Vermont Comprehensive Assessment Program (VTCAP)

VERMONT
AGENCY OF EDUCATION

Practice Test Alignment Document
Science │ Grade 8

Sequence Number	Standard	Learning Target
Session 1		
1	**SEP**: Analyzing and Interpreting Data, **DCI**: ESS1.B: Earth and the Solar System, **CCC**: Scale, Proportion, and Quantity, **PE: MS-ESS1-3**: Analyze and interpret data to determine scale properties of objects in the solar system.	Describe evidence that Earth and Venus are similar enough to be called sister planets and describe a reason differences between Earth and Venus have only been discovered since the 1960s.
2	**SEP**: Using Mathematical and Computational Thinking, **DCI**: PS4.A: Wave Properties, **CCC**: Patterns, **PE: MS-PS4-1**: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	Describe and compare sounds waves in a diagram and predict how doubling the frequency of a wave affects energy.
3	**SEP**: Constructing Explanations and Designing Solutions, **DCI**: LS4.B: Natural Selection, **CCC**: Cause and Effect, **PE: MS-LS4-4**: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	Describe the effects of a mutation on a population over time as genetic variations that improve survival become more common in a population as more individuals with that variation survive and reproduce.
4*	**SEP**: Developing and Using Models, **DCI**: ESS2.D: Weather and Climate, **CCC**: Systems and System Models, **PE: MS-ESS2-6**: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	Use a model to explain a reason for the difference in temperature between two locations, describe ocean currents that could be added to the model, and use the model to describe how energy from the Sun causes ocean currents.
5	**SEP**: Developing and Using Models, **DCI**: PS1.B: Chemical Reactions, **CCC**: Energy and Matter, **PE: MS-PS1-5**: Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	Describe the model that shows atoms and molecules in a chemical reaction.
6	**SEP**: Developing and Using Models, **DCI**: PS1.B: Chemical Reactions, **CCC**: Energy and Matter, **PE: MS-PS1-5**: Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	Explain how a model shows that matter is conserved in chemical reactions and explain that substances have different properties because the chemical reaction produces new combinations of atoms.

*This is a hand-scored question. The rubric can be found at the end of this document for reference.
Science and Engineering Practices (**SEP**), Disciplinary Core Ideas (**DCI**), Cross-Cutting Concepts (**CCC**)

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Sequence Number	Standard	Learning Target
7	**SEP**: Developing and Using Models, **DCI**: PS1.A: Structure and Properties of Matter, **CCC**: Scale, Proportion, and Quantity, **PE: MS-PS1-1**: Develop models to describe the atomic composition of simple molecules and extended structures.	Visualize the arrangements of atoms too small to be seen as a model to explain why substances have different properties.
8	**SEP**: Developing and Using Models, **DCI**: PS1.A: Structure and Properties of Matter, **PE: MS-PS1-1**: Develop models to describe the atomic composition of simple molecules and extended structures.	Identify the model that shows an element's matter is composed of repeating units of one type of atom.
9	**SEP**: Constructing Explanations and Designing Solutions, **DCI**: LS1.C: Organization for Matter and Energy Flow in Organisms, **CCC**: Energy and Matter, **PE: MS-LS1-6**: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Explain how an organism depends on photosynthesis to survive and provide evidence that supports the explanation.
10	**SEP**: Constructing Explanations and Designing Solutions, **DCI**: LS1.C: Organization for Matter and Energy Flow in Organisms, **CCC**: Energy and Matter, **PE: MS-LS1-6**: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Use a diagram to describe how an organism can disrupt a food web.
11	**SEP**: Analyzing and Interpreting Data, **DCI**: LS2.A: Interdependent Relationships in Ecosystems, **CCC**: Cause and Effect, **PE: MS-LS2-1**: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Complete a model to show the environmental factors that could cause a trend shown in a graph and explain the relationship between environmental factors and the data.
12	**SEP**: Analyzing and Interpreting Data, **DCI**: LS2.A: Interdependent Relationships in Ecosystems, **CCC**: Cause and Effect, **PE: MS-LS2-1**: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Make a prediction supported by a food web and diagram about how a population may be affected if a change were made to the ecosystem.
Session 2		
1	**SEP**: Analyzing and Interpreting Data, **DCI**: LS4.A: Evidence of Common Ancestry and Diversity, **CCC**: Patterns, **PE: MS-LS4-3**: Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	Use a table to observe similarities and differences in organisms' patterns of growth at different stages of development and explain that the organisms have a common ancestor as the embryos are similar at early stages of development.

