



Biology  
High School

**1.0 Understands and applies the skills of scientific inquiry.**

- 1.1 Uses scientific inquiry to design, conduct, and analyze scientific investigations.
- 1.2 Identifies questions and concepts that guide scientific investigations.
- 1.3 Understands that different kinds of questions suggest different kinds of investigations.
- 1.4 Uses appropriate models when necessary.
- 1.5 Develops hypothesis.
- 1.6 Identifies controls and variables.
- 1.7 Designs and executes scientific investigations.
- 1.8 Selects and uses appropriate tools, technology and techniques to gather data.
- 1.9 Makes appropriate qualitative and quantitative observations.
- 1.10 Recognizes the importance of multiple trials with reproducible results.
- 1.11 Organizes data and observations efficiently, including creating appropriate tables and graphs.
- 1.12 Analyzes and evaluates the data and observations.
- 1.13 Integrates data and observations to draw appropriate conclusions.
- 1.14 Accounts for errors in investigations.
- 1.15 Uses evidence to infer possible applications or extensions for further inquiry.
- 1.16 Uses various methods to communicate experimental methods, observations, results, and interpretations.
- 1.17 Uses appropriate safety procedures when conducting investigations.
- 1.18 Students use appropriate safety procedures when conducting investigations.
- 1.19 Recognizes that safety concerns change with different procedures.
- 1.20 Knows locations and appropriate uses of the safety equipment in the classroom.

**2.0 Understands and applies scientific concepts, principles, and theories pertaining to Earth and the Universe.**

- 2.1 Understands and applies knowledge of the origin and evolution of the Earth system including formation of the solar system, geologic time, interactions among hydrosphere, lithosphere, and atmosphere and origins and evolution of life.
- 2.2 Understands the principles of geologic time.

- 2.3 Recognizes the main events in the history of the earth.
- 2.4 Discusses the potential scientific explanations for the origin of life.

### **3.0 Understands and applies concepts, principles and theories pertaining to life and its interactions.**

- 3.1 Understands and applies knowledge of the cell and its processes.
- 3.2 Identifies cell structures and explains how their form reflects their function.
- 3.3 Compares prokaryotic cell organization to eukaryotic.
- 3.4 Describes cell transport processes and their importance to cell regulation.
- 3.5 Hypothesizes how different environmental conditions affect cell processes.
- 3.6 Recognizes the importance of cell specialization in the development of organism.
- 3.7 Compares and explains the processes of cell growth and division.
- 3.8 Explains the processes of cell regulation and hypothesizes the effect of potential errors.
- 3.9 Explains how cell function is dependent on chemical reactions and the role enzymes play in biological reactions.
- 3.10 Summarizes how photosynthesis stores energy using chemical bonds.
- 3.11 Summarizes how cellular respiration breaks down complex molecules to provide energy.
- 3.12 Evaluates the interdependence of photosynthesis and cellular respiration.
- 3.13 Understands the cycling of matter and the flow of energy through ecosystems.
- 3.14 Summarizes the nitrogen and carbon cycles.
- 3.15 Recognizes that matter and energy are conserved as they flow through and between organisms.
- 3.16 Organizes the energy transformation from producers through levels of consumers and decomposers.
- 3.17 Understands and applies knowledge of the molecular basis of heredity.
- 3.18 Explains the structure of DNA in cells including chromosomes form and function.
- 3.19 Applies the process of base pairing to explain chromosome replication.
- 3.20 Hypothesizes why the structure of DNA allows it to serve its purpose in living organisms.
- 3.21 Recognizes the influence of multiple scientists in the discovery of DNA.
- 3.22 Summarizes the role of DNA and RNA in protein synthesis.
- 3.23 Recognizes that the sequence of DNA dictates the genetic information found in genes.
- 3.24 Explains the types of genetic mutations and their role in genetic disorders.
- 3.25 Summarizes how genes direct and control protein synthesis.
- 3.26 Explains the role of proteins in determining the phenotype of organisms.
- 3.27 Compares and contrasts diploid (body/somatic) and haploid (sex/sperm and

egg) cells.

3.28 Describes how sex cells transmit genetic information through the process of meiotic cell division and fertilization.

3.29 Utilizes Punnett squares to demonstrate genetic probability with varying inheritance patterns.

3.30 Explains how sexual reproduction and mutations provide the variation seen in a population.

3.31 Applies knowledge of DNA to explain its uses in biotechnology.

3.32 Understands and applies knowledge of biological evolution.

3.33 Evaluates the influences for Darwin's theory of Evolution by Natural Selection.

3.34 Understands that species change over time as a consequence of a variety of factors - genetic variation, over population, competition for resources, and natural selection (survival of fittest).

3.35 Understands that evolution is a shift in gene frequencies.

3.36 Applies the principles of evolution to predict how a species may change over time.

3.37 Explains how current biological diversity is a result of species changing over time.

3.38 Describes how current diverse species are related by descent from common ancestors.

3.39 Evaluates evidence that supports evolution.

3.40 Understands the identification, organization and structures of living organisms.

3.41 Identifies the characteristics that all living things share in common.

3.42 Compares current the classification system with previous model.

3.43 Explains that biological classification is based on evolutionary relationships.

3.44 Applies differing levels of classification to group organisms based on evolutionary relationships.

3.45 Uses dichotomous keys to identify organisms.

3.46 Describes the importance and apply the concepts of binomial nomenclature.

3.47 Evaluates the developing complexity of organisms from single celled life to phylum chordate.

3.48 Correlates organism structure and behavior to habitat requirements.

3.49 Identifies characteristics of organisms that lead to their classification.

3.50 Understands and applies knowledge of the interdependence of organisms and their interactions with the environment.

3.51 Explains interrelationships and interdependency of biotic and abiotic factors leads to long-term stable systems.

3.52 Hypothesizes the impact humans on ecosystems.

3.53 Identifies environmental factors and finite resources that influence ecosystems interactions.

**4.0 Understands and applies concepts and theories pertaining to matter, its composition and the forces that govern it.**

4.1 Understands and applies knowledge of chemical reactions.

4.2 Uses the basic principles of chemistry to explain how molecules are formed and how they react with each other.

4.3 Explains how the structure of water contributes to its unique properties are important to life.

4.4 Identifies the four main macromolecules and their functions in living things.

**5.0 Understands the nature of science.**

5.1 Understands how science develops and changes over time.

5.2 Explains that all scientific ideas are tentative and subject to change and improvement with data to support this.

5.3 Explains that most core scientific theories have large quantities of experimental and observational evidence.

5.3 Understands that scientific innovators have had difficulty breaking through the accepted ideas of their time to reach new conclusions that are considered to be common knowledge.

5.5 Understands that people continue inventing new ways of doing things, solving problems, and getting work done.

5.6 Knows that human behavior can affect earth processes and systems.

5.7 Knows ways in which humans can modify ecosystems and cause irreversible effects.