Achievement Level Descriptors

for

Physical Science

Georgia Department of Education
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Achievement Levels and Achievement Level Descriptors

With the implementation of the Georgia Milestones Assessment System, Georgia educators have developed four achievement levels to describe student mastery and command of the knowledge and skills outlined in Georgia's content standards. Most students have at least some knowledge of the content described in the content standards; however, achievement levels succinctly describe how much mastery a student has. Achievement levels give meaning and context to scale scores by describing the knowledge and skills students must demonstrate to achieve each level.

The four achievement levels on Georgia Milestones are *Beginning Learner, Developing Learner, Proficient Learner,* and *Distinguished Learner.* The general meaning of each of the four levels is provided below:

Beginning Learners **do not yet demonstrate proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards. The students ***need substantial academic support*** to be prepared for the next grade level or course and to be on track for college and career readiness.

Developing Learners **demonstrate partial proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards. The students ***need additional academic support*** to ensure success in the next grade level or course and to be on track for college and career readiness.

Proficient Learners **demonstrate proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards. The students ***are prepared*** for the next grade level or course and are on track for college and career readiness.

Distinguished Learners **demonstrate advanced proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards. The students ***are well prepared*** for the next grade level or course and are well prepared for college and career readiness.

More detailed and content-specific concepts and skills are provided for each grade, content area, and course in the **Achievement Level Descriptors** (ALDs). ALDs are narrative descriptions of the knowledge and skills expected at each of the four achievement levels and were developed for each grade level, content area, and course by committees of Georgia educators in March 2015 and July 2015. The ALDs are based on the state-adopted content standards.

ALDs show a *progression of knowledge and skills* for which students must demonstrate competency across the achievement levels. It is important to understand that a student should demonstrate mastery of the knowledge and skills within his/her achievement level *as well as all content and skills in any achievement levels that precede his/her own, if any*. For example, a Proficient Learner should also possess the knowledge and skills of a Developing Learner *and* a Beginning Learner.

POLICY ALDs				
	Beginning Learner	**Developing Learner**	**Proficient Learner**	**Distinguished Learner**
	Beginning Learners do not yet demonstrate proficiency in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards. The students need substantial academic support to be prepared for the next grade level or course and to be on track for *college and career readiness.*	**Developing Learners demonstrate partial proficiency in the knowledge and skills** necessary at this grade level/course of learning, as specified in Georgia's content standards. The students need additional academic support to ensure success in the next grade level or course and to be on track for *college and career readiness.*	**Proficient Learners demonstrate proficiency in the knowledge and skills** necessary at this grade level/course of learning, as specified in Georgia's content standards. The students are prepared for the next grade level or course and are on track for *college and career readiness.*	**Distinguished Learners demonstrate advanced proficiency in the knowledge and skills** necessary at this grade level/course of learning, as specified in Georgia's content standards. The students are well prepared for the next grade level or course and are well prepared for *college and career readiness.*
RANGE ALDs				
Standard	**Beginning Learner**	**Developing Learner**	**Proficient Learner**	**Distinguished Learner**
	A student who achieves at the **Beginning Learner** level demonstrates minimal command of the grade-level standards. The pattern exhibited by student responses indicates that students are most likely able to:	A student who achieves at the **Developing Learner** level demonstrates partial command of the grade-level standards. The pattern exhibited by student responses indicates that students are most likely able to:	A student who achieves at the **Proficient Learner** level demonstrates proficiency of the grade-level standards. The pattern exhibited by student responses indicates that students are most likely able to:	A student who achieves at the **Distinguished Learner** level demonstrates advanced proficiency of the grade-level standards. The pattern exhibited by student responses indicates that students are most likely able to:

