Introduction

In this task, students are asked to draw a model that shows what the motion of water molecules look like before and after the water is heated. This task is a classroom-based assessment that is designed to be used independently of any particular curriculum or instructional sequence, and is intended to be used as a formative check of student understanding of an unpacked "part" of a performance expectation (the learning performance described).

STANDARDS:

This task is intended to assess a learning performance (LP) that was derived from the following NGSS PEs:
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.

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

LP: Develop a model that explains how particle motion changes when thermal energy is transferred to or from a substance without changing state

ANNOTATION KEY

EQUITY	SCENARIOS	SEPs	DCIs	CCCs	SENSE-MAKING	ASSESSMENT PURPOSE
Supporting a wide range of diverse students.	Information provided to elicit performances.	Opportunities to demonstrate science and engineering practices.	Opportunities to demonstrate understanding of disciplinary core ideas.	Opportunities to demonstrate understanding of crosscutting concepts.	Opportunities for reasoning about phenomena and problems.	Highlights how the task features connect to intended assessment use.

✓ STRENGTHS

The questions in the task are **centered around a specific, real-world occurrence** that students can likely relate to—or could be easily demonstrated.

The task **helps students understand what needs to be included in the response** by including clear directions to include both pictures and a written description.

The task **surfaces student understanding of a specific aspect of the DCI.**

The task has a clearly **specific focus, and the question addresses this target explicitly.**

The task **asks students to show their thinking in multiple formats, ensuring that all students can make facets of their understanding visible.**

! OPPORTUNITIES FOR IMPROVEMENT

The **task is not driven by a specific phenomenon that is engaging or problematized**. This limits both sense-making using DCIs and SEPs as well as student engagement. While a phenomenon is included, student responses are limited to molecular motion before and after heating, rather than explaining an aspect of the phenomenon.

This task is very reminiscent of traditional science test questions because students are not asked to use their conceptual understanding of related DCIs to a phenomenon or problem, **but rather to simply represent a piece of DCI understanding via a diagram.**

Although language like "construct a model" and "explain" are used, students are not using modeling to sense-make about the phenomenon, but rather using parts of the SEP to represent the DCI—this could be misinterpreted.

How does this task support all students?

✓ The task includes several features to support diverse students. The scenario uses simple language that is easily understood, and does not include too much additional information that is not related to the task. The scenario is one that is easily understood by most students, and can be easily demonstrated if needed.

What are the major takeaways?

SUMMARY POINTS:

Overall, this task is asking students to represent a DCI understanding in a drawing, not to make sense of a phenomenon using modeling and their DCI understanding. While this is consistent with the intended purpose of the task, it should be noted that a very similar student response could be elicited by posing the clearly 1-D prompt “draw a picture of what how molecules movements change when liquids are heated”.

SUGGESTED IMPROVEMENTS

The task would be improved if the scenario was amended to create a need to know—if students were given a truly puzzling phenomenon or problem that required understanding how molecular motion changes to address. This would incentivize an emphasis on sense-making in teaching and learning, and wouldn’t run the risk of being interpreted as emphasizing rote knowledge.

How should this task be used?

This task could be used as intended: a formative check of student understanding of a specific piece of the DCI that builds toward the targeted PEs. This could be particularly useful in surfacing whether students understand that when a liquid is heated, molecular motion and kinetic energy increase during a unit that includes the relationships between transfers of energy and molecular motion. If used beyond a quick formative check, it should be used in conjunction with other tasks that emphasize making sense of a phenomenon or solving a problem.