

ISTEP+ Performance Level Descriptors Science – Grade 10

Grade 10 Pass+

Pass+ students apply and adapt scientific methodologies to laboratory investigations in many contexts. They develop and communicate thorough explanations based on scientific data and observations. *Pass+* students can explain the development, evaluation, and modification of scientific theories over time. *Pass+* students demonstrate advanced understanding in the use of biological concepts to describe living systems. They understand in detail and can communicate the integral relationship between molecular and cellular structure and function. *Pass+* students analyze and explain interdependence within ecosystems, including specific examples of the transfer and cycling of matter and energy. *Pass+* students analyze a variety of inheritance scenarios to demonstrate understanding of the processes that govern heredity. *Pass+* students can use different types of evidence to determine relationships among organisms and describe and model the role of natural selection in the evolution of differences among organisms.

Examples of specific knowledge, skills, and abilities for Grade 10 students scoring at the *Pass+* level include, but are not limited to, the following:

- Develop explanatory models based on observations during laboratory investigations.
- Synthesize data from multiple investigations to form comprehensive explanations of scientific phenomena.
- Use scientific data to design solutions that address environmental and social concerns.
- Explain the cyclical interaction between science and technology (i.e., how each can lead to advancements in the other).
- Investigate and describe the building blocks and small number of chemical elements from which organic compounds are composed.
- Explain factors that influence the differentiation of cells.
- Relate structure to function for specific cellular components, such as the cell membrane, mitochondria, chloroplasts, and ribosomes.
- Determine the inheritance pattern of a trait given phenotypic data over several generations.
- Predict how specific types of mutations (insertions, deletions, and substitutions) might affect the organism's phenotype.
- Evaluate evidence, including anatomical and molecular similarities among organisms, that supports the modern scientific theory of the origins and history of life on Earth.

Grade 10 Pass

Pass students apply scientific methodologies to laboratory investigations within the context of physical, Earth, and life science. They develop and communicate explanations based on scientific data and observations. *Pass* students understand that scientific theories are based on the results of many experiments and that new data may cause theories to be re-evaluated. *Pass* students demonstrate proficient understanding in the use of biological concepts to describe living systems. They understand the integral relationship between molecular and cellular structure and function. *Pass* students demonstrate understanding of interdependence within ecosystems, including the transfer and cycling of matter and energy. *Pass* students can describe the processes that govern heredity. They can use different types of evidence to determine relationships among organisms and describe the role of natural selection in the evolution of differences among organisms.

Examples of specific knowledge, skills, and abilities for Grade 10 students scoring at the *Pass* level include, but are not limited to, the following:

- Explain how major scientific theories are developed and are supported by the results of multiple experiments.
- Communicate experimental results (e.g., with graphs, charts, and tables) and develop explanations from them.
- Evaluate scientific work generated by peers.
- Understand and describe the major organic compounds and the role of molecular shape in cellular processes.
- Describe how features of cells contribute to growth and survival.
- Describe how energy flows from the sun through ecosystems through the process of photosynthesis and cellular respiration.
- Describe the impact of a variety of phenomena on ecosystems.
- Relate the production of proteins to the observable traits of an organism.
- Explain how the unique shape and activity of each protein is determined by the sequence of its amino acids.
- Describe the processes and purposes of mitosis and meiosis.
- Describe DNA replication, including the possible impacts on an organism of changes to a DNA sequence during replication.
- Understand and apply inheritance patterns to genotypes and phenotypes across generations.
- Use anatomical and molecular evidence to establish evolutionary relationships.

Grade 10 Did Not Pass

Did Not Pass students apply basic scientific methodologies to laboratory investigations within simple contexts. They develop and communicate simple or partial explanations based on scientific data and observations. *Did Not Pass* students understand that scientific theories involve experimentation and may change over time. *Did Not Pass* students demonstrate limited understanding in the use of biological concepts to describe living systems. They may have difficulty recognizing the integral relationship between molecular and cellular structure and function. *Did Not Pass* students demonstrate a basic understanding of interdependence within ecosystems, including the transfer and cycling of matter and energy. *Did Not Pass* students can describe a limited number of the processes that govern heredity. They may have difficulty using different types of evidence to determine relationships among organisms and describing the role of natural selection in the evolution of differences among organisms.

Examples of specific knowledge, skills, and abilities for Grade 10 students scoring at the *Did Not Pass* level include, but are not limited to, the following:

- Communicate results of basic investigations with writing, tables, graphs, and diagrams.
- Apply laboratory techniques to measure physical quantities with appropriate units.
- Recognize that scientific knowledge can be used to guide decisions on environmental and social issues.
- Recognize that taxonomic classifications reflect relationships between species.
- Know that biochemical reactions occur within cells to maintain life.
- Recognize that the external environment can affect the functioning of cells.
- Understand that there are factors that may limit the amount of life environments can support.
- Understand the relationships between chromosomes, DNA, and genes.
- Know that cell division and specialization produce complete multicellular organisms from a single cell.
- Distinguish between dominant and recessive genes.
- Describe how organisms with beneficial traits are more likely to survive, reproduce, and pass on their traits due to genetic variations and environmental forces.