Task Template

Grade 5 Overall Claim Students demonstrate a sophisticated understanding of the core ideas and applications of practices and crosscutting concepts in the disciplines of science.		
Explanatory Statements	Students integrate disciplinary core ideas and crosscutting concepts with scientific practices to investigate and explain how and why phenomena occur, and to design and refine solutions to problems.	Students connect knowledge across the disciplines of science to ask questions, plan and carry out investigations, and analyze and interpret data to support an argument about phenomena in a variety of contexts.
Measurement Target 1: Students are able to investigate and interpret data to draw or support conclusions about the structure and properties of matter, including whether or not matter is conserved, and to identify materials and mixtures based upon their properties or results of a reaction.		
Summary (Topic 1 Bundle): The bundle organizes performance expectations with a focus on helping students begin to understand the conservation of matter and its particulate nature. Instruction developed from this bundle should always maintain the three-dimensional nature of the standards and is not limited to the practices and concepts directly linked with any of the bundle performance expectations. • Develop a model to describe that matter is made of particles too small to be seen. • Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. • Make observations and measurements to identify materials based on their properties. • Conduct an investigation to determine whether the mixing of two or more substances results in new substances.		

Focal Knowledge, Skills, and Abilities (fKSAs)	**5.1a** Students are able to investigate the properties of matter using measurements to support a conclusion related to identifying materials.	**Rationale**	• Students will describe the evidence from data that properties of materials can be used to identify materials. • Students will use quantitative and qualitative data to identify materials based on their properties. • Students will measure and describe physical quantities such as weight, time, temperature, and volume.
Student Model	(*One overall summary variable of proficiency*) Not yet defined.		
Task Model	Given a brief real-world scenario describing an observable phenomenon, the student applies mathematical and computational thinking to measure a variety of properties to identify materials and uses the results for an explanation of the phenomenon. Example: Given a representation of baking soda mixed with vinegar, the student accurately constructs a conclusion, supported with data, that the baking soda reacts in a specific way with vinegar, unlike other materials.		

Work Product Summary	• Students identify a material based on provided properties and explain their answer using relevant scientific information. • Students identify a material using observations and/or measurements about its properties and explain their answer using relevant scientific information. • Students ask questions about what measurements can be used to identify materials. • Students use observations and measurements to provide the data necessary to address the purpose of the investigation. • Students collect and record data, according to the investigation plan.		
Task Model Variables	• How properties are presented • Which properties are used (e.g., color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility) • Which material(s) are given • How similar the materials are regarding the properties	**Notes on Task Features and Task Variables**	Tasks do not include density or distinguishing mass and weight. Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.
Example Phenomena	• Recording tape is magnetic. • Mixing baking soda and vinegar makes a lot of foam.		
Measurement Model	Univariate Rasch partial-credit psychometric model		
Evaluation Model	• Is the explanation logical? • Does the response demonstrate an understanding of how properties can be used to identify materials?		
Focal Knowledge, Skills and Abilities (fKSAs)	**5.1b** Students are able to investigate or create an explanation around conservation of matter using measurements when substances are mixed, or undergo a change in form, properties, or state.	**Rationale**	• Students will describe that the total weights of the substances did not change, regardless of the reaction or changes in properties that were observed. • Students will identify and describe the purpose of an investigation. • Students will use quantitative and qualitative data to describe physical quantities such as weight, time, temperature, and volume.
Student Model	(*One overall summary variable of proficiency*) Not yet defined.		
Task Model	Given a brief real-world scenario describing an observable phenomenon, the student applies mathematical and computational thinking to produce data that can serve as the basis for evidence for an explanation of a phenomenon (e.g., when matter changes, its weight does not change). Example: Given a representation of water molecules in solid form, the student accurately constructs a representation of water molecules in liquid form and explains why a frozen water bottle that weighs 500 mg will weigh the same amount when the water melts.		