Sequence Number	Standard	Learning Target
2	**SEP**: Constructing Explanations and Designing Solutions, **DCI**: ESS3.C: Human Impacts on Earth Systems, **CCC**: Cause and Effect, **PE: MS-ESS3-3**: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Use a data table and a graph to describe a change that would cause a positive impact on an area and determine a solution that could help reduce an impact without hurting people.
3*	**SEP**: Engaging in Argument from Evidence, **DCI**: LS1.B: Growth and Development of Organisms, **CCC**: Cause and Effect, **PE: MS-LS1-4**: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Construct an argument about how the behavior of organisms affects reproduction in the population and support a claim with evidence explaining how a specialized structure affects the reproduction of the plant species.
4	**SEP**: Planning and Carrying Out Investigations, **DCI**: ESS2.D: Weather and Climate, **CCC**: Cause and Effect, **PE: MS-ESS2-5**: Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	Predict the expected weather before a change in seasons using the provided data.
5	**DCI**: ESS2.C: The Roles of Water in Earth's Surface Processes, **CCC**: Cause and Effect, **PE: MS-ESS2-5**: Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	Describe that rising air cools as it is forced upward with topography, reaches the dew point, and then water precipitates out of the air.
6	**DCI**: ESS2.D: Weather and Climate, **CCC**: Systems and System Models, **PE: MS-ESS2-6**: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	Support a claim about how the geography of land influences climate and describe a factor they may cause differences in climate for two locations at the same latitude.
7	**SEP**: Planning and Carrying Out Investigations, **DCI**: ESS2.C: The Roles of Water in Earth's Surface Processes, **CCC**: Cause and Effect, **PE: MS-ESS2-5**: Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	Describe how data in the graph supports a claim about the weather for an area.
8	**SEP**: Planning and Carrying Out Investigations, **DCI**: PS2.A: Forces and Motion, **PE: MS-PS2-2**: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	Complete a table to show the independent and dependent variables in an investigation, identify which variables should be controlled, and describe how to collect data to answer an investigation question.

Sequence Number	Standard	Learning Target
9	**SEP**: Planning and Carrying Out Investigations, **DCI**: PS2.A: Forces and Motion, **CCC**: Stability and Change, **PE: MS-PS2-2**: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	Complete a claim supported by data collected during an investigation about how changing the force of friction on a track changes the time needed for the car to reach a certain point and how the car's speed changes.
10	**SEP**: Engaging in Argument from Evidence, **DCI**: PS3.B: Conservation of Energy and Energy Transfer, **CCC**: Energy and Matter, **PE: MS-PS3-5**: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	Identify locations on a diagram that show where energy is changing and where energy is being transferred and support the response with evidence.
11	**SEP**: Engaging in Argument from Evidence, **DCI**: PS3.B: Conservation of Energy and Energy Transfer, **CCC**: Energy and Matter, **PE: MS-PS3-5**: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	Identify an energy conversion that explains an observation.
Session 3		
1	**SEP**: Constructing Explanations and Designing Solutions, **DCI**: PS2.A: Forces and Motion, **CCC**: Systems and System Models, **PE: MS-PS2-1**: Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	Describe how a belt helps keep a block from falling out of a car during a collision, and the force pair that occurs during the collision with a wall.
2	**SEP**: Developing and Using Models, **DCI**: LS3.B: Variation of Traits, **CCC**: Cause and Effect, **PE: MS-LS3-2**: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	Complete a model to show possible alleles of offspring and describe the probability of offspring with certain characteristics.
3	**SEP**: Obtaining, Evaluating, and Communicating Information, **DCI**: PS4.C: Information Technologies and Instrumentation, **PE: MS-PS4-3**: Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	Support a claim using data from a table that analog signals are more distorted than digital signals, and that digital signals can be converted back to sound with all of the original characteristics.
4*	**SEP**: Developing and Using Models, **DCI**: PS1.A: Structure and Properties of Matter, PS3.A: Definitions of Energy, **CCC**: Cause and Effect, **PE: MS-PS1-4**: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	Draw a model to show the arrangement and spacing of particles and describe the temperature in three locations, describe how the motion of the particles changes from one environment to another, and use the models to explain an observation.

