



# Transitional Colorado Assessment Program (TCAP) Assessment Framework Grade 8 Science

The assessment frameworks specify the content that will be eligible for assessment in the 2012 and 2013 TCAP by aligning the assessment objectives from the Colorado Model Content Standards (old standards) with the Colorado Academic Standards (new standards). TCAP supports the transition to the Colorado Academic Standards (CAS) during the next two years as a gradual approach to statewide measuring of student achievement of the new standards.

Please remember that the TCAP frameworks, and thus TCAP, are not inclusive of **all** of the CAS. **Districts should, however, still transition to the full range of the new standards as the complete set of CAS will be considered eligible content for inclusion in the new 2014 assessment.**

The frameworks are organized as indicated in the table below:

<b>Standard</b>	Indicates the broad knowledge skills that all students should be acquiring in Colorado schools at grade level. Each standard is assessed every year.		
<b>Benchmark</b>	Tactical descriptions of the knowledge and skills students should acquire by each grade level assessed by the TCAP.		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
Specific knowledge and skills eligible for inclusion on TCAP for each grade level.	Provides the code(s) from the Colorado Academic Standards (CAS) that correspond(s) to the assessment objective.	Provides the text from the CAS which correspond(s) to the assessment objective.	Provides clarifying information.

The following may assist in understanding the revised frameworks:

The Colorado Academic Standards are mastery based. Some assessment objectives are aligned to expectations at 8<sup>th</sup> grade or below that are embedded throughout the CAS standards. Examples of expectation sentence stems are provided and these assessment objectives are eligible for assessment with the TCAP.

- A CAS may be aligned to multiple assessment objectives. To ensure a reasonable document length per grade, some instances of multiple CAS alignments have been omitted.



- Some assessment objectives, or parts of assessment objectives, do not explicit align with the CAS but will still be assessed. Where this occurs, it is noted with language such as “this will continue to be assessed.” The concepts from these assessment objectives are also compiled in a table at the bottom of each framework for easy reference. The purpose of continuing to assess non-CAS aligned objectives is to ensure the reliability and comparability of the TCAP to prior year’s assessments.
- Assessment objectives and parts of assessment objectives that will no longer be assessed have been struck through and are included in the revised frameworks for purposes of comparison to the prior frameworks only.
- Math is an integral part of science. The CAS has separated science related math concepts into distinct content area domains, but students should be able to interpret mathematical presentations of scientific data and trends in graphs, charts and tables.
- In some cases, an assessment objective is aligned to both an entire grade level expectation (GLE) and to a specific evidence outcome (EO) from that GLE. Text from the EO is included in these instances because it provides further clarification and may assist with interpretation of the framework.
- A key to the CAS Alignment Code can be by following this link:  
[http://www.cde.state.co.us/cdeassess/UAS/AdoptedAcademicStandards/CAS\\_Reference\\_system.pdf](http://www.cde.state.co.us/cdeassess/UAS/AdoptedAcademicStandards/CAS_Reference_system.pdf)

The revised frameworks directly build off of the work done on the original Colorado Student Assessment Program (CSAP) frameworks and reflect a joint endeavor between the Office of Assessment, Research and Evaluation and the content specialists from the Office of Academic and Instructional Support.



<b>Standard 1</b>		Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:	
<b>Benchmark 1</b>		Ask questions and state hypotheses that lead to different types of scientific investigations (for example: experimentation, collecting specimens, constructing models, researching scientific literature)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Plan and design a scientific investigation that includes: <ul style="list-style-type: none"> <li>• developing a testable question</li> <li>• researching scientific literature</li> <li>• stating a hypothesis</li> <li>• identifying the independent and the dependent variables</li> <li>• designing a written procedure for a controlled experiment</li> <li>• using an appropriate observation/measurement technique for data collection</li> <li>• <del>keeping all other conditions constant</del></li> </ul>	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Find, evaluate, and select appropriate information from reference books, journals, magazines, online references, and databases to answer scientific questions.  Use tools to gather, view, analyze, and report results for scientific investigations designed to answer questions.  Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate an issue.  Ask testable questions and make a falsifiable hypothesis and use an inquiry based approach to find an answer.  Evaluate the reproducibility of an experiment, and critically examine conflicts in experimental results.	Identifying the independent and dependent variables, is not explicit in the CAS; however, it is implied that it will be taught before 8 <sup>th</sup> grade.
	SC09-GR.7-S.2-GLE.4.N.2	Design an experiment to observe photosynthesis or respiration, and clearly define controls and variables.	



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<b>Benchmark 1</b>		Ask questions and state hypotheses that lead to different types of scientific investigations (for example: experimentation, collecting specimens, constructing models, researching scientific literature)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
b. Identify the independent and dependent variables in a previously conducted scientific investigation on a specific topic.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Design an experiment ... and clearly define controls and variables.	Identifying the independent and dependent variables is not explicit in the CAS; however, it is implied that it will be taught before 8 <sup>th</sup> grade.
c. Identify different methods used to investigate scientific questions (e.g., controlled experiments, collecting specimens, constructing models, researching scientific literature, etc.).	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Recognize and describe the ethical traditions of science: value peer review; truthful reporting of methods and outcomes; making work public; and sharing a lens of professional skepticism when reviewing the work of others.  Ask testable questions and make a falsifiable hypothesis about ... and design a method to find an answer.  Describe methods and equipment used to explore...	



