Grade 10 Alaska Science Assessment Achievement Level Descriptors (ALDs)

The achievement level descriptors describe what a typical student scoring at each achievement level can do. A student who scores at a level would be expected to also be able to demonstrate the skills described in previous levels. A student would not necessarily demonstrate all the skills listed at a particular achievement level on a particular test in order to score at that level.

	Needs Support **Student may partially meet the standards but needs support to master the knowledge and skills of current grade-level content.**	**Approaching Proficient** **Student partially meets the standards and may have gaps in knowledge and skills but is approaching mastery of some grade-level content.**	**Proficient** **Student meets the standards and demonstrates mastery of the knowledge and skills of most grade-level content.**	**Advanced** **Student meets the standards and demonstrates mastery of the knowledge and skills on a range of complex grade-level content.**
Life Science: *Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.*	**A student at this level:** can explain the structure of DNA.	**A student at this level:** can explain that the structure of DNA determines the structure of proteins produced in cells.	**A student at this level:** can construct an explanation based on evidence for how the structure of DNA determines the structure of proteins that carry out the essential functions of life through systems of specialized cells.	**A student at this level:** can use reasoning to support explanations for how gene sequencing within the DNA molecules present in all cells of an organism affects protein function, which in turn affects the functioning of body tissues, organs, and systems of living organisms.
	can order the hierarchical organization systems that provide specific functions within multicellular organisms.	can describe the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	can develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	can distinguish between the accuracy of hierarchical models and the actual body systems and functions the models represent.
	can explain that feedback homeostasis is essential for life.	can give an example and explain a feedback mechanism that maintains homeostasis.	can plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	can evaluate and/or modify an investigation to provide evidence that feedback mechanisms maintain homeostasis.
	can recognize the role of cellular division (mitosis) in producing and maintaining complex organisms.	can describe the role of cellular division (mitosis) and differentiation in maintaining complex organisms.	can use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	can develop a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

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Life Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.	can recognize that photosynthesis is the process that transforms light energy into stored chemical energy.	can construct an explanation of how photosynthesis transforms light energy into stored chemical energy.	can use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	can develop a model that demonstrates the processes involved in photosynthesis transforming light energy into stored chemical energy.
	can complete a model showing the correct number of carbon, hydrogen, or oxygen atoms within a sugar molecule or general formula.	can recognize that carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form other large carbon-based molecules.	can construct an explanation based on evidence of how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.	can refine an explanation based on scientific evidence of how atoms in sugar molecules are recycled within cells and used to form complex carbohydrates, amino acids, lipids, and nucleic acids.
	can recognize that cells obtain energy through food particles and air particles.	can explain that cellular respiration is a chemical process whereby food molecules and oxygen molecules are rearranged into new compounds.	can use a model to illustrate that cellular respiration is a chemical process whereby food molecules and oxygen molecules are rearranged into new compounds that result in a net transfer of energy.	can develop and use a model that shows that the chemical reaction of food molecules and oxygen molecules releases energy as the matter is rearranged while existing chemical bonds are broken and new chemical bonds are formed and also shows that neither matter nor energy is created or destroyed.
	can recognize that carrying capacities of ecosystems vary over time.	can identify factors that affect carrying capacities of ecosystems.	can use mathematical and/or computational representations to support explanations of factors that affect carrying capacities of ecosystems at different scales.	can develop mathematical and/or computational representations to support explanations of factors that affect carrying capacities of ecosystems at different scales.