Atomic and Nuclear Theory and the Periodic Table				
SPS1a SPS1b SPS1c SPS2a SPS2b SPS2c SPS4a SPS4b SPS4c	• identify the structure of the atom; • recognize that the following data trends exist: number of valence electrons; types of ions formed by main group elements; location and properties of metals, nonmetals, and metalloids; and phases at room temperature; • use the Periodic Table as a model to locate the main group elements; • use data to identify properties of ionic and covalent compounds; • use models to relate stable, binary ionic compounds to the balance of charges; • recognize that the International Union of Pure and Applied Chemistry (IUPAC) nomenclature is used to name chemicals; • use a model to recognize that the nucleus changes as a result of fission and fusion; • recognize the relationship between half-life and radioactive decay; • identify evidence that supports nuclear energy as an alternative energy source;	• recognize models that show the differences between atoms, ions, and isotopes; • use data to describe trends of the following: number of valence electrons; types of ions formed by main group elements; location and properties of metals, nonmetals, and metalloids; and phases at room temperature; • use the Periodic Table as a model to identify some properties of the main group elements; • use data to recognize that there are differences in the properties of ionic and covalent compounds; • write formulas for stable, binary ionic compounds based on balance of charges; • use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature to identify the names of simple chemicals; • explain how the nucleus changes as a result of fission and fusion using a model; • explain the process of half-life as it relates to radioactive decay; • compare and contrast evidence about the applications, benefits, and problems of nuclear energy	• develop and use models to compare and contrast the structure of atoms, ions and isotopes; • analyze and interpret simple data to determine trends of the following: number of valence electrons; types of ions formed by main group elements; location and properties of metals, nonmetals, and metalloids; and phases at room temperature; • use the Periodic Table as a model to predict the properties of main group elements; • analyze and interpret data to predict properties of ionic and covalent compounds; • develop and use models to predict formulas for stable, binary ionic compounds based on balance of charges; • use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature for translating between simple binary chemical names and chemical formulas (one to one chemical compounds; • develop a model that illustrates how the nucleus changes as a result of fission and fusion;	• justify models to compare and contrast the structure of atoms, ions and isotopes; • analyze and interpret complex data to make comparisons in trends of the following: number of valence electrons; types of ions formed by main group elements; location and properties of metals, nonmetals, and metalloids; and phases at room temperature; • use the Periodic Table as a model to analyze the properties of main group elements; • compare properties of ionic and covalent compounds using evidence from data; • refine models to predict formulas for stable, binary ionic compounds based on balance of charges; • use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature for translating between complex binary chemical names and chemical formulas (compounds with subscripts); • compare models that illustrate how the nucleus changes as a result of fission and fusion;

		as an alternative energy source;	• use mathematics and computational thinking to explain the process of half-life as it relates to radioactive decay • construct arguments based on evidence about the applications, benefits, and problems of nuclear energy as an alternative energy source;	• apply mathematics and computational thinking to create examples that explain the process of half-life as it relates to radioactive decay; • analyze and defend arguments based on evidence about the applications, benefits, and problems of nuclear energy as an alternative energy source;
Chemical Reactions and Properties of Matter				
SPS3a SPS3b SPS5a SPS5b SPS6a SPS6b SPS6c SPS6d SPS6e	• recognize that mass is conserved during a chemical reaction; • explain that the total number of atoms is conserved during a chemical reaction; • use a model to identify particle arrangement and motion in solids, liquids, gases, and plasmas; • recognize that relationships exist among temperature, pressure, volume, and density of gases in closed systems; • recognize a solution; • recognize that surface area, and agitation affect the rate solutes dissolve in a specific solvent; • recognize that there is a relationship between temperature and solubility; • recognize that the structure of acids and bases determine their properties;	• carry out investigations to provide evidence to support the claim that mass is conserved during a chemical reaction; • use a model to explain that the total number of atoms is conserved during a chemical reaction; • compare and contrast models depicting the particle arrangement and motion in solids, liquids, gases, and plasmas; • carry out investigations to identify the relationships among temperature, pressure, volume, and density of gases in closed systems; • use models to describe the properties of solutions; • explain how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent;	• plan and carry out investigations to generate evidence supporting the claim that mass is conserved during a chemical reaction; • develop and use a model of a chemical equation to illustrate how the total number of atoms is conserved during a chemical reaction; • ask questions to compare and contrast models depicting the particle arrangement and motion in solids, liquids, gases, and plasmas; • plan and carry out investigations to identify the relationships among temperature, pressure, volume, and density of gases in closed systems; • develop and use models to explain the properties (solute/solvent, conductivity,	• refine investigations to generate evidence supporting the claim that mass is conserved during a chemical reaction; • justify a model of a chemical equation to illustrate how the total number of atoms is conserved during a chemical reaction; • refine questions to analyze models depicting the particle arrangement and motion in solids, liquids, gases, and plasmas; • communicate findings from investigations to identify the relationships among temperature, pressure, volume, and density of gases in closed systems; • justify models to explain the properties of solutions; • refine investigations to determine how temperature, surface area, and agitation

	• recognize that household substances can be classified as acidic, basic, or neutral;	• identify the effect of temperature on solubility; • identify relationships between the structure and properties of acids and bases; • describe patterns in information provided to classify common household substances as acidic, basic, or neutral;	and concentration) of solutions; • plan and carry out investigations to determine how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent; • analyze and interpret data from a solubility curve to determine the effect of temperature on solubility; • obtain and communicate information that can be used to explain the relationship between the structure and properties (e.g., pH, and color change in the presence of an indicator) of acids and bases; • plan and carry out investigations to detect patterns in order to classify common household substances as acidic, basic, or neutral;	affect the rate solutes dissolve in a specific solvent; • use data to graph a solubility curve that can be used to determine the effect of temperature on solubility; • analyze information that can be used to explain the relationship between the structure and properties of acids and bases; • refine investigations to detect patterns in order to classify common household substances as acidic, basic, or neutral;
Energy, Force, and Motion				
SPS7a SPS7b SPS7c SPS7d SPS8a SPS8b SPS8c SPS8d	• recognize an example of an energy transformation; • recognize that molecular motion relates to thermal energy changes; • define the terms insulator and conductor as they relate to the transfer of energy; • recognize that the flow of energy changes during phase change; • recognize that the motion of an object can be explored	• identify energy transformations within a system; • explain how molecular motion relates to thermal energy changes in terms of conduction, convection, and radiation; • explain why certain materials are better at insulation and conduction than others;	• construct explanations for energy transformations within a system; • plan and carry out investigations to describe how molecular motion relates to thermal energy changes in terms of conduction, convection, and radiation; • analyze and interpret specific heat data to justify the selection of a material for a	• refine explanations for energy transformations within a system; • refine investigations to describe how molecular motion relates to thermal energy changes in terms of conduction, convection, and radiation; • compare multiple sources of specific heat data to justify the selection of materials for