<b>Standard 1</b>		Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:	
<b>Benchmark 2</b>		Use appropriate tools, technologies and metric measurements to gather and organize data and report results	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Record and report data from a scientific investigation using the appropriate tool and metric units.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Use tools to gather, view, analyze, and report results for scientific investigations...	
		Select proper tools to measure the mass and volume of an object and use appropriate units.	
b. Describe how different types of technologies are used in scientific investigations (e.g., telescopes, computers, calculators, seismographs, satellites, microscopes, etc.).	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Select and use technology tools to gather, view, analyze, and report results for scientific investigations...	
		Use models and technology tools ...	
	SC09-GR.6-S.2-GLE.1.N1	Ask testable questions and make a falsifiable hypothesis about how environmental conditions affect organisms, populations, or entire species and design a method to find the answer.	



<b>Standard 1</b>		Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:	
<b>Benchmark 2</b>		Use appropriate tools, technologies and metric measurements to gather and organize data and report results	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
c. Construct and use different types of visual methods (e.g., data tables, bar and line graphs, diagrams, etc.) to summarize and present data.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Use models and technology tools to help visualize ...  Data tables, charts, and graphs allow people to compare and contrast ...	
	SC09-GR.8-S.1-GLE.3.N2	Share experimental data, and respectfully discuss conflicting results emulating the practice of scientists.	

<b>Standard 1</b>		Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:	
<b>Benchmark 3</b>		Interpret and evaluate data in order to formulate a logical conclusion	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Interpret and evaluate data/observations (e.g., data tables, bar and line graphs, diagrams, written descriptions, etc.) to formulate a logical conclusion.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Gather, analyze, and interpret data. Identify evidence.  Develop, communicate, and justify an evidence-based explanation.	
	SC09-GR.8-S.3-GLE.1-EO.b	Observe and gather data for various weather conditions and compare to historical data for that date and location.	
	SC09-GR.8-S.3-GLE.1-EO.c	Use models to develop and communicate a weather prediction.	



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<b>Benchmark 3</b>		Interpret and evaluate data in order to formulate a logical conclusion	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
b. Use evidence to state if a hypothesis is supported or not supported.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Ask testable questions and make a falsifiable hypothesis about ... and design a method to find an answer.  Identify evidence ...	
	SC09-GR.8-S.1-GLE.3-EO.b	Gather, analyze, and interpret data on physical and chemical changes.	
c. Make predictions based on experimental data.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Predict and evaluate ...  Use research-based models to describe ..., and predict ...  Use models and diagrams to predict ...  Recognize that mathematical models are used to predict ...	
	SC09-GR.6-S.2-GLE.1-EO.a	Interpret and analyze data about changes in environmental conditions - such as climate change - and populations that support a claim describing why a specific population might be increasing or decreasing.	
	SC09-GR.6-S.3-GLE.1-EO.a	Gather, analyze, and communicate an evidence-based explanation for the complex interaction between Earth's constructive and destructive forces.	



<b>Standard 1</b>			
Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:			
<b>Benchmark 4</b>			
Demonstrate that scientific ideas are used to explain previous observations and to predict future events (for example: plate tectonics and future earthquake activity)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. <del>Evaluate collected data/observations and explain the patterns seen in past, current, and future scientific phenomena (e.g., plate tectonics, future earthquake activity, etc.).</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 1</b>			
Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:			
<b>Benchmark 5</b>			
Identify and evaluate alternative explanations and procedures			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe other reasonable explanations, using the same independent and dependent variable, for the resulting data or observations from an investigation.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Gather, analyze and interpret data ...  Employ tools to gather, view, analyze, and report results for the scientific investigations ...  Share experimental data, and respectfully discuss conflicting results.  Gather, analyze, and communicate an evidence-based explanation for the complex interaction between ...	Identifying the independent and dependent variables is not explicit in the CAS; however, it is implied that it will be taught before 8 <sup>th</sup> grade.
	SC09-GR.6-S.2-GLE.1-EO.a	Interpret and analyze data about changes in environmental conditions - such as climate change - and populations that support a claim describing why a specific population might be increasing or decreasing.	





<b>Standard 1</b>		Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:	
<b>Benchmark 5</b>		Identify and evaluate alternative explanations and procedures	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
b. <del>Recognize and/or explain that alternative experimental designs can be used to investigate the same testable question.</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 1</b>		Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. Students know and are able to:	
<b>Benchmark 6</b>		Communicate results of their investigations in appropriate ways (for example: written reports, graphic displays, oral presentations)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Recognize that there are several different ways to communicate the results of investigations (e.g., it is good to keep written reports so that information is preserved over time; oral presentations given to a large group are best when accompanied by a visual presentation; data is best suited for certain types of visual displays - bar graphs, line graphs, tables, etc.), and they are each used at different times.		Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Work in groups using the writing process to effectively communicate an understanding ...  Develop, communicate, and justify an evidence-based scientific example ...  Research, critique, and communicate scientific theories that explain ...  Gather, analyze, and communicate data that explains...
	SC09-GR.6-S.2-GLE.1.N1	Ask testable questions and make a falsifiable hypothesis about how environmental conditions affect organisms, populations, or entire species and design a method to find the answer.	



<b>Standard 2</b>		Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 1</b>		Physical properties of solids, liquids, gases and the plasma state and their changes can be explained using the particulate nature of matter model	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe the particulate model for solid, liquid, gas, <del>and plasma</del> including the arrangement, motion, and energy of the particles <del>(for example, a lit fluorescent light bulb contains plasma which has widely spaced and highly energetic particles).</del>	SC09-GR.6-S.1-GLE.3	The physical characteristics and changes of solid, liquid, and gas states can be explained using the particulate model.	
b. Using the kinetic molecular theory, predict how changes in temperature affect the behavior of particles of matter.	SC09-GR.6-S.1-GLE.3-EO.b	Distinguish between changes in temperature and changes of state using the particle model of matter.	