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Life Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.	can identify factors that affect species populations in ecosystems.	can provide examples of factors that affect biodiversity and populations in ecosystems.	can use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems at different scales.	can develop and incorporate changes to mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems at different scales.
	can identify energy flows in photosynthesis and respiration.	can describe the cycling of matter and flow of energy in photosynthesis and respiration.	can construct an explanation based on evidence for the cycling of matter and flow of energy in photosynthesis and respiration.	can revise an explanation based on evidence for the cycling of matter and flow of energy in photosynthesis and respiration.
	can identify that matter and energy transfer among organisms within an ecosystem.	can identify mathematical representations that support claims for the cycling of matter and flow of energy in an ecosystem.	can use mathematical representations to support claims for the cycling of matter and flow of energy in an ecosystem.	can develop mathematical representations to support claims for the cycling of matter and flow of energy in an ecosystem.
	can recognize the role of photosynthesis and cellular respiration in the movement of carbon between different spheres on Earth.	can describe the role of photosynthesis and cellular respiration in the cycling of carbon between the biosphere, atmosphere, hydrosphere, and geosphere.	can develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon between the biosphere, atmosphere, hydrosphere, and geosphere.	can compare models illustrating photosynthesis and cellular respiration to analyze the differences in how they cycle matter between the biosphere, atmosphere, hydrosphere, and geosphere.

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Life Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.	can recognize that changing conditions may result in changes to an ecosystem.	can recognize that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions but that changing conditions may result in changes to an ecosystem.	can evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions but that changing conditions may result in changes to an ecosystem.	can provide claims, evidence, and reasoning supporting the concept that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions but that changing conditions may result in changes to an ecosystem.
	can identify the impacts of human activities on the environment and biodiversity.	can identify solutions for reducing the impacts of human activities on the environment and biodiversity.	can design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	can prioritize the criteria and make trade-offs as necessary to further reduce environmental impact and loss of biodiversity while still addressing the needs of humans within the environment.
	can identify behaviors that affect an individual's chances to survive and reproduce.	can describe the role of group behavior on an individual's chances to survive and reproduce.	can evaluate evidence for the role of group behavior on an individual's and on a species' chances to survive and reproduce.	can determine the degree to which evidence supports a causal claim that group behavior can have a survival advantage for some species, including how the evidence distinguishes between causal and correlational relationships and how it supports a cause-and-effect relationship between group behavior and individual survival.

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Life Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.	can describe the basic structure and function of DNA in coding instructions for characteristic traits passed from parents to offspring.	can identify the relationships between DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	can ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	can analyze and modify questions to identify the cause-and-effect relationships associated with DNA and traits passed from parents to offspring.
	can explain that there is genetic variation in the traits of organisms.	can explain how genetic variations may result from new genetic combinations that result due to meiosis or mutations caused by environmental factors.	can make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	can use reasoning to describe links between the evidence and the claims that genetic mutations and/or meiosis produce genetic variations between cells of an organism or between individual organisms and that those differences can be inherited by offspring.
	can recognize that genetic variation exists within a population.	can recognize that variation is expressed in the genetic traits of a population.	can apply the concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	can utilize statistics and probability to compare the variation and distribution of expressed traits across multiple populations.
	can recognize that biological evolution exists and is supported by scientific evidence.	can recognize that common ancestry and biological evolution are supported by DNA and fossil evidence.	can communicate the scientific concept that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	can develop arguments supported by scientific evidence that demonstrate that common ancestry and biological evolution are supported by discoveries in DNA similarities, refinement of traits reflected by fossil evidence, similarities and differences in amino acid sequences, and anatomical and embryological development of organisms.

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Life Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.	can recognize that natural selection affects evolution.	can recognize that genetic variation within a population makes some individuals successful in natural selection and more likely to evolve to changing conditions.	can construct an explanation based on evidence that the process of evolution by natural selection primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of organisms that are better able to survive and reproduce in the environment.	can justify an explanation with multiple pieces of specific evidence for how the process of evolution by natural selection results from (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of organisms that are better able to survive and reproduce in the environment.
	can recognize that changes in traits occur within populations.	can explain that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait.	can apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait.	can develop scientific explanations and provide supporting statistics and probability evidence to communicate that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking the trait.

