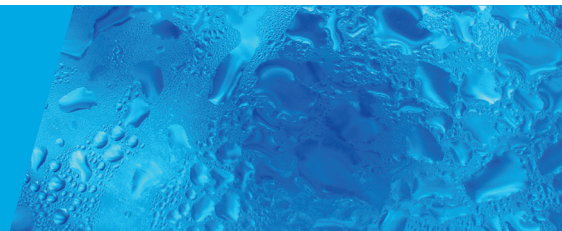


# CURIOSITY AT HOME

## PHASE CHANGE SANDWICH



Water can exist as a gas, liquid, or solid. It can also change between these different states depending on how much energy it has. In this experiment we can observe water's phase changes happening all at once across the different layers of this phase change "sandwich"!

### MATERIALS

- Clear glass jar
- Plastic cling wrap
- Water
- Ice cube
- Stove or electric kettle to heat water
- Rubber band or string (optional)
- Something to write with
- Science notebook or paper



gas



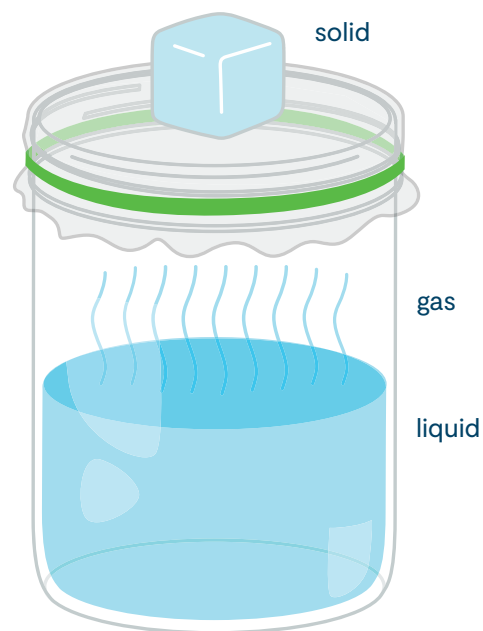
liquid



solid

### PROCEDURE

- Heat one cup of water. It does not have to be boiling, but you should be able to see lots of steam rising from the surface. Ask an adult nearby to help you heat and pour the hot water.
- Pour the hot steaming water into a clear container that won't melt, such as a glass jar, until it is about half way full.
- Cover the mouth of the jar completely with a piece of clear plastic wrap. The plastic wrap should be big enough to cover the entire opening of the jar and be secure enough that no steam can escape and the plastic is taut across the opening.
- Place an ice cube on top of the plastic wrap. Make sure the plastic is secure around the mouth of the jar so it doesn't fall under the weight of the ice cube. It may help to use a rubber band or a string to secure the plastic wrap.
- Observe over time what happens outside and inside the jar. What happens as the hot water evaporates? What happens to the ice cube? Do you notice anything starting to happen on the bottom of the plastic wrap?



*Experiment continued on next page...*



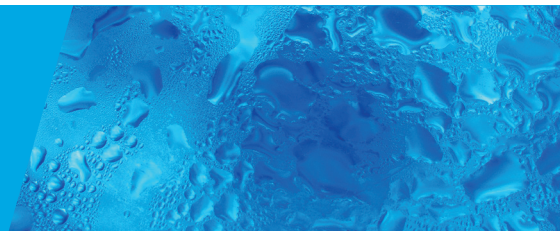
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# CURIOSITY AT HOME

## PHASE CHANGE SANDWICH



### EXPLORE MORE

- Do you notice any differences when the water is fully boiling as opposed to just steaming a little when you pour it in the jar?
- Will different amounts of water in the jar make any difference?
- If you don't put an ice cube on the plastic wrap, what do you think will happen? Try doing the experiment again, but without the ice cube. What differences between the two experiment trials did you see?

### WHAT'S HAPPENING?

When you pour the water in the jar, you may notice that the liquid water is vaporizing and turning into steam gradually. That is because the water is hot enough and has so much energy that the water molecules move around more and start turning into a gas. Heat rises, so that steam rises up toward the top opening of the jar until it is trapped there with the plastic wrap.