<b>Standard 2</b>		Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> <b>Students know and can demonstrate understanding that:</b>	
<b>Benchmark 2</b>		Mixtures of substances can be separated based on their properties (for example: solubility, boiling points, magnetic properties, densities and specific heat)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Explain how to use differences in solubility, boiling points, and magnetic properties to separate mixtures of substances (for example, filtration can be used to separate mixtures by solubility or physical size).	SC09-GR.7-S.1-GLE.1-EO.a	Identify properties of substances in a mixture that could be used to separate those substances from each other.	



<b>Standard 2</b>	Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> <b>Students know and can demonstrate understanding that:</b>		
<b>Benchmark 2</b>	Mixtures of substances can be separated based on their properties (for example: solubility, boiling points, magnetic properties, densities and specific heat)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
b. Apply the concept of density to explain how mixtures of liquids and solids can be separated (for example, relative densities – sinking and floating).	SC09-GR.7-S.1-GLE.1-EO.b	Develop and design a scientific investigation to separate the components of a mixture.	

<b>Standard 2</b>	Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> <b>Students know and can demonstrate understanding that:</b>		
<b>Benchmark 3</b>	Mass is conserved in a chemical or physical change		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Distinguish between a physical change and a chemical change.	SC09-GR.8-S.1-GLE.3-EO.a	Identify the distinguishing characteristics between a chemical and a physical change.	
b. Apply the law of conservation of mass to physical changes (for example, predict the mass of a substance after a phase change).	SC09-GR.8-S.1-GLE.3-EO.d	Identify evidence that suggests that matter is always conserved in physical and chemical changes.	The term “law of conservation” is not explicit in the CAS before high school, but the concept is fundamental to 8 <sup>th</sup> grade science.
	SC09-GR.8-S.1-GLE.3-EO.c	Gather, analyze, and interpret data that show mass is conserved in a given chemical or physical change.	
c. Apply the law of conservation of mass to chemical changes (for example, determine the mass of products given the mass of reactants).	SC09-GR.8-S.1-GLE.3-EO.d	Identify evidence that suggests that matter is always conserved in physical and chemical changes.	The term “law of conservation” is not explicit in the CAS before high school, but the concept is fundamental to 8 <sup>th</sup> grade science.
	SC09-GR.8-S.1-GLE.3-EO.c	Gather, analyze, and interpret data that show mass is conserved in a given chemical or physical change.	



<b>Standard 2</b>		Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> <b>Students know and can demonstrate understanding that:</b>	
<b>Benchmark 4</b>		Mass and weight can be distinguished	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Explain that the mass of an object is the amount of matter (measured in grams using a balance) it has and the weight of an object is the force of gravity (measured in Newtons using a spring scale) acting on its mass.	SC09-GR.6-S.1-GLE.4	Distinguish among, explain, and apply the relationships among mass, weight, volume, and density.	
b. Predict how changes in the force of gravity affect the mass and weight of an object (for example, the mass of an object on the Moon will stay the same but its weight will be less than if the object were on Earth).	SC09-GR.6-S.1-GLE.4-EO.b	Predict how changes in acceleration due to gravity will affect the mass and weight of an object.	
	SC09-GR.6-S.1-GLE4-EO.a	Explain that the mass of an object does not change, but its weight changes based on the gravitational forces acting upon it.	



<b>Standard 2</b>	Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 5</b>	All matter is made up of atoms that are comprised of protons, neutrons and electrons and when a substance is made up of only one type of atom, it is an element		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify that all matter is made up of atoms and that atoms are made of protons, neutrons, and electrons, and describe the location and charge of the parts of an atom.	SC09-GR.6-S.1-GLE.1	All matter is made of atoms, which are far too small to see directly through a light microscope. Elements have unique atoms and thus, unique properties. Atoms themselves are made of even smaller particles.	Matter concepts are implicit throughout these GLEs.
	SC09-GR.6-S.1-GLE.2	Atoms may stick together in well-defined molecules or be packed together in large arrays. Different arrangements of atoms into groups compose all substances.	
b. Identify that a substance made up of only one type of atom is an element, an atom is the smallest unit of an element that still retains the properties of that element, and different elements have different properties.	SC09-GR.6-S.1-GLE.1	All matter is made of atoms, which are far too small to see directly through a light microscope. Elements have unique atoms and thus unique properties. Atoms themselves are made of even smaller particles.	Matter concepts are implicit throughout these GLEs.
	SC09-GR.6-S.1-GLE.2	Atoms may stick together in well-defined molecules or be packed together in large arrays. Different arrangements of atoms into groups compose all substances.	
c. <del>Explain that the number of protons in an atom determines what element it is.</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.



<b>Standard 2</b>		Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 6</b>		When two or more elements are combined a compound is formed which is made up of molecules	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Explain that two or more atoms may chemically combine to form a molecule, and recognize that a molecule can be represented by a chemical formula that shows the ratio of atoms of each element in the molecule (for example, H <sub>2</sub> and H <sub>2</sub> O are molecules).	SC09-GR.6-S.1-GLE.2-EO.b	Identify evidence suggesting that atoms form into molecules with different properties than their components.	
b. Describe that two or more elements may chemically combine to form a compound that may have different properties than the elements.	SC09-GR.6-S.1-GLE.2-EO.b	Identify evidence suggesting that atoms form into molecules with different properties than their components.	
	SC09-GR.6-S.1-GLE.1-EO.c	Develop an evidence based scientific explanation of the atomic model as the foundation for all chemistry.	
c. Explain how mixtures are different than compounds.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.
d. Identify that the smallest unit of a compound that still retains the properties of that compound is a molecule.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.



