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# Performance Level Descriptors

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# Science

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## **Grade 5 – Content Summary**

### ***Nature and Application of Science and Technology***

*Performances:*

- Distinguish well designed fair tests from flawed fair tests.
- Distinguish questions that can be investigated using a fair test from those which cannot be investigated using a fair test.
- Identify conclusions that are consistent with data from a fair test.

### ***Physical Science***

*Performances:*

- Recognize that unbalanced forces on objects changes their motion.
- Distinguish diagrams showing particles that compose a liquid from a diagram showing particles that compose a solid.

### ***Earth Science***

*Performances:*

- Distinguish processes that result in building Earth structures from those that wear down Earth structures.
- Identify the reason two objects of different diameters (for instance, the moon and the sun) may appear to be the same diameter.

### ***Life Science***

*Performances:*

- Identify structures of familiar plants and animals and the function each serves in the life of the plant or animal.
- Recognize that variation in appearance and behavior of organisms of the same kind often is advantageous to survival and reproduction.



## Science – Grade 5

Performance Level 4 – Advanced	
<p><i>Students are able to consistently, effectively, and skillfully demonstrate knowledge of grade-level science content. Students are able to apply their content knowledge in a variety of new contexts.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish questions that can be investigated using a fair test from those which cannot be investigated using a fair test</li> <li>▪ Identify conclusions that are consistent with data from a fair test</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish diagrams that show particles comprising a liquid from diagrams that show particles comprising a solid</li> <li>▪ Recognize that unbalanced forces on objects will change their motion</li> <li>▪ Compare the energy of two objects of the same mass and shape moving at different speeds</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify processes that produce “slow” changes in Earth’s surface</li> <li>▪ Distinguish processes that result in building Earth’s topography from those that wear down Earth materials</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Recognize that variation in appearance and behavior of organisms of the same group often is advantageous to survival and reproduction</li> <li>▪ Predict the changes in groups and numbers of organisms when one population in a food chain decreases in number or is extinguished</li> <li>▪ Predict the effects on the number and size of populations of organisms in an ecosystem as biotic and abiotic components change</li> </ul>



## Science – Grade 5

Performance Level 3 – Meets Standard	
<p><i>Students frequently, accurately, and satisfactorily demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Match numerical data with verbal descriptions of patterns in the data</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify processes that will successfully separate the components of a mixture (e.g. a mixture of water, iron filings and sand)</li> <li>▪ Give examples of forces (e.g. pushes, pulls, gravity, magnetism)</li> <li>▪ Identify the energy of an object due to its motion</li> <li>▪ Compare the speeds of moving objects</li> <li>▪ Give examples of stored forms of energy</li> <li>▪ Trace the path of electricity through series and parallel circuits</li> <li>▪ Distinguish a complete electrical circuit from an incomplete electrical circuit</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify how the motion of Earth in the Earth/Sun system explains day and night</li> <li>▪ Order Earth materials (clay, fine sand, coarse sand, gravel) on the basis of particle size</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify structures within familiar plants and the function each serves in the life of the plant</li> <li>▪ Order the stages in the life cycle of a familiar plant or animal</li> <li>▪ Identify structures that can be used to distinguish one group of animals from another (e.g. fish from mammals, or birds from amphibians) and how the distinguishing structures help the animal survive</li> <li>▪ Identify changes in the physical characteristics and behavior of an organism that result from changes in the organism's environment (e.g., hibernation, color changes of rabbits)</li> <li>▪ Know that organisms of the same species have variation in their appearance (eye color, height, tail length) and behavior (ability to hunt, ability to fend off predators)</li> <li>▪ Analyze energy and matter flow in food chains</li> </ul>