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Life Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.	can recognize adaptations within a population over time.	can recognize that natural selection leads to adaptation of populations.	can construct an explanation based on evidence for how natural selection leads to adaptation of populations.	can refine an explanation of how specific biotic and abiotic differences in ecosystems (e.g., seasonal temperature ranges, long-term climate change, acidity, light, geographic barriers, development of other populations) contribute to changes in gene frequency over time, leading to adaptation of populations.
	can describe how species are affected differently by changes to environmental conditions.	can explain that some environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	can evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	can evaluate the degree to which given empirical evidence can be used to construct logical arguments that identify causal links between environmental changes and changes in the number of individuals or species based on environmental factors that can determine the ability of individuals in a species to survive and reproduce.
	can identify human activities likely to have an adverse impact on biodiversity in Alaska.	can identify solutions for mitigating adverse impacts of human activity on biodiversity in Alaska.	can design a simulation to test a solution to mitigate profound adverse impacts of human activity on biodiversity in Alaska.	can interpret simulation results and predict the effects of specific design refinements to mitigate profound adverse impacts of human activity on biodiversity in Alaska.

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Life Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of life science disciplinary core ideas to make sense of phenomena and solve problems.	can identify constraints for a solution to a major global challenge that accounts for societal needs and wants.	can describe a major global challenge and specify qualitative criteria and constraints for solutions that account for societal needs and wants.	can analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	can compare and contrast several major global challenges and the qualitative and quantitative criteria for each to demonstrate how the solutions for these challenges overlap and interfere with each other and the needs and wants of society.
	can recognize small, manageable problems that can be solved through engineering.	can explain how a solution to a complex real-world problem can be broken into smaller, more manageable problems that can be solved through engineering.	can design a solution to a complex real-world problem by breaking it into smaller, more manageable problems that can be solved through engineering.	can interpret preliminary data of an engineering solution to a complex real-world problem and propose refinements to that solution.
	can identify trade-offs in solutions to a simple problem.	can describe a possible solution to a complex real-world problem.	can evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.	can refine a solution to a complex real-world problem to reduce the possible social, cultural, and environmental impacts of that solution.
	can identify possible impacts of proposed solutions to a real-world problem.	can identify possible impacts of a proposed solution to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	can use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	can develop a simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

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Physical Science:	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.	can identify the periodic table as a model and identify relative properties of matter.	can explain that the periodic table can be used as a model to identify the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.	can use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost (valence) energy level of atoms.	can explain and/or support predictions with evidence from the periodic table as a model of the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
	can identify the structures of substances can be the result of electrical forces.	can explain that the structures of substances at the bulk scale can be used to infer the strength of electrical forces between particles.	can plan and conduct an investigation to gather evidence to compare the structures of substances at the bulk scale to infer the strength of electrical forces between particles.	can evaluate and/or modify an investigation by assessing the accuracy, precision, and limitations of data produced to demonstrate the relationship between the structures of substances to infer the strength of the electrical forces of the particles of the substances.
	can identify changes in the composition of the nucleus of an atom.	can describe the changes in the composition of the nucleus of an atom and the relative amount of energy released during the processes of fission, fusion, and radioactive decay.	can develop qualitative models to illustrate the changes in the composition of the nucleus of an atom and the energy released during the processes of fission, fusion, and radioactive decay.	can evaluate and refine qualitative models of fusion, fission, and radioactive decay to better represent nuclear changes to atoms that undergo these events and the differences in the energy released during these events.

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Physical Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.	can identify scientific information about molecular-level structures.	can recognize that scientific and technical information about molecular-level structures helps to explain the functioning of natural and designed materials.	can communicate scientific and technical information about why the molecular-level structure is important in the functioning of natural and designed materials.	can utilize scientific and technical information to predict how atomic and molecular electrostatic forces result in the macroscopic arrangement (repeating patterns) of the atoms or molecules within natural or synthesized materials.
	can identify that patterns in chemical properties and trends in the periodic table depend on the outermost electron states of atoms.	can explain that the outcome of a simple chemical reaction is based on the outermost electron states of reactants, trends in the periodic table, and the patterns of chemical properties.	can construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.	can refine and expand the explanation of a model representing patterns in the outcome of a chemical reaction system, given new or updated evidence.
	can identify that there are changes in energy in a chemical reaction system.	can describe that the release or absorption of energy from a chemical reaction system depends on the changes in total bond energy.	can develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends on the changes in total bond energy.	can modify a model to demonstrate the differences in bond energies of reactants and products while indicating that the overall energy of a chemical reaction system and environment is conserved.
	can identify that changes to the temperature of a system results in a change to the reaction rate of the system.	can describe that changing the temperature or concentration of reacting particles affects the rate at which a reaction occurs.	can apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of reacting particles on the rate at which a reaction occurs.	can predict the outcome of a chemical reaction, based on changes made to the temperature of the chemical system or the concentration of reactants or products in the system.