<b>Standard 2</b>	Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 7</b>	Quantities (for example: time, distance, mass, force) that characterize moving objects and their interactions within a system (for example, force, speed, velocity, potential energy, kinetic energy) can be described, measured and calculated		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Use measurements for objects that are moving in a straight line to relate distance, time, and average speed with words, graphs, and calculations.	SC09-GR.8-S.1-GLE.1-EO.b	Use mathematical expressions to describe the movement of an object.	
b. Identify the forces acting on a moving object and explain the effects of changes in the direction and magnitude of forces on the motion of the object.	SC09-GR.8-S.1-GLE.1-EO.a	Predict and evaluate the movement of an object by examining the forces applied to it	
	SC09-GR.8-S.1-GLE.1-EO.b	Use mathematical expressions to describe the movement of an object.	
	SC09-GR.8-S.1-GLE.1-EO.c	Develop and design a scientific investigation to collect and analyze speed and acceleration data to determine the net forces acting on a moving object.	
	SC09-GR.8-S.1-GLE.2-EO.a	Gather, analyze, and interpret data to describe the different forms of energy and energy transfer.	
c. Compare the relative amount of potential energy (stored energy) and kinetic energy (energy of motion) of a moving object at different points along its path (for example, a moving roller coaster has the most potential energy at the top of a hill and the most kinetic energy at the bottom of the hill).	SC09-GR.8-S.1-GLE.2-EO.a	Gather, analyze, and interpret data to describe the different forms of energy and energy transfer.	
	SC09-GR.8-S.1-GLE.2-EO.b	Develop a research-based analysis of different forms of energy and energy transfer.	
	SC09-GR.8-S.1-GLE.2-EO.c	Use research-based models to describe energy transfer mechanisms, and predict amounts of energy transferred.	



<b>Standard 2</b>	Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 8</b>	There are different forms of energy and those forms of energy can be transferred and stored (for example: kinetic, potential) but total energy is conserved		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Recognize that energy is the ability to make objects move, and identify that mechanical, sound, thermal, solar, electromagnetic, chemical, and nuclear are some of the forms of energy.	SC09-GR.8-S.1-GLE.2	There are different forms of energy, and those forms of energy can be changed from one form to another – but total energy is conserved.	
b. Explain that energy can be transferred (moved) from one object to another and transformed (changed) from one form to another.	SC09-GR.8-S.1-GLE.2-EO.b	Develop a research-based analysis of different forms of energy and energy transfer.	
	SC09-GR.8-S.1-GLE.2-EO.a	Gather, analyze, and interpret data to describe the different forms of energy and energy transfer.	
c. Identify the energy transformations that occur in a specific system.	SC09-GR.8-S.1-GLE.2-EO.c	Use research-based models to describe energy transfer mechanisms, and predict amounts of energy transferred.	
	SC09-GR.8-S.1-GLE.2-EO.a	Gather, analyze, and interpret data to describe the different forms of energy and energy transfer.	
d. Apply the law of conservation of energy to describe what happens when energy is transferred and/or transformed.	SC09-GR.8-S.1-GLE.2-N.3	Use tools to gather, view, analyze, and report results for scientific investigations designed to answer questions about energy transformations.	The term “law of conservation” is not explicit in the CAS before high school, but the concept is fundamental to 8 <sup>th</sup> grade science.





<b>Standard 2</b>	Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 9</b>	<del>Electric circuits provide a means of transferring electrical energy when heat, light, sound, magnetic effects and chemical changes are produced</del>		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe the flow of electrons through a circuit.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.
b. Identify series circuits and parallel circuits, and compare the two types of circuits.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 2</b>	Physical Science: Students know and understand common properties, forms, and changes in matter and energy. <i>(Focus: Physics and Chemistry)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 10</b>	<del>White light is made up of different colors that correspond to different wavelengths</del>		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe that white light is made of different colors of light (ROYGBIV).			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.
b. Compare the relative wavelengths of different colors of light (for example, red light has a longer wavelength than blue light).	SC09-GR.8-S.1-GLE.4-EO.a	Compare and contrast different types of waves.	



<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 1</b>			
Classification schemes can be used to understand the structure of organisms			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify physical characteristics used to classify vertebrates.	SC09-GR.4-S.2-GLE.1	All living things share similar characteristics, but they also have differences that can be described and classified.	
b. Classify organisms by their physical characteristics (e.g. using a key, accessing prior knowledge).	SC09-GR.4-S.2-GLE.1	All living things share similar characteristics, but they also have differences that can be described and classified.	

<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 2</b>			
Human body systems have specific functions and interactions (for example: circulatory and respiratory, muscular and skeletal)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify organs, organ systems and describe their functions.	SC09-GR.7-S.2-GLE.2.EO.b	Develop, communicate, and justify an evidence-based scientific explanation regarding the functions and interactions of the human body.	
	SC09-GR.7-S.2-GLE.2.EO.c	Gather, analyze, and interpret data and models on the functions and interactions of the human body.	
b. Explain the interaction of body systems.	SC09-GR.7-S.2-GLE.2.EO.b	Develop, communicate, and justify an evidence-based scientific explanation regarding the functions and interactions of the human body.	

<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 3</b>			
There is a differentiation among levels of organization (cells, tissues, and organs) and their roles within the whole organism			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify levels of organization within an organism.	SC09-GR.7-S.2-GLE.2	The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions.	
	SC09-GR.7-S.2-GLE.2.EO.c	Gather, analyze, and interpret data and models on the functions and interactions of the human body.	



