

SCIENCE TASK ANNOTATION

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.



Overall, this task is asking students to represent a DCI understanding in a drawing. A similar student response could be elicited by posing the prompt "draw a picture of how molecules movements change when liquids are heated". This task does ask students to demonstrate some of the skills associated with the SEP modeling—by asking students to both explain and draw a picture, it may help surface whether students understand and can use diagrams to make their thinking about molecular motion visible.

DCIs
SEPs
SENSE-MAKING

HEATED CUP OF WATER

Thermal energy is slowly transferred to a cup of water by heating it in a microwave, but there is no change in the state of water. Imagine that you had a very powerful tool that allowed you to see how the water molecules are moving after thermal energy is transferred to the water by heating.

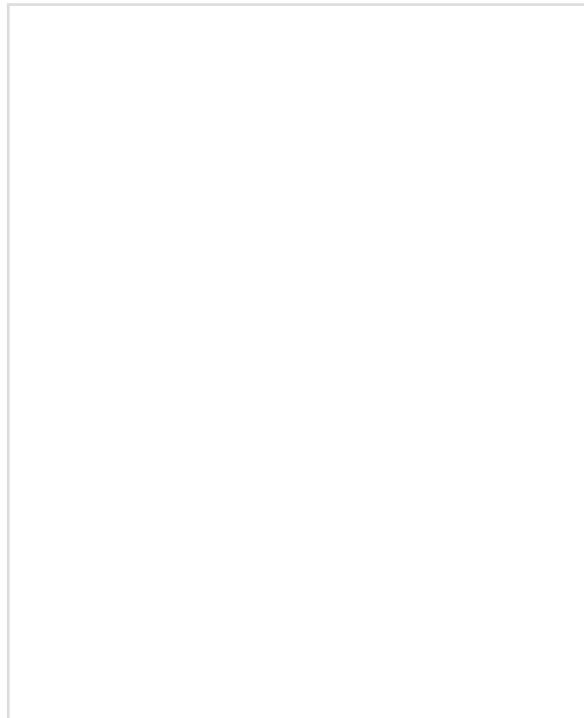
This task is situated around a general statement rather than a specific instance or observation—the exact same task and student response could be elicited around any warmed substance that doesn't change state. This scenario is not made relevant to students, nor is it clear why this is a phenomenon that needs to be explained. This scenario does not give students something to make sense of if they have already received instruction on particle movement when a liquid is warmed up.

SCENARIOS

HEATED CUP OF WATER (CONTINUED)

Construct a model to explain the motion of the water molecules before and after water is heated.

Be sure your model includes pictures and a key.



Write a description of what your model shows.

This can be answered without using any information from the scenario other than the fact that the water does not change state, suggesting that it might be a sophisticated recall question, rather than a 2- or 3-D question focused on sense-making. This can be appropriate if the purpose is a formative check on student understanding of the DCI, but should not be used as evidence that students can make sense of phenomena.

SCENARIOS

SENSE-MAKING

Successfully responding to this question requires that students can show, in a diagram and written description, that they know that 1) particles in liquids are moving around but in close contact with another, and 2) when a liquid is heated, the particles move faster/increases the kinetic energy of the particles. This most closely connects to:

- parts of the 6-8 DCI elements:
 - PS1.A "...liquids are made of molecules...that are moving about relative to one another"
 - PS3.A "The temperature of a system is proportional to the average kinetic energy... per molecule"
- part of SEP #2 element "develop and use a model..." to represent their DCI understanding. Students are demonstrating that they understand the skills associated with modeling, an important step on the path toward sense-making with models.

DCIs

SEPs

SENSE-MAKING