Biology Performance Level Descriptors

Limited

A student performing at the **Limited Level** demonstrates a minimal command of Ohio's Learning Standards for Biology. A student at this level has an emerging ability to describe genetic patterns of inheritance and how traits are defined by instructions encoded in many discrete genes, explain that Earth's present-day species descended from common ancestral species due to variation and the natural selection of heritable characteristics, construct classification systems based on anatomical and molecular analysis to indicate the degree of relatedness between organisms, use data to study the rate of change in complex ecosystems, and describe the cellular processes as part of a biochemical system.

A student at the **Limited Level** can:

- Recall that DNA is the blueprint for cell structures and processes;
- Name the complementary base pairs in DNA;
- Recall that populations can change from generation to generation due to selective pressures;
- Given a scenario, predict which traits may increase survivability in a species;
- State that organisms are classified on morphological and molecular evidence;
- Recall that ecosystems change as geological and biological conditions vary;
- Identify different types of cells (e.g., prokaryotic vs. eukaryotic, plant vs. animal);
- Identify the products of photosynthesis and cellular respiration (e.g. oxygen, carbon dioxide, glucose, etc.);
- Recall that cell components work together to perform the functions of the cell.
- Develop questions and concepts that guide scientific investigations;
- Make observations and look for patterns.
- Use technology and mathematics to improve investigations and communications.
- Conduct an experiment with controlled variables based on a question or hypothesis.

Biology Performance Level Descriptors

Basic

A student performing at the **Basic Level** demonstrates a partial command of Ohio's Learning Standards for Biology. A student at this level has a general ability to describe genetic patterns of inheritance and how traits are defined by instructions encoded in many discrete genes, explain that Earth's present-day species descended from common ancestral species due to variation and the natural selection of heritable characteristics, construct classification systems based on anatomical and molecular analysis to indicate the degree of relatedness between organisms, use data to study the rate of change in complex ecosystems, and describe the cellular processes as part of a biochemical system.

A student at the **Basic Level** can:

- Recognize the structural and base pairing differences between DNA and RNA;
- Identify that the sequence of DNA bases in a chromosome determines the sequence of amino acids in a protein;
- Recall that the insertion, deletion or substitution of segments of DNA are mutations which alter genes;
- Identify how an altered gene may be passed on to every cell that develops from that cell;
- Describe the concept of differentiation—although all cells have identical genetic information, different genes are active in different types of cells;
- Identify that variations within a population in a changing environment can lead to evolution;
- Provide an example of natural selection;
- Interpret a cladogram showing relationships among species;
- Recall how carrying capacity limits a population;
- Explain how the functions of cellular parts are made possible by their structures;
- Use a diagram to model the transport of particles into and out of the cell.
- Conduct scientific investigations using a variety of methods and tools to collect empirical evidence, observing appropriate safety techniques
- Recognize where improvements in technology have allowed us to gather new scientific evidence
- Recognize scientific explanations and models.
- Determine relevant independent variables affecting observed patterns.
- Manipulate an independent variable to affect a dependent variable.

Biology Performance Level Descriptors

Proficient

A student performing at the **Proficient Level** demonstrates an appropriate command of Ohio's Learning Standards for Biology. A student at this level has a consistent ability to describe genetic patterns of inheritance and how traits are defined by instructions encoded in many discrete genes, explain that Earth's present-day species descended from common ancestral species due to variation and the natural selection of heritable characteristics, construct classification systems based on anatomical and molecular analysis to indicate the degree of relatedness between organisms, use data to study the rate of change in complex ecosystems, and describe the cellular processes as part of a biochemical system.