<b>Standard 3</b>	Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 4</b>	Multicellular organisms have a variety of ways to get food and other matter to their cells (for example: digestion, transport of nutrients by circulatory system)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe the various processes that food undergoes to be absorbed by an organism's cells.	SC09-GR.7-S.2- GLE.2.EO.c	Gather, analyze, and interpret data and models on the functions and interactions of the human body.	
	SC09-GR.7-S.2-GLE.2.N.1	Critically evaluate models, and identify the strengths and weaknesses of the model in representing our understanding of the human body.	
b. <del>Identify and compare ways various organisms transport nutrients and wastes (open and closed circulatory systems, plant vascular systems, etc.).</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.
c. <del>Identify and compare ways various organisms exchange carbon dioxide and oxygen (stomata, lungs, skin, gills, etc.) with the environment.</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 3</b>	Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 5</b>	Photosynthesis and cellular respiration are basic processes of life (for example, set up a terrarium or aquarium and make changes such as blocking out light)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe the processes of photosynthesis and cellular respiration.	SC09-GR.7-S.2- GLE.4.EO.a	Gather, analyze, and interpret data regarding the basic functions of photosynthesis and cellular respiration.	



<b>Standard 3</b>		Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 5</b>		Photosynthesis and cellular respiration are basic processes of life (for example, set up a terrarium or aquarium and make changes such as blocking out light)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
b. Describe the relationship between photosynthesis and cellular respiration within plants and between plants and animals (for example, animals can only do cellular respiration, plants do both).	SC09-GR.7-S.2- GLE.4.EO.b	Use direct and indirect evidence to describe the relationship between photosynthesis and cellular respiration within plants – and between plants and animals.	

<b>Standard 3</b>		Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 6</b>		Different types of cells have basic structures, components and functions (for example: cell membrane, nucleus, cytoplasm, chloroplast, single-celled organisms in pond water, Elodea, onion cell, human cheek cell)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify cellular organelles and their functions.	SC09-GR.7-S.2- GLE.3.EO.a	Gather, analyze, and interpret data and models on the different types of cells, their structures, components and functions.	
	SC09-GR.7-S.2-GLE.3- EO.b	Develop, communicate, and justify an evidence-based scientific explanation regarding cell structures, components, and their specific functions.	
b. Differentiate between animal and plant cells and single celled organisms.	SC09-GR.7-S.2-GLE.3- EO.c	Compare and contrast the basic structures and functions of plant cells, animal cells, and single-celled organisms.	
	SC09-GR.7-S.2-GLE.3- EO.a	Gather, analyze, and interpret data and models on the different types of cells, their structures, components and functions.	



<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 7</b>			
There are noncommunicable conditions and communicable diseases (for example: heart disease and chicken pox)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Classify conditions as communicable or noncommunicable and recognize the cause of communicable diseases.	CH09-GR.5-S.2-GLE.5-EO.a	Differentiate between communicable and non-communicable diseases, including asthma, AIDS, epilepsy.	This assessment objective is located in the Comprehensive Health standards in 5 <sup>th</sup> grade.  This assessment objective will continue to be assessed in the 8 <sup>th</sup> grade Science TCAP.

<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 8</b>			
There is a flow of energy and matter in an ecosystem (for example: as modeled in a food chain, web, pyramid, decomposition)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Examine and analyze the flow of energy and matter in a dynamic ecosystem (e.g. sun to producer to consumer, roles and importance of different organisms).	SC09-GR.6-S.2-GLE.2	Organisms interact with each other and their environment in various ways that create a flow of energy and cycling of matter in an ecosystem.	Concepts of energy flow in an ecosystem are implicit throughout this GLE.
	SC09-GR.6-S.2-GLE.1-EO.c	Model equilibrium in an ecosystem, including basic inputs and outputs, to predict how a change to that ecosystem such as climate change might impact the organisms, populations, and species within it such as the removal of a top predator or introduction of a new species.	
b. Infer the number of organisms or amount of energy available at each level of an energy pyramid.	SC09-GR.6-S.2-GLE.2-EO.a	Develop, communicate, and justify an evidence-based explanation about why there generally are more producers than consumers in an ecosystem.	



<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 9</b>			
<del>Asexual and sexual cell reproduction/division can be differentiated</del>			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Differentiate between mitosis and meiosis.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.
b. Relate the number of chromosomes to the final product of mitosis or meiosis.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 10</b>			
Chromosomes and genes play a role in heredity (for example, genes control traits, while chromosomes are made up of many genes)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe the relationship between chromosomes, genes and traits and their role in heredity.	SC09-GR.8-S.2-GLE.2-EO.a	Develop, communicate, and justify an evidence-based scientific explanation for how genetic information is passed to the next generation.	
	SC09-GR.8-S.2-GLE.2-EO.b	Use direct and indirect observations, evidence, and data to support claims about genetic reproduction and traits of individuals	
b. Infer the traits of the offspring based on the genes of the parents (including dominant, recessive traits and use of punnet square diagrams).	SC09-GR.8-S.2-GLE.2-EO.d	Use models and diagrams to predict the phenotype and genotype of offspring based on the genotype of the parents.	
	SC09-GR.8-S.2-GLE.2-EO.e	Use computer simulations to model and predict phenotype and genotype of offspring based on the genotype of the parents.	



<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 11</b>			
Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe several environmental factors that could limit the size of an organism's population.	SC09-GR.6-S.2-GLE.1	Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species.	Concepts of environmental limitations on organisms are implicit throughout this GLE.
	SC09-GR.7-S.2-GLE.1-EO.b	Analyze and interpret data about specific adaptations to provide evidence and develop claims about differential survival and reproductive success.	
b. Describe the impact of humans on the environment and how that affects the survival of populations and entire species.	SC09-GR.8-S.2-GLE.1	Human activities can deliberately or inadvertently alter ecosystems and their resiliency.	Concepts of human environmental impact are implicit throughout this GLE.
c. Describe how organisms change in response to environmental factors.	SC09-GR.6-S.2-GLE.1	Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species.	Concepts of adaptation are implicit throughout this GLE.
	SC09-GR.7-S.2-GLE.1-EO.b	Analyze and interpret data about specific adaptations to provide evidence and develop claims about differential survival and reproductive success.	
	SC09-GR.6-S.2-GLE.2-EO.c	Compare and contrast the flow of energy with the cycling of matter in ecosystems.	