*This is a hand-scored question. The rubric can be found at the end of this document for reference.
Science and Engineering Practices (**SEP**), Disciplinary Core Ideas (**DCI**), Cross-Cutting Concepts (**CCC**)

Sequence Number	Standard	Learning Target
5	**SEP**: Developing and Using Models, **DCI**: LS2.B: Cycle of Matter and Energy Transfer in Ecosystems, **PE: MS-LS2-3**: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	Complete a model to show the movement of matter in an ecosystem and describe that as matter moves through the ecosystem, the amount of matter stays the same.
6	**DCI**: LS2.B: Cycle of Matter and Energy Transfer in Ecosystems, **CCC**: Energy and Matter, **PE: MS-LS2-3**: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	Support a claim with evidence that matter and energy move between living and nonliving parts of an ecosystem.
7	**DCI**: LS1.C: Organization for Matter and Energy Flow in Organisms, PS3.D: Energy in Chemical Processes and Everyday Life, **CCC**: Energy and Matter, **PE: MS-LS1-6**: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Explain that during photosynthesis, trees use carbon dioxide and water that they take in to produce sugars that help them grow.
8	**SEP**: Constructing Explanations and Designing Solutions, **DCI**: LS1.C: Organization for Matter and Energy Flow in Organisms, PS3.D: Energy in Chemical Processes and Everyday Life, **CCC**: Energy and Matter, **PE: MS-LS1-6**: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Describe how animals depend on plants for energy, as plants get their energy directly from sunlight and animals get their energy directly from food.
9	**DCI**: ESS2.C: The Roles of Water in Earth's Surface Processes, **CCC**: Cause and Effect, **PE: MS-ESS2-5**: Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	Describe thunderstorm formation using a diagram as warm air moves over cold air, and some of the water vapor in the air cools and condenses and falls as rain.
10	**SEP**: Analyzing and Interpreting Data, **DCI**: ESS3.B: Natural Hazards, **CCC**: Patterns, **PE: MS-ESS3-2**: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	Use a diagram to select weather conditions that could be used to predict if a tornado might form.
11	**SEP**: Planning and Carrying Out Investigations, **DCI**: ESS2.C: The Roles of Water in Earth's Surface Processes, **PE: MS-ESS2-5**: Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	Describe that differences in pressure cause air masses to move.

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Science and Engineering Practices (**SEP**), Disciplinary Core Ideas (**DCI**), Cross-Cutting Concepts (**CCC**)

Sequence Number	Standard	Learning Target
12	**SEP**: Analyzing and Interpreting Data, **DCI**: ESS3.B: Natural Hazards, **PE: MS-ESS3-2**: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	Describe a possible impact of high-resolution radar technology on communities and use a map to identify the state that would benefit most from the technology.

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Science and Engineering Practices (**SEP**), Disciplinary Core Ideas (**DCI**), Cross-Cutting Concepts (**CCC**)

Scoring Rubrics

Session 1

Question 4
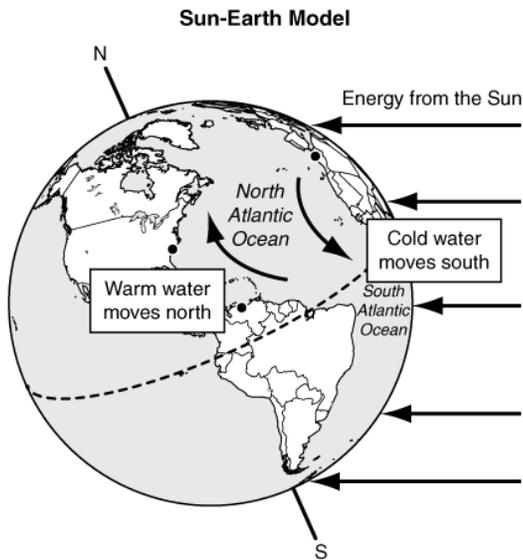
Scoring Rubric

Score	Description
4	The response demonstrates thorough use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response uses the model to explain one reason for the difference in temperature between Caracas and Myrtle Beach. The response also describes ocean currents that could be added to the model to provide another reason for the differences in temperature between the cities and includes the direction and temperature of the currents near Caracas, Myrtle Beach, and Casablanca. The response • clearly applies science and engineering practices to provide an explanation or solution; • provides a coherent and accurate explanation or solution based on disciplinary core ideas; • reflects thorough understanding of complex ideas and crosscutting concepts; and • effectively applies and demonstrates complete understanding of the three dimensions.
3	The response demonstrates sufficient use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack some detail or information, or the response may contain minor errors in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
2	The response demonstrates limited use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack multiple details or information, or the response may contain major error(s) in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
1	The response demonstrates minimal use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
0	The response is inaccurate, is irrelevant, or contains no evidence of use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
Blank	No response.

Sample Student Response:

a. The model shows that while the Sun's rays reach Caracas at an almost direct/perpendicular/90-degree angle, the rays reach Myrtle Beach at a more indirect/flatter/less than 90-degree angle. The farther a city is from the equator, the more the Sun's energy at a location is spread out across Earth's surface.

