1. **Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:**
   - A. demonstrate safe practices during laboratory and field investigations; and
   - B. demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.
2. **Scientific processes. The student uses scientific practices and equipment during laboratory and field investigations. The student is expected to:**
   - A. know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;
   - B. know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories;
   - C. know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;
   - D. distinguish between scientific hypotheses and scientific theories;
   - E. plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;
   - F. collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as data-collecting probes, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, balances, gel electrophoresis apparatuses, micropipettes, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;
   - G. analyze, evaluate, make inferences, and predict trends from data; and
   - H. communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.
3. **Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:**
   - A. analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;
   - B. communicate and apply scientific information extracted from various sources such as current events, published journal articles, and marketing materials;
   - C. draw inferences based on data related to promotional materials for products and services;
   - D. evaluate the impact of scientific research on society and the environment;
   - E. evaluate models according to their limitations in representing biological objects or events; and
   - F. research and describe the history of biology and contributions of scientists.
4. **Science concepts. The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells. The student is expected to:**
   - A. compare and contrast prokaryotic and eukaryotic cells, including their complexity, and compare and contrast scientific explanations for cellular complexity;
   - B. investigate and explain cellular processes, including homeostasis and transport of molecules; and
   - C. compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza.
5. **Science concepts. The student knows how an organism grows and the importance of cell differentiation. The student is expected to:**
   - A. describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms;
   - B. describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation; and
   - C. recognize that disruptions of the cell cycle lead to diseases such as cancer.
6. **Science concepts. The student knows the mechanisms of genetics such as the role of nucleic acids and the principles of Mendelian and non-Mendelian genetics. The student is expected to:**
   - A. identify components of DNA, identify how information for specifying the traits of an organism is carried in the DNA, and examine scientific explanations for the origin of DNA;
   - B. recognize that components that make up the genetic code are common to all organisms;
   - C. explain the purpose and process of transcription and translation using models of DNA and RNA;
   - D. recognize that gene expression is a regulated process;
   - E. identify and illustrate changes in DNA and evaluate the significance of these changes;
   - F. predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses, and non-Mendelian inheritance; and
   - G. recognize the significance of meiosis to sexual reproduction.
7. **Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life. The student is expected to:**
   - A. analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental;
   - B. examine scientific explanations of abrupt appearance and stasis in the fossil record;
   - C. analyze and evaluate how natural selection produces change in populations, not individuals;
   - D. analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;
   - E. analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species; and
   - F. analyze other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination.
8. **Science concepts. The student knows that taxonomy is a branching classification based on the shared characteristics of organisms and can change as new discoveries are made. The student is expected to:**
   - A. define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community;
   - B. categorize organisms using a hierarchical classification system based on similarities and differences shared among groups; and
   - C. compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals.
9. **Science concepts. The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms. The student is expected to:**
   - A. compare the functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids;
   - B. compare the reactants and products of photosynthesis and cellular respiration in terms of energy, energy conversions, and matter; and
   - C. identify and investigate the role of enzymes.
10. **Science concepts. The student knows that biological systems are composed of multiple levels. The student is expected to:**
    - A. describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals;
    - B. describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants; and
    - C. analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.
11. **Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:**
    - A. summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems; and
    - B. describe how events and processes that occur during ecological succession can change populations and species diversity.
12. **Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:**
    - A. interpret relationships, including predation, parasitism, commensalism, mutualism, and competition, among organisms;
    - B. compare variations and adaptations of organisms in different ecosystems;
    - C. analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids;
    - D. describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles; and
    - E. describe how environmental change can impact ecosystem stability.