<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 12</b>			
Changes or constancy in groups of organisms over geologic time can be revealed through evidence			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Compare and contrast evidence of past life from different epochs to existing organisms.	SC09-GR.7-S.2-GLE.5	Multiple lines of evidence show the evolution of organisms over geologic time.	Concepts of organism comparison are implicit throughout this GLE.
	SC09-GR.7-S.2-GLE.5-EO.a	Interpret and analyze data from the fossil record to support a claim that organisms and environments have evolved over time.	





<b>Standard 3</b>			
Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. <i>(Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 13</b>			
Individual organisms with certain traits are more likely than others to survive and have offspring			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Evaluate the potential of an organism with specific traits to survive and reproduce in an environment.	SC09-GR.7-S.2-GLE.1-EO.a	Develop, communicate, and justify an evidence-based explanation for why a given organism with specific traits will or will not survive to have offspring in a given environment.	
	SC09-GR.8-S.2-GLE.2-EO.a	Develop, communicate, and justify an evidence-based scientific explanation for how genetic information is passed to the next generation	

<b>Standard 4</b>			
Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 1</b>			
Inter-relationships exist between minerals, rocks and soils			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Understand the three types of rocks (igneous, sedimentary, metamorphic) and the processes that formed them through the rock cycle.	SC09-GR.7-S.3-GLE.2	Geologic time, history, and changing life forms are indicated by fossils and successive sedimentation, folding, faulting, and uplifting of layers of sedimentary rock.	Understanding the three different types of rock and their formation processes is not explicit in the CAS, but is implied in the "rock cycle" in third grade (SC09-G.3-S.3-GLE.1)
b. Understand the composition and relationships of rocks, minerals, and soil formation.	SC09-GR.3-S.3-GLE.1-EO.a	Investigate and identify two or more ways that Earth's materials can be broken down and/or combined in different ways such as minerals into rocks, rock cycle, formation of soil, and sand.	





<b>Standard 4</b>			
Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 2</b>			
Humans use renewable and nonrenewable resources (for example: forests and fossil fuels)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Understand the differences between renewable and nonrenewable energy resources.	SC09-GR.6-S.3-GLE.3-EO.b	Identify and evaluate types and availability of renewable and nonrenewable resources.	
b. Predict the advantages and disadvantages of using both types of energy resources (renewable and non-renewable) and their sustainability.	SC09-GR.6-S.3-GLE.3-EO.a	Research and evaluate data and information to learn about the types and availability of various natural resources, and use this knowledge to make evidence-based decisions.	
	SC09-GR.6-S.3-GLE.3-EO.b	Gather, analyze and communicate evidence from text and other sources that explains the formation of Earth's surface features.	
	SC09-GR.6-S.3-GLE.3-EO.d	Research and critically evaluate data and information about the advantages and disadvantages of using fossil fuels and alternative energy sources.	

<b>Standard 4</b>			
Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 3</b>			
Natural processes shape Earth's surface (for example: landslides, weathering, erosion, mountain building, volcanic activity)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Explain why Earth's surface is always building up in some places and wearing and down in others (types of erosion, types of deposition).	SC09-GR.6-S.3-GLE.1-EO.a	Gather, analyze, and communicate an evidence-based explanation for the complex interaction between Earth's constructive and destructive forces.	



<b>Standard 4</b>	Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 4</b>	Major geological events such as earthquakes, volcanic eruptions, and mountain building are associated with plate boundaries and attributed to plate motion		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Understand plate boundaries, their movements, and the resulting geologic events.	SC09-GR.7-S.3-GLE.1	Major geologic events such as earthquakes, volcanic eruptions, mid-ocean ridges, and mountain formation are associated with plate boundaries and attributed to plate motions.	An understanding of plate boundaries and motion are implied throughout this GLE.

<b>Standard 4</b>	Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 5</b>	Fossils are formed and used as evidence to indicate that life has changed through time		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe methods of fossil formation.	SC09-GR.4-S.2-GLE.2	Comparing fossils to each other or to living organisms reveals features of prehistoric environments and provides information about organisms today.	Understanding the process of fossil formation is implied throughout this GLE.

<b>Standard 4</b>	Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 6</b>	Successive layers of sedimentary rock and the fossils contained within them can be used to confirm age, geologic time, history, and changing life forms of the Earth; this evidence is affected by the folding, breaking and uplifting of layers		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Interpret rock layers, including position (concept of superpositioning), composition and fossil content to determine past conditions.	SC09-GR.7-S.3-GLE.2-N.2	Describe how scientists study fossils, and suggest ways that understanding fossil evidence contributed to our knowledge about life on Earth over geologic time.	
b. Predict the change in rock layer sequence due to folding, breaking and uplifting.	SC09-GR.7-S.3-GLE.2-EO.d	Use direct and indirect evidence to determine the sequence of events in geologic time.	



<b>Standard 4</b>	Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 7</b>	The atmosphere has basic composition, properties, and structure (for example: the range and distribution of temperature and pressure in the troposphere and stratosphere)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify all of the layers of the atmosphere, their order and the properties and individual characteristics that define them.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 4</b>	Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 8</b>	Atmospheric circulation is driven by solar heating (for example: the transfer of energy by radiation, convection, conduction)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Explain that the Sun heats Earth via radiation that in turn heats the atmosphere via conduction and convection.	SC09-GR.8-S.3-GLE.1	Weather is a result of complex interactions of Earth's atmosphere, land and water that are driven by energy from the sun, and can be predicted and described through complex models.	Concepts of solar heating and atmospheric circulation are implicit throughout this GLE.