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Physical Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.	can identify that a reaction can move in both forward and reverse directions.	can refer to aspects of kinetic molecular theory to explain how altering a condition of a reaction affects the forward and/or reverse rate of the reaction at equilibrium.	can make arguments based on kinetic molecular theory to explain how altering conditions affects the forward and reverse rates of a reaction at equilibrium.	can refine and make predictions based on kinetic molecular theory of how forward and reverse rates of reactions will be affected by changes in the conditions of a reaction at equilibrium.
	can identify graphical representations that support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	can identify mathematical representations that support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	can use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	can develop mathematical representations using molar mass and Avogadro's number to support the claim that atoms, and therefore mass, are conserved during a chemical reaction in a closed system.
	can identify qualitative relationships among the net force on a macroscopic object, the object's mass, or the object's acceleration.	can identify data needed to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, the object's mass, and the object's acceleration.	can analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net forces on a macroscopic object, the object's mass, and the object's acceleration.	can predict cause-and-effect correlations in data needed to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, the object's mass, and the object's acceleration.

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Physical Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.	can qualitatively describe that the total momentum of a system of objects is conserved when there is no net force on the system.	can identify mathematical representations that support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.	can use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.	can critically evaluate the initial and final conditions of a system after the interaction of objects within that system and then develop relative mathematical representations to describe that the total momentum of the system was conserved since there was no net force on the system.
	can apply science and engineering ideas to alter a device that minimizes the force on a macroscopic object during a collision.	can identify science and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.	can apply science and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.	can refine a device by extending the impact time, reducing the device mass, and/or considering cost-benefit analysis to improve the performance of the device in such a way that the force on a macroscopic object during a collision is minimized.
	can identify Newton's law of gravitation or Coulomb's law.	can identify mathematical representations of Newton's law of gravitation or Coulomb's law to describe the gravitational and electrostatic forces between objects.	can use mathematical representations of Newton's law of gravitation and Coulomb's law to describe and predict the gravitational and electrostatic forces between objects.	can utilize mathematical formulas representing Newton's law of gravitation and Coulomb's law to quantify the change in the energy of objects interacting through electric or gravitational forces depends on the distance between the objects.

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Physical Science: (cont) *Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.*	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
	can explain an electric current and a magnetic field.	can explain that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.	can plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.	can evaluate and/or refine an investigation to provide more accurate, precise, and useful data on the presence of an electric current in a circuit and a magnetic field near that circuit.
	can describe a change in the energy of a system.	can describe that there will be a change in the energy of one component in a system when the change in energy of the other component(s) and energy flows into and out of the system are known.	can create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows into and out of the system are known.	can evaluate the limitations (e.g., precision and reliability) of a computational model, based on assumptions made when creating the numeric descriptions of energy changes and flows in a system.
	can describe energy as the motion or position of particles or objects.	can describe that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects).	can develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects).	can use models to show that in closed systems energy is conserved at both the macroscopic and molecular/atomic scales and that as one form of energy changes, the total system energy remains constant, as observed by other forms of energy changing by the same amount, or changes only by the amount of energy that is transferred into or out of the system.

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Physical Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.	can identify a device that converts one form of energy into another form of energy.	can identify desirable characteristics of a device that works within given constraints to convert one form of energy into another form of energy.	can design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.	can use the results obtained by the testing of multiple devices to improve device performance by increasing the efficiency of energy conversion, keeping in mind the criteria and constraints and noting any modifications in trade-offs that work within those constraints.
	can explain that thermal energy flows from areas of high temperature to areas of lower temperature.	can describe that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).	can plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).	can evaluate and refine an investigation to provide increased accuracy and precision of data collected and can identify any potential cause of an apparent loss of energy from a closed system (which should be zero in an ideal system) and adjust the design of the investigation accordingly (second law of thermodynamics).