## Science – Grade 5

Performance Level 2 – Below Standard	
<p><i>Students inconsistently, inadequately, or partially demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Match a graph with a description of the information contained in the graph</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify materials that are heat insulators</li> <li>▪ Identify physical properties that are used to classify familiar materials</li> <li>▪ Distinguish the physical characteristics of solutions from the physical characteristics of heterogeneous mixtures.</li> <li>▪ Identify changes in states of matter that result when materials are heated or cooled</li> <li>▪ Recognize that the combined mass of the parts of an object is equal to the mass of the whole object</li> <li>▪ Identify magnetism as a force that acts at a distance</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Order Earth materials (clay, fine sand, coarse sand, gravel) by their rate of deposition</li> <li>▪ Identify processes that produce “sudden” changes in Earth’s surface</li> <li>▪ Identify examples of how human activities (e.g., altering percentage of ground cover, slope of the land) can affect the flow of water</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify physical characteristics (e.g., hair, number of toes, flowers, arrangement of leaves on stems) that offspring typically inherit from their parents</li> <li>▪ Recognize that offspring will show variation in those physical characteristics that are inherited from the same parents (e.g., a brother and sister can have different shapes to their noses)</li> <li>▪ Identify physical characteristics of organisms that allow them to survive in their environments</li> <li>▪ Categorize organisms in an ecosystem as either producers, consumers, or decomposers</li> <li>▪ Identify examples of limited resources</li> </ul>



## Science – Grade 5

Performance Level 1 – Well Below Standard	
<p><i>Students rarely, incorrectly, or minimally demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"><li>▪ Match tools with the physical properties they measure (e.g., thermometer to measure temperature, balance to compare masses)</li></ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"><li>▪ Identify the physical properties of common objects</li><li>▪ Give examples of different forms of energy</li><li>▪ Identify ways in which speed is measured</li><li>▪ Identify energy transformations observed in nature and in the home</li></ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"><li>▪ Identify Earth as one of the planets in the Solar System</li><li>▪ Identify examples of weathering and erosion</li></ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"><li>▪ Identify the basic needs of plants and animals</li><li>▪ Give examples of ways that human activity (e.g. logging, burning fossil fuels) can change ecosystems</li><li>▪ Give examples of biotic and abiotic components of ecosystems</li></ul>



## Grade 8 – Content Summary

### ***Nature and Application of Science and Technology***

*Performances:*

- Distinguish questions that can be investigated scientifically from those which cannot be investigated scientifically.
- Distinguish hypotheses that can be tested scientifically from those which cannot be tested scientifically. Identify conclusions that are consistent with a given data set.

### ***Physical Science***

*Performances:*

- Distinguish changes that occur in the motion of molecules and the distance between molecules as energy is added or removed from a material.
- Relate the mass of solute that will dissolve in a solvent as the temperature of the solvent increases or decreases.

### ***Earth Science***

*Performances:*

- Relate the position and orientation of Earth on its axis to seasonal change.
- Order by time of deposition, layers of sedimentary rock using the fossils contained in the layers.

### ***Life Science***

*Performances:*

- Identify ways in which cells, organs, and organ systems interact to maintain homeostasis.
- Recognize that an advantage of sexual reproduction is that it results in diversity within a population and increases the probability of the survival and reproduction of the population.



**Science – Grade 8**

Performance Level 4 – Advanced	
<p><i>Students are able to consistently, effectively, and skillfully demonstrate knowledge of grade-level science content. Students are able to apply their content knowledge in a variety of new contexts.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish questions that can be investigated scientifically from those which cannot (e.g., how does changing temperature change evaporation rate)</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish forces that act at a distance (gravitational and magnetic) from contact forces</li> <li>▪ Distinguish changes that occur in the motion of particles and the distance between molecules as energy is added or removed from a material</li> <li>▪ Relate the mass of solute that will dissolve in a solvent as the temperature of the solvent increases or decreases</li> <li>▪ Distinguish heat energy from temperature</li> <li>▪ Match energy level of radiant energy with its wavelength and frequency</li> <li>▪ Recognize that balanced forces do not change the motion of an object</li> <li>▪ Identify energy transformation and transfer in complex systems</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Relate the position and orientation of Earth on its axis to seasonal change</li> <li>▪ Identify parts of the solar system (including asteroids, comets, moons) and match the physical characteristics and motion with each part</li> <li>▪ Identify state and energy changes in the water cycle</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify ways in which cells, organs, and organ systems interact</li> <li>▪ Identify relationships among DNA, genes, chromosomes, and traits</li> <li>▪ Recognize that an advantage of sexual reproduction is that it results in diversity within a population and increases the probability of survival of the population</li> </ul>