<b>Standard 4</b>	Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:		
<b>Benchmark 9</b>	There are quantitative changes in weather conditions over time and space (for example: humidity, temperature, air pressure, cloud cover, wind, precipitation)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Interpret weather data and the changes that occur over time (graph, charts, weather maps).	SC09-GR.8-S.3-GLE.1-EO.b	Observe and gather data for various weather conditions and compare to historical data for that date and location.	



<b>Standard 4</b>		Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 10</b>		<del>There are large-scale and local weather systems (for example: fronts, air masses, storms)</del>	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Use several pieces of evidence (cloud observations, weather maps) to identify causes of changes in weather and weather patterns (weather moves west to east).	SC09-GR.8-S.3-GLE.1-EO.c	Use models to develop and communicate a weather prediction.	
b. <del>Identify the inter-relationship between large-scale weather systems and local weather.</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.
c. Explain how Earth's surface features (such as mountains, oceans) affect local weather.	SC09-GR.5-S.3-GLE.3	Weather conditions change because of the uneven heating of Earth's surface by the Sun's energy. Weather changes are measured by differences in temperature, air pressure, wind and water in the atmosphere and type of precipitation.	
	SC09-GR.8-S.3-GLE.2-EO.b	Research and evaluate direct and indirect evidence to explain how climates vary from one location to another on Earth.	

<b>Standard 4</b>		Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 11</b>		<del>The world's water is distributed and circulated through oceans, glaciers, rivers, groundwater, and atmosphere</del>	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. <del>Explain the processes and relationships that connect elements (all water sources) of the water cycle.</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.



<b>Standard 4</b>		Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 12</b>		The ocean has a certain composition and physical characteristics (for example: currents, waves, features of the ocean floor, salinity, and tides)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Understand the composition and physical characteristics of oceans (for example: temperature, salinity, wavelength, ocean floor, etc).			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 4</b>		Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:	
<b>Benchmark 13</b>		There are characteristics (components, composition, size) and scientific theories of origin of the Solar System	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe the parts (planets, Sun, moons, asteroids, comets) of the Solar System and their motions.	SC09-GR.8-S.3-GLE.3-EO.a	Construct a scale model of the solar system, and use it to explain the motion of objects in the system such as planets, Sun, Moons, asteroids, comets, and dwarf planets.	
b. Compare and contrast the characteristics of the Sun, Moon and Earth.	SC09-GR.8-S.3-GLE.3	The solar system is comprised of various objects that orbit the Sun and are classified based on their characteristics.	
c. Examine and explain the scientific theories on the formation of our Solar System, Earth, and Moon.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.



<b>Standard 4</b>			
Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 14</b>			
Relative motion, axes tilt and positions of the Sun, Earth, and Moon have observable effects (for example: seasons, eclipses, moon phases)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Understand how the location of the Moon affects the phases of the Moon, eclipses, and the tides.	SC09-GR.8-S.3-GLE.4.EO.a	Develop, communicate, and justify an evidence-based explanation using relative positions of Earth, Moon, and Sun to explain the following natural phenomenon: 1. Tides 2. Eclipses of the Sun and Moon 3. Different shapes of the Moon as viewed from Earth	
	SC09-GR.8-S.3-GLE.4.EO.c	Use models to explain the relative motions of Earth, Moon, and Sun over time	
b. Understand how the tilt and motions of Earth results in days, years and seasons	SC09-GR.8-S.3-GLE.4-EO.b	Analyze and interpret data to explain why we have seasons.	

<b>Standard 4</b>			
Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 15</b>			
The universe consists of many billions of galaxies (each containing many billions of stars) and that vast distances separate these galaxies and stars from one another and from Earth			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Describe the components of the universe in terms of galaxies, stars, and solar system	SC09-GR.8-S.3-GLE.3-EO.a	Construct a scale model of the solar system, and use it to explain the motion of objects in the system such as planets, Sun, Moons, asteroids, comets, and dwarf planets.	While CAS is concerned only with the solar system, TCAP may still assess concepts about galaxies, stars and the universe.



<b>Standard 4</b>			
Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. <i>(Focus: Geology, Meteorology, Astronomy, Oceanography)</i> Students know and can demonstrate understanding that:			
<b>Benchmark 16</b>			
Technology is needed to explore space (for example: telescopes, spectroscopes, spacecraft, life support systems)			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Understand the technologies needed to explore space and evaluate their effectiveness and challenges.			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.

<b>Standard 5</b>			
Students understand that the nature of science involves a particular way of building knowledge and making meaning of the natural world. Students know and can demonstrate understanding that:			
<b>Benchmark 1</b>			
A controlled experiment must have comparable results when repeated			
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify a controlled factor in a scientific investigation.	SC09-GR.7-S.2-GLE.4-N.2	Design an experiment to observe photosynthesis or respiration, and clearly define controls and variables.	
b. Explain that by repeating a controlled experiment, it should lead to comparable results.	SC09-GR.8-S.1-GLE.3-N.1	Evaluate the reproducibility of an experiment, and critically examine conflicts in experimental results.	
	SC09-GR.7-S.2-GLE.4.N.1	Ask a testable question and make a falsifiable hypothesis about photosynthesis or respiration and design an inquiry based method to find an answer.	
	SC09-GR.7-S.1-GLE.1.N.1	Ask testable questions and make a falsifiable hypothesis about using properties in perform separations, and design a method to find an answer.	
	SC09-GR.6-S.1-GLE.4.N.2	Ask testable questions and make a falsifiable hypothesis about density and design an inquiry based method to find an answer.	
c. Identify and/or explain that evidence collected through repeated experiments cannot be accurately compared to previous experimental results, if conditions were not kept the same.	SC09-GR.8-S.1-GLE.3-N.1	Evaluate the reproducibility of an experiment, and critically examine conflicts in experimental results.	
	SC09-GR.8-S.1-GLE.1-EO.c	Develop and design a scientific investigation to collect and analyze speed and acceleration data to determine the net forces acting on a moving object.	
	SC09-GR.8-S.1-GLE.3.N.1	Evaluate the reproducibility of an experiment, and critically examine conflicts in experimental results.	





