

Students will be able to:

THE CHEMISTRY OF LIFE

- Recognize carbon as the basic building block of organic molecules.
- State examples of organic molecules that contain C, H, N, O, P, S.
- Identify the properties of water that support life functions.
- Recognize the properties of acids and bases.
- State the elements found in carbohydrates, lipids, proteins and nucleic acids.
- Recognize that nutrients in food contain organic molecules.
- Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions.
- Identify factors, such as pH and temperature, that have an effect on enzymes.

Students will be able to:

STRUCTURE AND FUNCTION OF CELLS

- Relate cell parts/organelles (*plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod*) to their functions.
- Compare and contrast at the cellular level, the general structures and degrees of complexity of prokaryotes and eukaryotes.
- Compare and contrast plant cells and animal cells and explain how cellular differences account for differences in functioning of plant and animals. (*modes of nutrition, mobility, support*)
- Describe how the six kingdoms (*Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia*) are different based on cell structure, cell number and cell reproduction.
- Explain the role of the cell membrane as a highly selective barrier (*diffusion, osmosis, facilitated diffusion, active transport*).
- State a word equation for photosynthesis.
- Identify the reactants, products, and basic purposes of photosynthesis and cellular respiration.
- State that cellular respiration provides energy for living things.
- Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms.
- Relate leaf structure to its function in photosynthesis.
- Explain the important role that ATP serves in metabolism.
- Describe the cell cycle and 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 how the process of meiosis results in the formation of haploid cells.
- Explain the importance of meiosis in sexual reproduction, and how gametes form diploid zygotes in the process of fertilization.
- Compare and contrast a virus and a cell in terms of genetic material and reproduction.

Students will be able to:

GENETICS

- Describe the basic structure (*double helix, sugar/phosphate backbone, linked by complementary nucleotide pairs*) of DNA, and describe its function in genetic inheritance.
- Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic code.
- Explain the basic processes of transcription and translation, and how they result in the expression of genes.
- Distinguish among the end products of replication, transcription, and translation.
- Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic (*physical characteristic*) change in an organism.
- Explain how mutations in gametes may result in phenotypic changes in offspring.
- Distinguish among observed inheritance patterns caused by several types of genetic traits. (*dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles*)
- Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance. (*dihybrid crosses*)
- Use a Punnett Square to determine the probabilities for genotype and phenotype combinations in monohybrid crosses.

Students will be able to:

HUMAN ANATOMY AND PHYSIOLOGY

- State levels of organization from cells to organ systems and provide examples of functional units for some of these systems. (*alveoli and gas exchange*)
- Make connections between life functions and specific human systems. (*digestive system, circulatory system and respiratory system with reactants and products of cellular respiration*)
- Explain generally how the digestive system converts food into smaller molecules that can be used by cells for energy and for repair and growth.
- Explain how the circulatory system transports nutrients and oxygen to cells and removes cell wastes.
- Describe how the kidneys and the liver are closely associated with the circulatory system as they perform the excretory function of removing waste from the blood. Recognize that kidneys remove wastes, and the liver removes many toxic compounds from blood.
- Explain how the respiratory system provides exchange of oxygen and carbon dioxide.
- Explain how the nervous system mediates communication among different parts of the body and mediates the body's interactions with the environment.
- Explain how the muscular/skeletal system works with other systems to support the body and allow for movement. Recognize that bones produce blood cells.
- Recognize that the sexual reproductive system allows organisms to produce offspring that receive half of their genetic information from their mother and half from their father, and that sexually produced offspring resemble, but are not identical to, either of their parents.
- Recognize that communication among cells is required for coordination of body functions.
- Recognize that the body's systems interact to maintain homeostasis.

*Students will be able to:*

EVOLUTION AND BIODIVERSITY

- Give specific pieces of evidence and explain how evolution is demonstrated by evidence from the fossil record, comparative anatomy, genetics, molecular biology, and examples of natural selection.
- Describe species as reproductively distinct groups of organisms. Recognize that species are further classified into a hierarchical taxonomic system (*kingdom, phylum, class, order, family, genus, species*) based on morphological, behavioral, and molecular similarities.
- Describe the role that geographic isolation can play in speciation.
- Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population.

*Students will be able to:*

ECOLOGY

- Give examples of how biotic and abiotic factors affect organisms.
- Distinguish between producers, consumers and decomposers
- Construct a simple food chain.
- Give examples of how energy is transferred from one trophic level to another.
- Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels. Describe how relationships among organisms (*predation, parasitism, competition, commensalism, mutualism*) add to the complexity of biological communities.
- Explain how birth, death, immigration, and emigration influence population size.
- Analyze changes in population size and biodiversity (*speciation and extinction*) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.
- Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in an ecosystem, and how oxygen cycles through photosynthesis and respiration.