## Science – Grade 8

Performance Level 3 – Meets Standard	
<p><i>Students frequently, accurately, and satisfactorily demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish a well designed investigation from a flawed investigation</li> <li>▪ Match numerical data with descriptions of patterns in the data</li> <li>▪ Match a location on a graph with a description of that location</li> <li>▪ Identify conclusions that are consistent with a given data set</li> <li>▪ Identify variables that must be controlled in an investigation</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish extrinsic and intrinsic properties</li> <li>▪ Predict the mass of a mixture based on the mass of the materials from which it is made</li> <li>▪ Distinguish homogeneous mixtures from heterogeneous mixtures</li> <li>▪ Use intrinsic properties to identify a material</li> <li>▪ Compare the energy levels of waves and recognize how waves transfer energy</li> <li>▪ Identify energy flow through systems that are due to convection, radiation, and conduction</li> <li>▪ Identify changes in an object's motion when unbalanced forces act on the object</li> <li>▪ Identify energy transformation and transfer in simple systems</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Relate the position and motion of the Earth/Sun system to day and night</li> <li>▪ Relate the position and motion of the Moon/Earth system to the phases of the Moon</li> <li>▪ Order Earth materials (clay, fine and coarse sand, gravel of different sizes) on the basis of the rate at which water flows through them</li> <li>▪ Order by time of deposition, layers of sedimentary rock</li> <li>▪ Apply information from a weather map to predict the weather conditions that most likely will be observed</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify structural relationships among cells, organs, and organ systems</li> <li>▪ Describe familiar functions of the respiratory, circulatory and digestive system</li> <li>▪ Identify characteristics of living organisms</li> <li>▪ Use a Punnet Square to represent genotype and identify phenotype for a single trait cross</li> <li>▪ Identify advantages of sexual reproduction over asexual reproduction</li> <li>▪ Identify structures that are relevant to the transmission of genetic information (DNA, genes, chromosomes)</li> <li>▪ Identify the direction of energy flow in a food web</li> <li>▪ Use energy webs to predict how changes in one population of animals will change populations of other animals</li> <li>▪ Predict the effects on the number and size of populations of organisms in an ecosystem as biotic and abiotic components change</li> </ul>



## Science – Grade 8

Performance Level 2 – Below Standard	
<p><i>Students inconsistently, inadequately, or partially demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"><li>▪ Identify flaws in simple investigations</li><li>▪ Use information from the description of an investigation to identify the tools needed to conduct the investigation</li></ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"><li>▪ Order visible light of different colors according to their energies</li><li>▪ Identify forms of energy in simple natural systems and in homes</li><li>▪ Recognize that waves can transfer energy</li><li>▪ Identify sound and light as common examples of waves</li></ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"><li>▪ Sequence the phases of the Moon</li><li>▪ Relate the rate at which water flows to the elevation through which the water has fallen</li></ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"><li>▪ Identify structures (cell, organ, organ systems) that comprise the human body</li><li>▪ Distinguish biotic from abiotic factors in ecosystems</li><li>▪ Identify recycling of matter as a characteristic of ecosystems</li><li>▪ Identify ways in which human activity impacts ecosystems</li></ul>