	using mathematical and graphical models; • recognize Newton's three laws of motion; • recognize that a relationship exists between mass and gravitational force for falling objects; • define the terms work and mechanical advantage, and identify simple machines;	• explain the flow of energy during specific phase changes; • describe an investigation used to analyze the motion of an object; • provide examples of Newton's three laws of motion; • explain the relationship between mass and gravitational force for falling objects; • explain the relationships between work, mechanical advantage, and simple machines;	practical application (e.g., insulators and cooking vessels); • analyze and interpret data to explain the flow of energy during phase changes using heating/cooling curves; • plan and carry out an investigation to analyze the motion of an object using mathematical and graphical models; • construct an explanation based on experimental evidence to support the claims presented in Newton's three laws of motion; • analyze and interpret data to identify the relationship between mass and gravitational force for falling objects; • use mathematics and computational thinking to identify the relationships between work, mechanical advantage, and simple machines;	practical applications across multiple contexts; • make inferences and/or predictions based on analysis and interpretation of data to explain the flow of energy during phase changes using heating/cooling curves; • refine an investigation used to analyze the motion of an object using mathematical and graphical models; • refine explanations based on experimental evidence to support the claims presented in Newton's three laws of motion; • make inferences and/or predictions based on analysis and interpretation of data to identify the relationship between mass and gravitational force for falling objects; • use mathematics and computational thinking to compare and analyze the relationships between work, mechanical advantage, and simple machines;
Waves, Electricity, and Magnetism				
SPS9a SPS9b SPS9c SPS9d SPS9e SPS10a SPS10b SPS10c	• recognize that relationships exist among wavelength, frequency, and energy in electromagnetic waves and amplitude and energy in mechanical waves;	• identify the relationships among wavelength, frequency, and energy in electromagnetic waves and amplitude and energy in mechanical waves;	• analyze and interpret data to identify the relationships among wavelength, frequency, and energy in electromagnetic waves and amplitude and energy in mechanical waves;	• analyze and interpret data to compare the relationships among wavelength, frequency, and energy in electromagnetic waves and amplitude and energy in mechanical waves;

	• classify waves as electromagnetic or mechanical; • recognize examples of reflection, refraction, interference, and diffraction; • recognize that different media affect the speed of sound and light waves; • describe the basic concept of the Doppler effect; • define the terms voltage, current, and resistance; • identify examples of simple series and parallel circuits; • recognize that a relationship exists between magnetism and the movement of electrical charge.	• describe the characteristics of electromagnetic and mechanical waves; • describe the concepts of reflection, refraction, interference, and diffraction; • identify how different media affect the speed of sound and light waves; • explain the changes in sound waves associated with the Doppler effect; • identify the relationships among voltage, current, and resistance; • describe the conventional flow of current and the flow of electrons in simple series and parallel circuits; • describe the relationship between magnetism and the movement of electrical charge.	• ask questions to compare and contrast the characteristics of electromagnetic and mechanical waves; • develop models based on experimental evidence that illustrate the phenomena of reflection, refraction, interference, and diffraction; • analyze and interpret data to explain how different media affect the speed of sound and light waves; • develop and use models to explain the changes in sound waves associated with the Doppler effect; • use mathematical and computational thinking to support a claim regarding relationships among voltage, current, and resistance; • develop and use models to illustrate and explain the conventional flow (direct and alternating) of current and the flow of electrons in simple series and parallel circuits; • plan and carry out investigations to determine the relationship between magnetism and the movement of electrical charge.	• refine questions to compare and contrast the characteristics of electromagnetic and mechanical waves; • Justify models based on experimental evidence that illustrate the phenomena of reflection, refraction, interference, and diffraction; • make inferences and/or predictions based on analysis and interpretation of data to explain how different media affect the speed of sound and light waves; • justify models to explain the changes in sound waves associated with the Doppler effect; • produce and analyze graphical displays to support a claim regarding relationships among voltage, current, and resistance; • justify models to illustrate and explain the conventional flow of current and the flow of electrons in simple series and parallel circuits; • refine investigations to determine the relationship between magnetism and the movement of electrical charge.

