Teacher Support Materials

Intended Use

These item sets are designed to assess all three dimensions of the performance expectation (PE) when used as written. They are also designed to work with any NGSS-aligned curriculum. In some instances, minor modifications may be necessary based on how the disciplinary core ideas were taught. For example, an item may use the term “particle,” but the term “molecule” may have been used in class. In instances such as this, a simple word-for-word replacement is appropriate. Where possible, the developers have noted these suggestions below, or accompanying the specific exemplar responses or scoring guides.

With very few exceptions, each item set is intended to assess only one PE. Exceptions, if any, are noted in the Specific PE Notes below. Depending on the PEs that you have bundled together in a unit, you may wish to select items from two or more PEs for an assessment. Keep in mind as you do so the amount of time students will need to respond to each item.

Performance Expectation (PE)

This item set assesses 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.

NGSS Assessment Boundaries

No assessment boundaries.

Use Notes

Depending on the terminology used in your curriculum, you may wish to define some of the terms used in this item set (e.g. mutualism) or delete specific material from the item set prior to use.

Scoring and Scoring Guides

The scoring guides focus on students’ conceptual understanding of the three dimensions of the PE. Therefore, the scoring of a response should focus on the aspects described in the scoring guide rather than length of response, spelling and/or grammar, or other features.

Most scoring guides have three columns. The first column specifies 5 levels of performance, from 0 to 4. The second column provides a general description of what should be included in a response at that level. This description is the same across all items that use a particular science and engineering practice (SEP). The third column provides an item-specific description that applies to the three dimensions associated with the PE being assessed by that item.

There are two exceptions to this general approach to scoring guides. One exception occurs when two-dimensional items are included in an item set to elicit student understanding of specific aspects of disciplinary core ideas (DCIs). Another exception occurs for assessments associated with the practices of *Using Mathematics and Computational Thinking*, *Asking Questions*, and *Designing Solutions*, because the student responses for these are so tightly linked to the content or a specific element of the practice that a general description for the levels of the scoring guide across the practice is not appropriate. In these cases, the scoring guides have two columns: one for the five levels of performance and one for the item-specific description.

Student responses will sometimes fall between scoring levels. For example, responses that exceed scoring level 2, but do not fully meet scoring level 3, are fairly common. In these cases, it is up to the teacher to decide whether to give an intermediate score (2.5) or use a 2+ or 3- system. Most important is to use the scoring guide to provide students with feedback on how to improve their responses.

Scoring Guide - Item 1a		
Level	**General Description**	**Item-Specific Description**
4 Complete and Correct	Student's model* completely and accurately represents the components, relationships, and the mechanisms of the phenomenon, AND student uses it to develop a complete and correct explanation or prediction.	Student's model of a liquid completely and correctly: • Shows that the particles are no longer regularly arranged. • Includes arrows on the particles to indicate the particles are moving around. • Describes in the caption that the particles are now liquid (or have melted) and are now moving faster.
3 Almost There	Student's model* completely and accurately represents the components, relationships, and the mechanisms of the phenomenon, AND includes a mostly correct use of the model to create an explanation or prediction.	Student's model of a liquid is correct as follows BUT has minor errors or omissions in the caption: • Shows that the particles are no longer regularly arranged. • Includes arrows on the particles to indicate the particles are moving around. • Partially describes in caption that the particles are now liquid (or have melted) and are now moving faster.
2 On the Way	Student's model* represents components of the phenomenon AND includes a partially correct representation of the relationships or mechanism associated with the phenomenon.	Student's model: • Shows the change in the arrangement and/or motion or the particles. • has a significant error or omission in the caption
1 Getting Started	Student's model* represents components of the phenomenon BUT provides little or no evidence of the relationships or mechanisms associated with the phenomenon.	Student's model shows particles BUT has significant errors or omissions in both the model and the caption.
0	Student's response is missing, illegible, or irrelevant.	
X	Student had no opportunity to respond.	

*A model can be a diagram, drawing, physical replica, diorama, dramatization, storyboard, or any other graphical, verbal, or mathematical representation. It may include labels or other written text as required by the prompt.