A student at the **Proficient Level** can:

- Correlate gene mutations with their short and long-term implications;
- Predict and interpret non-Mendelian monohybrid and Mendelian dihybrid crosses;
- Describe the steps of protein synthesis from DNA transcription to translation;
- Explain how sorting and recombination of genes in sexual reproduction and meiosis result in variations of traits in offspring;
- Determine how variations within populations in a changing environment can lead to evolution;
- Given a real-world example, predict and provide evidence to support how a population has responded to environmental changes;
- Complete cladograms based on evidence;
- Given population graphs or charts containing data, determine the changes to an ecosystem, including carrying capacity;
- Predict the effect of geological, biological and/or environmental changes on a population within an ecosystem (e.g., shifting weather patterns, loss of habitat);
- Interpret graphs or data (e.g., temperature, pH, light, concentration) to explain the rate of enzyme activity in a cell;
- Describe regulation of the cellular environment (e.g., homeostasis);
- Determine an amino acid sequence from a DNA/RNA base sequence using a codon chart;
- Describe how cell components work together to perform the functions of the cell;
- Design and conduct an experiment to determine the effects of external factors (e.g., pH, temperature, concentration) on cellular functions (e.g., transport, enzyme rate, photosynthesis, cellular respiration).
- Formulate and revise explanations and models using logic and scientific evidence (critical thinking).
- Analyze scientific explanations and models
- Communicate and support scientific arguments.
- Analyze data graphically and mathematically.
- Consider and evaluate anomalies (persistent outliers) in data and evidence.

Biology Performance Level Descriptors

Accelerated

A student performing at the **Accelerated Level** demonstrates a strong command of Ohio's Learning Standards for Biology. A student at this level has a superior ability to describe genetic patterns of inheritance and how traits are defined by instructions encoded in many discrete genes, explain that Earth's present-day species descended from common ancestral species due to variation and the natural selection of heritable characteristics, construct classification systems based on anatomical and molecular analysis to indicate the degree of relatedness between organisms, use data to study the rate of change in complex ecosystems, and describe the cellular processes as part of a biochemical system.

A student at the **Accelerated Level** can:

- Investigate Mendelian and non-Mendelian inheritance (e.g., dihybrid crosses, sex-linked traits, linkage) to compare predicted results to actual results;
- Interpret data from a real-world scenario involving biotechnology (e.g., gel electrophoresis, gene therapy, cloning);
- Explain why a population is or is not in Hardy-Weinberg equilibrium based on given data or conditions (e.g., no mutation is occurring, mating is random);
- Given data and/or a scenario, make and justify a conclusion about evolutionary mechanisms in a population;
- Given population graphs or charts containing data, analyze current and past data to predict and provide evidence to support the predicted changes in an ecosystem;
- Use mathematical models (e.g. exponential or logistic growth) to explain carrying capacity and homeostasis within ecosystems;
- Create a cladogram showing relationships among species;
- Design a model to explain the transformation of energy through ATP and cycling of carbon through cellular processes in cells (e.g., photosynthesis, cellular respiration);
- Explain how the cellular environment affects the shape and function of an enzyme (e.g., PH, temperature, concentration).

Biology Performance Level Descriptors

Advanced

A student performing at the **Advanced Level** demonstrates a distinguished command of Ohio's Learning Standards for Biology. A student at this level has a sophisticated ability to describe genetic patterns of inheritance and how traits are defined by instructions encoded in many discrete genes, explain that Earth's present-day species descended from common ancestral species due to variation and the natural selection of heritable characteristics, construct classification systems based on anatomical and molecular analysis to indicate the degree of relatedness between organisms, use data to study the rate of change in complex ecosystems, and describe the cellular processes as part of a biochemical system.

A student at the **Advanced Level** can:

- Analyze data and provide evidence for the selection of an evolutionary mechanism that has occurred in a given population;
- Design or simulate a population growth model by manipulating environmental conditions;
- Develop and test a hypothesis to improve the design of an industrial application of cellular processes
  (e.g., optimal environment for fermentation, genetically modified organisms);
- Use mathematical reasoning to analyze graphs displaying data about enzyme activity and how it impacts a cell;
- Explain the relative effects of different mutations (e.g., substitution or deletion) in DNA on the operation of protein because of changes in sequence of amino acids;
- Interpret the results of experiments to identify evidence for core ideas in biology