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Physical Science: (cont)	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.	can explain that opposite charges attract and like charges repel each other.	can describe that two objects interacting through electrical or magnetic fields experience forces between them and changes in energy due to the interaction (Coulomb's law).	can use a model of two objects interacting through electrical or magnetic fields to illustrate the forces between them and the changes in energy due to the interaction (Coulomb's law).	can use a developed model to determine whether the energy stored in electrical or magnetic fields increased, decreased, or remained the same after two objects interacted and can describe the cause-and-effect relationships on a qualitative level between forces produced by electric or magnetic fields and the change in energy of the objects in the system (Coulomb's law).
	can identify that waves travel at different speeds through solids, liquids, and gases and that higher-frequency waves have shorter wavelengths.	can identify mathematical representations that qualitatively support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	can use mathematical representations to qualitatively support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	can predict the relative change in the wavelength of a wave when it moves from one medium to another, resulting in different wave speeds based on the mathematical relationship $v = f\lambda$, and express that relative change in terms of cause (different media) and effect (different wavelengths but same frequency).

	Needs Support **Student may partially meet the standards but needs support to master the knowledge and skills of current grade-level content.**	Approaching Proficient **Student partially meets the standards and may have gaps in knowledge and skills but is approaching mastery of some grade-level content.**	Proficient **Student meets the standards and demonstrates mastery of the knowledge and skills of most grade-level content.**	Advanced **Student meets the standards and demonstrates mastery of the knowledge and skills on a range of complex grade-level content.**
Physical Science: (cont) *Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.*	**A student at this level:**	**A student at this level:**	**A student at this level:**	**A student at this level:**
	can identify an advantage or disadvantage of using digital transmission and storage of information with respect to forms other than digital, including analog.	can recognize that advantages and disadvantages exist for using digital transmission and storage of information with respect to forms other than digital, including analog.	can evaluate questions about the advantages and disadvantages of using digital transmission and storage of information with respect to forms other than digital, including analog.	can evaluate and assess the stability and importance of systems that employ digital information in terms of the digital transmission and storage of information.
	can recognize evidence that electromagnetic radiation can be described as a wave or a particle, depending on the situation.	can recognize evidence and reasoning behind the idea that electromagnetic radiation can be described by either a wave model or a particle model.	can evaluate claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described as either a wave model or a particle model and that for some situations one model is more useful than the other.	can evaluate models of systems that describe the transfer of energy and information to identify why the wave model is more useful in some situations and why the particle model is more useful in others.
	can recognize that there are different frequencies of electromagnetic radiation.	can recognize that different frequencies of electromagnetic radiation have a variety of effects when absorbed by matter.	can evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	can provide evidence and reasoning that can be used to evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

	Needs Support **Student may partially meet the standards but needs support to master the knowledge and skills of current grade-level content.**	Approaching Proficient **Student partially meets the standards and may have gaps in knowledge and skills but is approaching mastery of some grade-level content.**	Proficient **Student meets the standards and demonstrates mastery of the knowledge and skills of most grade-level content.**	Advanced **Student meets the standards and demonstrates mastery of the knowledge and skills on a range of complex grade-level content.**
Physical Science: (cont) *Students use science and engineering practices, crosscutting concepts, and an understanding of physical science disciplinary core ideas to make sense of phenomena and solve problems.*	**A student at this level:** can recognize that some devices, such as solar cells and communication technology, use waves for operation.	**A student at this level:** can recognize that some devices, such as solar cells and communication technology, use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	**A student at this level:** can communicate technical information about how some devices, such as solar cells and communication technology, use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	**A student at this level:** can utilize the cause-and-effect relationships used to produce functionality of multiple communication technologies to support arguments that some devices are preferable under a specified set of criteria.