You may notice that the steam collects at the bottom of the plastic wrap to make droplets of water. This is because the hot water vapor gets cooled down by the cold ice cube at the top, and therefore loses its energy, changing phases back into liquid water. This process is called condensation. Ever wondered why your cold drink on a hot day starts getting "sweaty?" Or why grass and outdoor plants may be wet and dewy in the morning? That's condensation! Water vapor in the air cools down enough that it turns back into a liquid and sticks to whatever it can attach itself to.

There is another phase change happening in this experiment as well. Can you guess what it is? It is the ice cube! The ice cube on top of your jar starts out solid because it is cold enough that its molecules do not move around like they do as liquids and gases. Over time, you might notice that the ice melts, changing from solid to liquid, due to being heated from below by the hot steam in the jar.

*Experiment continued on next page...*



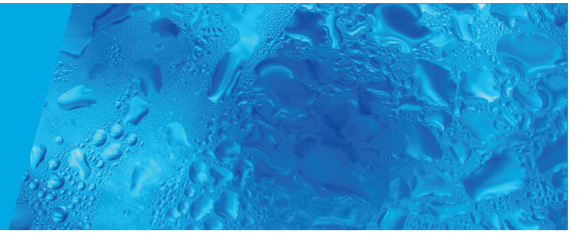
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# CURIOSITY AT HOME

## PHASE CHANGE SANDWICH



### K-2 EXPLORATION

- Do you think a sugary drink would evaporate faster or slower than the plain water? Give it a try!
- Do you think the evaporation experiment would have worked faster or slower if you put the sealed hot water into the fridge? What about in the freezer?
- If you wait a while and then tap the plastic wrap on the jar with your finger, the drops of water that collected there might fall down. What does this remind you of? **Hint:** where else have you seen falling droplets of water?



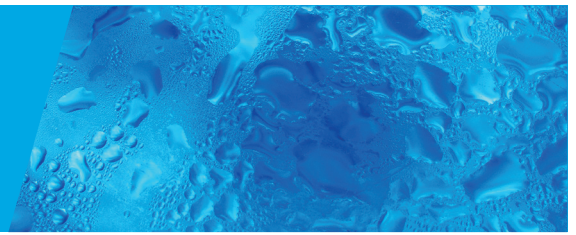
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## PHASE CHANGE SANDWICH



### 3–5 EXPLORATION

Explore the following questions and write your observations in your science notebook.

- Where else in your life do you see water turning into a gas? List a few examples in your science notebook and think about what is making that water turn into a gas.
- Do you think you would see different results if you used different liquids such as sugary drinks or salty water instead of plain water? Do you think this would change the way the reaction happens? What do you think would change? Make a prediction and then try the experiment again with a different liquid.
- Does the surrounding temperature have an effect on the evaporation process? If you think it does, what aspects of the experiment would be changed? Try the experiment again, but change the surrounding temperature by placing the jar outside on a hot or cold day, or placing the jar in the fridge during the experiment. Did you notice any differences after you changed the surrounding temperature?



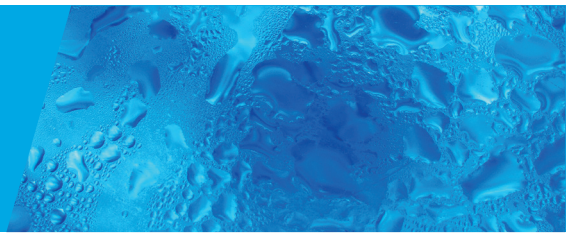
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# CURIOSITY AT HOME

## PHASE CHANGE SANDWICH



### GRADE 6–8 EXPLORATION

Explore the following questions and write your observations in your science notebook.

- Water vapor is in the air around us all the time. If you have ever been to a tropical place, you may have noticed the air seems thicker and is humid. Humidity is the measurement of how much water is in the air. Why might tropical places have higher levels of humidity?
- Science doesn't end once our experiment is over! We observed the different phase changes of water in this experiment. How can you connect this to natural phenomena, like rain? Based on what you have observed, how do you think rain clouds form? Draw a picture of the process in your science notebook. What are some similarities and differences between this process in the natural world and the process in our experiment?
- Do you think you would see different results if you used different liquids such as sugary drinks or salty water instead of plain water? Do you think this would change the way the reaction happens? What do you think would change? Make a prediction and then try the experiment again with a different liquid.



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