

Biology

Earth and Space Science

- Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.

Life Science

- Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.
- Identify the major parts of the brain on diagrams or models.
- Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.
- Describe the factors affecting blood flow through the cardiovascular system.
- Compare and contrast structure and function of various types of microscopes.
- Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.
- Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.
- Relate the structure of each of the major plant organs and tissues to physiological processes.
- Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.
- Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.
- Describe the conditions required for natural selection, including overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.
- Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.
- Describe how mutation and genetic recombination increase genetic variation.
- Describe how and why organisms are hierarchically classified and based on evolutionary relationships.
- Explain the reasons for changes in how organisms are classified.

- Discuss distinguishing characteristics of the domains and kingdoms of living organisms.
- Describe the scientific explanations of the origin of life on Earth.
- Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.
- Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.
- Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.
- Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.
- Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.
- Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.
- Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.
- Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.
- Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.
- Explain the basic processes of transcription and translation, and how they result in the expression of genes.
- Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.



- Explain how and why the genetic code is universal and is common to almost all organisms.
- Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.
- Discuss the need for adequate monitoring of environmental parameters when making policy decisions.
- Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.
- Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.
- Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
- Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.
- Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
- Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
- Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.
- Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.
- Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.
- Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.
- Identify the reactants, products, and basic functions of photosynthesis.
- Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.
- Explain the interrelated nature of photosynthesis and cellular respiration.