Scoring Guide - Item 1b		
Level	**General Description**	**Item-Specific Description**
4 Complete and Correct	Student's model* completely and accurately represents the components, relationships, and the mechanisms of the phenomenon, AND student uses it to develop a complete and correct explanation or prediction.	Student's model of the evaporating liquid completely and correctly: • Shows that the particles are significantly farther apart. • Includes longer arrows on the particles that in the first model to show faster movement. • Includes an arrow showing transfer of thermal energy from outside to the bowl. • Includes a caption describing thermal energy causing changes in motion and spacing of the particles.
3 Almost There	Student's model* completely and accurately represents the components, relationships, and the mechanisms of the phenomenon, AND includes a mostly correct use of the model to create an explanation or prediction.	Student's model: • Shows that the particles are significantly farther apart. • Includes longer arrows on the particles that in the first model to show faster movement. BUT, *one* of the following has an error or is omitted: • Includes an arrow showing transfer of thermal energy from outside to the bowl. • Includes a caption describing thermal energy causing changes in motion and spacing of the particles.
2 On the Way	Student's model* represents components of the phenomenon AND includes a partially correct representation of the relationships or mechanism associated with the phenomenon.	Student's model: • Shows that the particles are significantly farther apart. • Includes longer arrows on the particles that in the first model to show faster movement. BUT, *both* of the following have errors or is omissions: • Includes an arrow showing transfer of thermal energy from outside to the bowl. • Includes a caption describing thermal energy causing changes in motion and spacing of the particles.
1 Getting Started	Student's model* represents components of the phenomenon BUT provides little or no evidence of the relationships or mechanisms associated with the phenomenon.	Student's model shows particles BUT has significant errors or omissions in both model and the caption.

0	Student's response is missing, illegible, or irrelevant.	
X	Student had no opportunity to respond.	

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Scoring Guide - Item 2		
Level	**General Description**	**Item-Specific Description**
4 Complete and Correct	Student's model* completely and accurately represents the components, relationships, and the mechanisms of the phenomenon, AND student uses it to develop a complete and correct explanation or prediction.	The model completely and correctly: • Shows the particles moving at a faster speed in the second pot than at the start. • Shows the particles in the third pot moving faster and farther apart than in the second pot and also moving out of the third pot. • Includes captions that describe the temperature, state(s), spacing, and motion of the particles. • Explains that these changes are caused by the transfer of thermal energy to the particles.
3 Almost There	Student's model* completely and accurately represents the components, relationships, and the mechanisms of the phenomenon, AND includes a mostly correct use of the model to create an explanation or prediction.	Student's model does the following, BUT there are minor errors or omissions in the captions and/ or the causal explanation: • Shows the particles moving at a faster speed in the second pot than at the start. • Shows the particles in the third pot moving faster and farther apart than in the second pot and also moving out of the third pot. • Includes captions that describe the temperature, state(s), spacing, and motion of the particles. • Explains that these changes are caused by the transfer of thermal energy to the particles.
2 On the Way	Student's model* represents components of the phenomenon AND includes a partially correct representation of the relationships or mechanism associated with the phenomenon.	Student's model does one of both of the following, BUT there are some errors: • Shows the particles moving at a faster speed in the second pot than at the start. • Shows the particles in the third pot moving faster and farther apart than in the second pot and also moving out of the third pot. AND does at least one of the following, but there are some errors or omissions: • Includes captions that describe the temperature, state(s), spacing, and motion of the particles. • Explains that these changes are caused by the transfer of thermal energy to the particles.

1 Getting Started	Student's model* represents components of the phenomenon BUT provides little or no evidence of the relationships or mechanisms associated with the phenomenon.	Student's model shows particles, BUT the motion is not represented accurately in the two pots, and the caption and explanation are missing or mostly incorrect.
0	Student's response is missing, illegible, or irrelevant.	
X	Student had no opportunity to respond.	

*A model can be a diagram, drawing, physical replica, diorama, dramatization, storyboard, or any other graphical, verbal, or mathematical representation. It may include labels or other written text as required by the prompt.