Scoring Rubrics

b. [Draw]

Sun-Earth Model

N

Energy from the Sun

North
Atlantic
Ocean

Cold water
moves south

Warm water
moves north

South
Atlantic
Ocean

S

[Describe]

In the North Atlantic Ocean, warm water flows north from the equator from Caracas to Myrtle Beach. Cold water moved south from Casablanca toward the equator.

c. The ocean plays a major role and has a great effect on weather and climate. Energy from the Sun is absorbed by the ocean, released slowly over time, and then globally redistributed through wind and ocean currents. As warm water flows north from the equator, cold water flows south. Thermal energy moves from areas of high temperatures to areas of low temperatures via conduction of heat from warmer objects (the warm water) to cooler objects (the cool land).

Scoring Rubrics

Session 2

Question 3

Scoring Rubric

Score	Description
4	The response demonstrates thorough use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response constructs an argument that the behavior of individual orchid bees affects reproduction in the orchid bee population, uses information that Henry learned to support the argument, and supports the scientist's claim that orchid plants have evolved to produce the specific scents that attract female orchid bees with evidence that explains how one characteristic of an orchid plant affects the reproduction of the orchid species. The response • clearly applies science and engineering practices to provide an explanation or solution; • provides a coherent and accurate explanation or solution based on disciplinary core ideas; • reflects thorough understanding of complex ideas and crosscutting concepts; and • effectively applies and demonstrates complete understanding of the three dimensions.
3	The response demonstrates sufficient use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack some detail or information, or the response may contain minor errors in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
2	The response demonstrates limited use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack multiple details or information, or the response may contain major error(s) in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
1	The response demonstrates minimal use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
0	The response is inaccurate, is irrelevant, or contains no evidence of use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
Blank	No response.

Sample Student Response:

a. The more attractive the scent collected by the male bee, the more likely it is that he will be chosen by a female. It is specifically important for them to find a good mate since female orchid bees usually mate just once in their lifetime.

b. Orchids have evolved to cater specifically to an orchid bee's preferences. The male bees are looking for oils to collect for an attractive scent. The plants make an oil to attract males who want to change their scent. As a male bee crawls into the flower of an orchid to search for and collect the perfume, the orchids get their pollen on the back of the male bee. The pollen is transported to the next flower of the same species that the bee visits. In this manner, the bee's pollination is more effective. Bees will look for other plants that make the same oil and more orchids that can reproduce with each other are pollinated with pollen from other orchids with the same scent.

Scoring Rubrics

Session 3

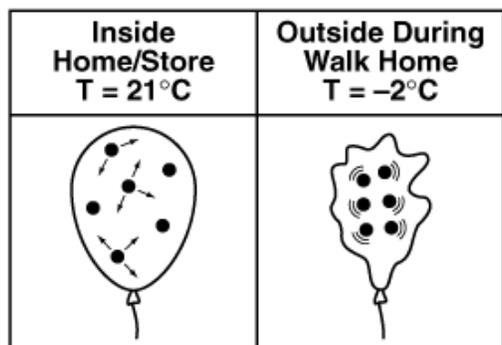**Question 4**

Scoring Rubric

Score	Description
4	The response demonstrates thorough use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response draws models to compare a helium-filled balloon in three locations: inside the store, outside during the walk home, and inside the home. Each model shows the arrangement, spacing, and motion of the helium atoms inside the balloon and the temperature of the helium-filled balloon. The response also describes what the models in part (a) show about the relationship between the temperature of the helium-filled balloon, the kinetic energy of the helium atoms, and the speed of the helium atoms, and uses the models to explain why the balloons are large inside the house and store but not outside during the walk home. The response • clearly applies science and engineering practices to provide an explanation or solution; • provides a coherent and accurate explanation or solution based on disciplinary core ideas; • reflects thorough understanding of complex ideas and crosscutting concepts; and • effectively applies and demonstrates complete understanding of the three dimensions.
3	The response demonstrates sufficient use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack some detail or information, or the response may contain minor errors in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
2	The response demonstrates limited use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack multiple details or information, or the response may contain major error(s) in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
1	The response demonstrates minimal use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
0	The response is inaccurate, is irrelevant, or contains no evidence of use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
Blank	No response.

Scoring Rubrics

Sample Student Response:

a. [Draw]

| Inside Home/Store T = 21°C | Outside During Walk Home T = −2°C |

b. The particles move less/more slowly because (thermal) energy leaves the balloon/the particles (atoms, helium) inside the balloon have less (kinetic) energy/ the temperature inside the balloon decreases.

c. In the colder balloon, the particles don't move as much and get closer together. The particles hit the balloon less hard and less often, so the balloon gets smaller.