## Science – Grade 8

Performance Level 1 – Well Below Standard	
<p><i>Students rarely, incorrectly, or minimally demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"><li>▪ Match tools with the physical properties they measure</li></ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"><li>▪ Identify the physical properties of common objects</li><li>▪ Identify common forms of energy (e.g., light, sound, electrical, kinetic, potential)</li><li>▪ Identify physical changes that occur when energy is added or removed from materials</li></ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"><li>▪ Identify the Sun as the energy source that drives most of the changes in Earth's systems (water, hydrologic, atmospheric, geological)</li></ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"><li>▪ Identify functions of major systems of the human body (respiratory, circulatory, digestive)</li><li>▪ Differentiate sexual from asexual reproduction</li><li>▪ Distinguish habitats from ecosystems</li><li>▪ Identify the Sun as the energy source for all ecosystems</li></ul>



## Grade 10 – Content Summary

### ***Nature and Application of Science and Technology***

#### *Performances:*

- Distinguish hypotheses that can be tested experimentally from hypotheses that cannot be tested experientially.
- Distinguish well constructed scientific explanations from poorly constructed scientific explanations.
- Distinguish conclusions that are consistent with observations from conclusions that are not consistent with observations.

### ***Physical Science***

#### *Performances:*

- Apply knowledge of the organization of the periodic table to predict the chemical properties of elements.
- Distinguish diagrams illustrating chemical bonding that results from the transfer of valence electrons from bonding that results when valence electrons are shared.
- Identify statements and equations that show the relationship between energy and matter.

### ***Earth Science***

#### *Performances:*

- Match descriptions of the evolution of the solar system and the composition of the Earth to the tenets of Solar Nebula Theory
- Identify sources of energy that fuel interaction in Earth's systems.

### ***Life Science***

#### *Performances:*

- Apply knowledge of metabolic processes to predict how changes in an organism's environment will effect changes in the process (for instance, how light intensity and carbon dioxide concentration in the atmosphere affects rate of photosynthesis).
- Relate changes in the genetic information of a population to the survival and reproduction of organisms that have adapted to changes in the population's environment.



## Science – Grade 10

Performance Level 4 – Advanced	
<p><i>Students are able to consistently, effectively, and skillfully demonstrate knowledge of grade-level science content. Students are able to apply their content knowledge in a variety of new contexts.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish well constructed scientific explanations from poorly constructed scientific explanations</li> <li>▪ Distinguish conclusions that are consistent with observations from conclusions that are not consistent with observations</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Apply knowledge of the organization of the periodic table to predict the chemical properties of elements</li> <li>▪ In diagrams illustrating chemical bonding, distinguish bonding that results from the transfer of valence electrons from bonding that results when valence electrons are shared</li> <li>▪ Recognize that chemical and physical changes obey the law of conservation of mass and of energy</li> <li>▪ Relate changes in temperature, pressure, and concentration to the rate of chemical reactions</li> <li>▪ Distinguish at the molecular level the transfer of energy by waves from the transfer of heat</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Match descriptions of the evolution of the Solar System and the composition of the Earth to the tenets of Solar Nebula Theory</li> <li>▪ Identify the relationship between the zones of likely volcanic activity and high earthquake potential to tectonic plates</li> <li>▪ Identify sources of energy that fuel interaction in Earth's systems</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Relate the molecular structure of enzymes to the molecular structure of the substrates on which the enzymes act</li> <li>▪ Identify how the structure of cells relate to energy transformations, energy transport, chemical changes, and the transport of chemicals that take place in cells (e.g., passive and active transport through cell membranes)</li> <li>▪ Predict the effect of mutations on the function of organisms</li> <li>▪ Interpret molecular representations of metabolic processes of plants and animals</li> <li>▪ Represent metabolic processes of plants and animals at the molecular level (respiration, action of enzymes)</li> <li>▪ Apply knowledge of metabolic processes to predict how changes in an organism's environment will affect changes in the process (e.g. how light intensity and carbon dioxide concentration in the atmosphere affects rate of photosynthesis)</li> <li>▪ Relate events during meiosis to variation of organisms in a species</li> <li>▪ Relate the survival and reproduction of organisms that have adapted to changes in a population's environment to changes in the genetic information of a population</li> </ul>