<b>Standard 5</b>	Students understand that the nature of science involves a particular way of building knowledge and making meaning of the natural world. Students know and can demonstrate understanding that:		
<b>Benchmark 2</b>	Scientific knowledge changes as new knowledge is acquired and previous ideas are modified (for example: through space exploration)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Identify and/or describe the reasons why scientific knowledge changes over time.	SC09-GR.8-S.2-GLE.2-N.2	Recognize that current understanding of genetics has developed over time and become more sophisticated as new technologies have lead to new evidence.	
	SC09-GR.6-S.1-GLE.2-N.2	Investigate how our current understanding of matter has developed through centuries of scientific investigations.	
	SC09-GR.8-S.1-GLE.1-N.1	Recognize that our current understanding of forces has developed over centuries of studies by many scientists, and that we will continue to refine our understanding of forces through continued scientific investigations and advances in data collection.	

<b>Standard 5</b>	Students understand that the nature of science involves a particular way of building knowledge and making meaning of the natural world. Students know and can demonstrate understanding that:		
<b>Benchmark 3</b>	<del>Contributions to the advancement of science have been made by people in different cultures and at different times in history</del>		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
<del>a. Recognize the concept of multicultural contributions to the advancement of science over time.</del>			Not explicitly in the CAS at 8 <sup>th</sup> grade or below.





<b>Standard 5</b>		Students understand that the nature of science involves a particular way of building knowledge and making meaning of the natural world. Students know and can demonstrate understanding that:	
<b>Benchmark 4</b>		Models can be used to predict change (for example: computer simulation, video sequence, stream table)	
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Recognize and/or describe that models can be used to obtain information about scientific processes and/or objects that may be difficult to study.	SC09-GR.8-S.1-GLE.4-N.1	Evaluate models used to explain and predict wave phenomena that cannot be directly measured.	
	SC09-GR.4-S.1-GLE.1-N.2	Understand that models are developed to explain and predict phenomena that cannot be directly observed.	
b. Describe a model that would be appropriate to understand a scientific process and content.	Expectations for students to understand the process of science is embedded throughout the Colorado Academic Standards and is not a standalone expectation. Examples of sentence stems from the Colorado Academic Standards that would relate to this framework objective are provided.	Use research-based models...  Understand that models are developed to explain and predict phenomena that cannot be directly observed.  Evaluate models...	
	SC09-GR.6-S.3-GLE.2.N.2	Create and evaluate models; identifying the strengths and weaknesses of the model in representing water circulation and distribution.	



<b>Standard 5</b>	Students understand that the nature of science involves a particular way of building knowledge and making meaning of the natural world. Students know and can demonstrate understanding that:		
<b>Benchmark 4</b>	Models can be used to predict change (for example: computer simulation, video sequence, stream table)		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
<p>c. Explain that models are used to understand processes and predict change in many situations:</p> <ul style="list-style-type: none"> <li>• where it may take several years to collect the data firsthand (e.g., sea floor spreading, etc.)</li> <li>• where the event has already occurred and evidence has been lost or is limited (e.g., asteroid impact, fossil record, etc.)</li> <li>• <del>when a process is dangerous to study (e.g., volcanoes, earthquakes, tornados, etc.)</del></li> <li>• when a process is very slow (e.g., erosion, continental drift, rock cycle, climate change, etc.)</li> <li>• <del>when the scale of size is difficult to replicate and makes observations difficult (e.g., atoms, cells, solar system, etc.)</del></li> <li>• <del>to make an abstract more understandable (e.g., Newton's Laws and amusement park physics, etc.)</del></li> </ul>	SC09-GR.4-S.3-GLE.1-N.1	Understand that models are developed to explain and predict natural phenomena that cannot be directly observed because they happen over long periods of time.	Some aspects of this assessment objective are not explicit referenced in the CAS; however, there are many content/context-specific examples in the nature of science throughout the standards that refer to using models to explain a variety of topics.



<b>Standard 5</b>	Students understand that the nature of science involves a particular way of building knowledge and making meaning of the natural world. Students know and can demonstrate understanding that:		
<b>Benchmark 5</b>	There are interrelationships among science, technology and human activity that affect the world		
<b>Assessment Objective</b>	<b>CAS Alignment Code</b>	<b>CAS Expectation Text</b>	<b>Comment</b>
a. Explain that human activity, including current scientific studies and technological advancements, can have both positive and negative effects on the natural world.	SC09-GR.8-S.2-GLE.1	Human activities can deliberately or inadvertently alter ecosystems and their resiliency.	<p>Concepts of positive and negative human impact on the natural world are implicit throughout this GLE.</p> <p>Assessment items relating to positive and negative effects of human health technology have been aligned to this objective but are now part of health and PE in the CAS</p>

**Note: Some assessment objectives or parts of assessment objectives are not contained within the Colorado Academic Standards at or below this grade level but will continue to be assessed with the TCAP in 8<sup>th</sup> grade. The concepts from these objectives are reflected in the table below.**

<b>Grade 8 Science</b>	<b>Relevant Assessment Objective(s)</b>
Communicable and non-communicable diseases.	3.7a
Components of the universe	4.15a