Work Product Summary	• Students use measurements and data to serve as the basis of an explanation of what happens to the mass of the new substance when the substances are combined. • Students use measurements and data to serve as the basis of an explanation of what happens to the mass of a substance when it changes state. • Students use measurements and data to serve as the basis of an explanation of what happens to the mass of a substance when it changes form. • Students measure or graph the given quantities using standard units. • Students measure and/or calculate the difference between the total weight of the substances before and after they are mixed and/or reacted.		
Task Model Variables	• How materials are presented • The change in state under investigation • Which material(s) are given • Which measurement tool(s) are given	**Notes on Task Features and Task Variables**	Whether or not students conduct an investigation collaboratively to produce data to serve as the basis for evidence, fair tests are used in which variables are controlled and the number of trials considered.
Example Phenomena	• When matter changes, its weight does not change. • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish (e.g., dissolving sugar in water).		
Measurement Model	Univariate Rasch partial-credit psychometric model		
Evaluation Model	• How is evidence used to support an explanation? • Does it provide evidence that students can apply their knowledge and skills appropriately?		
Focal Knowledge, Skills, and Abilities (fKSAs)	**5.1c** Students are able to identify what properties differ and what stays the same in a mixture or reaction.	**Rationale**	• Students will use evidence, related to properties, to determine whether new substances are formed by mixing two or more substances. • Students will identify the change (cause) to a system (i.e., mixing of two or more substances) and quantify the result (effect). • Students will use quantitative and qualitative data to describe physical quantities such as weight, time, temperature, and volume.
Student Model	(*One overall summary variable of proficiency*) Not yet defined.		
Task Model	Given a brief real-world scenario describing an observable phenomenon, the student applies the property of conservation along with knowledge of the chemical properties of particular elements, to describe and predict the outcomes of reactions. Example: Given a representation of a candle going out after a jar is placed over it (i.e., running out of oxygen causes the reaction to stop) the student explains that the reaction of vinegar and baking soda produces a gas (i.e., carbon dioxide) that also makes the flame go out, thus has different properties than does oxygen.		

Work Product Summary	• Students use observations and measurements to produce data to serve as the basis for evidence for an explanation of the properties of the new substance when the initial substances are mixed or when the initial substances reacted. • Students collect and record data, including data about the substances before and after mixing. Students provide quantitative and/or qualitative observations to support their conclusion.		
Task Model Variables	• How materials are presented • Quantitative (e.g., weight) and qualitative properties (e.g., state of matter, color, texture, odor) of the substances to be mixed • The reaction which occurs • Which measurement tool(s) are given	**Notes on Task Features and Task Variables**	Examples of reactions or changes could include phase changes, dissolving, or mixing. Note: The Science and Engineering Practice states that students are to "Conduct an investigation collaboratively to produce data to serve as the basis for evidence."
Example Phenomena	• Baking soda and vinegar can burst a zip-lock bag. • Mixing baking soda and vinegar makes a lot of foam.		
Measurement Model	Univariate Rasch partial-credit psychometric model		
Evaluation Model	• How is evidence used to support an explanation? • Does it provide evidence that students can apply interpretations/explanations/conclusions from a set of experimental results?		
Focal Knowledge, Skills, and Abilities (fKSAs)	**5.1d** Students are able to create a model that describes matter as made of particles too small to be seen.	**Rationale**	• Students will develop and use models to demonstrate understanding that matter is made of particles too small to be seen. • Students use the model to make a prediction about a phenomenon (e.g., an expanding balloon, evaporating liquids, substances that dissolve in a solvent, effects of wind).
Student Model	(*One overall summary variable of proficiency*) Not yet defined.		
Task Model	Given a brief real-world scenario describing an observable phenomenon, the student applies scientific concepts appropriately to construct a model and uses the model to make an accurate prediction about the phenomenon. Example: Student draws an accurate model to describe that particles too small to be seen can explain the result of compressing air in a syringe.		
Work Product Summary	• Students explain an event or phenomena that shows the effect of the use of a substance that is too small to be seen. • Students use an event or phenomena to show the effect of the use of a substance that is too small to be seen. • Students develop a model to describe a phenomenon that includes the idea that matter is made of particles too small to be seen.		
Task Model Variables	• How phenomena are presented • Components for the phenomena (macroscopic observable matter; e.g., as sugar, air, water). • Which particles are included • Type of model used (drawing, image, animated simulation)	**Notes on Task Features and Task Variables**	Students may produce data to be used as evidence to support the idea that even though matter is made of particles too small to be seen, matter can still exist and can be detected by means other than seeing. This evidence will be used to support students' thinking as they develop models that depict matter.

Example Phenomena	• You can smell food cooking from across a room. • Adding air expands a basketball.
Measurement Model	Univariate Rasch partial-credit psychometric model
Evaluation Model	• How is the model used to support an explanation? • Is there evidence that the development of the model used logic and evidence? Note: Students do not have to use the terms particles or matter.