## Science – Grade 10

Performance Level 3 – Meets Standard	
<p><i>Students frequently, accurately, and satisfactorily demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish hypotheses that can be tested scientifically from guesses that cannot be tested scientifically</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify trends in chemical and physical properties across the periodic table</li> <li>▪ Know that a balanced chemical equation is a representation of the law of conservation of mass</li> <li>▪ Identify factors that influence the rate of chemical reactions</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify gravity as the force that keeps objects in the Solar System in their orbit</li> <li>▪ Identify changes that occur as Earth materials move through the rock cycle</li> <li>▪ Identify changes that occur when Earth systems interact (e.g., the hydrosphere/atmosphere interactions of the water cycle)</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify a complete equation for photosynthesis and identify the missing elements in an incomplete equation for photosynthesis</li> <li>▪ Compare the products, reactants, and energy changes that occur in photosynthesis and cellular respiration</li> <li>▪ Identify energy transformations that occur in organisms and how these transformations contribute to the survival of the organism</li> <li>▪ Recognize an ordered sequence of activity in a cell undergoing mitosis</li> <li>▪ Identify the structures and processes involved in reproduction, development, transmission of genetic information (e.g. chromosomes, DNA, cell cycle, meiosis, fertilization)</li> <li>▪ Identify the relationship between diversity in plant and animal populations and the survival of the population when changes occur in the environment</li> <li>▪ Identify how evolution and diversity within species are related</li> <li>▪ Identify the ways in which photosynthesis and respiration influence the flow of energy in living systems and in ecosystems</li> </ul>



## Science – Grade 10

Performance Level 2 – Below Standard	
<p><i>Students inconsistently, inadequately, or partially demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Distinguish well organized experimental data from poorly organized experimental data</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify the atomic structure of elements using information (atomic mass and number) from the periodic table</li> <li>▪ Balance simple chemical equations</li> <li>▪ Recognize that an atom is neutral when the number of protons in an atom's nucleus equals the number of electrons surrounding the nucleus</li> <li>▪ Identify the sequence of energy transfer by waves in a familiar system (e.g. the transfer of energy from a vibrating violin string to an ear drum)</li> <li>▪ Identify the sequence of energy transfers and transformations in a familiar system (e.g., from burning coal to electrical energy)</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify materials and structures found in the geosphere</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify examples of the complex chemical substances that animals synthesize from the foods they eat</li> <li>▪ Identify the advantages of sexual reproduction over asexual reproduction</li> <li>▪ Use Punnet squares to represent genotype and use genetic information to identify the phenotype for a single trait cross</li> <li>▪ Identify ways in which members of the same species exhibit diverse physical characteristics and behaviors</li> </ul>



## Science – Grade 10

Performance Level 1 – Well Below Standard	
<p><i>Students rarely, incorrectly, or minimally demonstrate knowledge of grade-level science content.</i></p>	<p><b>Nature and Application of Science and Technology:</b></p> <ul style="list-style-type: none"> <li>▪ Match graphical data with numerical data in tabular form</li> </ul> <p><b>Physical Science:</b></p> <ul style="list-style-type: none"> <li>▪ Locate electrons, protons and neutrons on a diagram of an atom</li> <li>▪ Balance simple chemical equations</li> <li>▪ Identify common forms of energy</li> <li>▪ Predict that change will occur when matter and energy interact</li> </ul> <p><b>Earth Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify Earth systems (hydrosphere, atmosphere, biosphere and geosphere)</li> </ul> <p><b>Life Science:</b></p> <ul style="list-style-type: none"> <li>▪ Identify structures that are relevant to the transmission of genetic information (DNA, genes, chromosomes)</li> <li>▪ Identify biotechnology applications in areas such as food production, medicine, agriculture and manufacturing (genetically altered corn, animal cloning, development of synthetic blood cells, and production of drugs)</li> </ul>