuals that have advantageous characteristics will increase. When an environment changes, the survival value of some inherited characteristics may change.

**10.22** Describe historical scientific developments that occurred in evolutionary thought (e.g., Lamarck and Darwin, Mendelian Genetics and modern synthesis).

**10.23** Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. (the intent of this indicator does not mandate the teaching or testing of intelligent design.)

**10.26** Use historical examples to explain how new ideas are limited by the context in which they are conceived. These ideas are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., biological evolution, germ theory, biotechnology and discovering germs).

**10.27** Describe advances in life sciences that have important long-lasting effects on science and society (e.g., biological evolution, germ theory, biotechnology and discovering germs).

**10.28** Analyze and investigate emerging scientific issues (e.g., genetically modified food, stem cell research, genetic research and cloning).

Science and Technology

**10.2** Describe examples of scientific advances and emerging technologies and how they may impact society.

Scientific Ways of Knowing

**10.1** Discuss science as a dynamic body of knowledge that can lead to the development of entirely new disciplines.

**10.2** Describe that scientists may disagree about explanations of phenomena, about interpretation of data or about the value of rival theories, but they do agree that questioning, response to criticism and open communication are integral to the process of science.

**10.3** Recognize that science is a systematic method of continuing investigation, based on observation, hypothesis testing, measurement, experimentation, and theory building, which leads to more adequate explanations of natural phenomena.

**10.4** Recognize that ethical considerations limit what scientists can do.

**10.5** Recognize that research involving voluntary human subjects should be conducted only with the informed consent of the subjects and follow rigid guidelines and/or laws.

**10.6** Recognize that animal-based research must be conducted according to currently accepted professional standards and laws.

**10.7** Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.

Scientific Inquiry

**10.1** Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g. OSHA, MSDS, eyewash, goggles and ventilation)

**10.2** Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology.

**10.3** Use mathematical models to predict and analyze natural phenomena.

**10.4** Draw conclusions from inquiries based on scientific knowledge and principles, the use of logic and evidence (data) from investigations.

**10.5** Explain how new scientific data can cause any existing scientific explanation to be supported, revised or rejected.

Ecology

Life Science

**10.9** Describe how matter cycles and energy flows through different levels of organization in living systems and between living systems and the physical environment. Explain how some energy is stored and much is dissipated into the environment as thermal energy (e.g., food webs and energy pyramids).

**10.13** Explain that the variation of organisms within a species increases the likelihood that at least some members of a species will survive under gradually changing environmental conditions.

**10.14** Relate diversity and adaptation to structures and their functions in living organisms (e.g., adaptive radiation).

Ecology Continued

**10.15** Explain how living things interact with biotic and abiotic components of the environment (e.g., predation, competition, natural disasters and weather).

**10.16** Relate how distribution and abundance of organisms and populations in ecosystems are limited by the ability of the ecosystem to recycle materials and the availability of matter, space and energy.

**10.17** Conclude that ecosystems tend to have cyclic fluctuations around a state of approximate equilibrium that can change when climate changes, when one or more new species appear as a result of immigration or when one or more species disappear.

**10.18** Describe ways that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. Explain how changes, either positive or changes in technology/biotechnology can cause significant negative, in environmental quality and carrying capacity.

**10.19** Illustrate how uses of resources at local, state, regional, national, and global levels have affected the quality of life (e.g., energy production and sustainable vs. unsustainable agriculture).

**10.24** Analyze how natural selection and other evolutionary mechanisms (e.g. genetic drift, immigration, emigration, mutation) and their consequences provide a scientific explanation for the diversity and unity of past life forms, as depicted in the fossil record, and present life forms.

Earth and Space Sciences

**10.1** Summarize the relationship between the climatic zone and the resultant biomes. (This includes explaining the nature of the rainfall and temperature of the mid-latitude climatic zone that supports the deciduous forest.

**10.5** Explain how the acquisition and use of resources, urban growth and waste disposal can accelerate natural change and impact the quality of life.

**10.6** Describe ways the at human activity can alter biogeochemical cycles (e.g., pest control, legume rotation crops vs. chemical fertilizers).

**10.7** Describe advances and issues in Earth and space science that have important long-lasting effects on science and society (e.g., geologic time scales, global warming, depletion of resources, exponential population growth).

Evolution: Change Through Time

Life Sciences

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Life Sciences Continued

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**10.25** Explain that life on Earth is thought to have begun as simple, one celled organisms approximately 4 billion years ago. During most of the history of Earth only single celled microorganisms existed, but once cells with nuclei developed about a billion years ago, increasingly complex multicellular organisms evolved.