The Case of Vanishing Ice

The Science of Sublimation

- **9th-12th Grade**
- **Common Core Objective(s)**
  Earth Science, Standard 4, Objective 1.d
  Chemistry, Standard 3, Objective 3.c
- **15 Minutes**
- **Key Skills**
  Inferring
  Observing
  Interpreting data
  Formulating models
- **Key Vocabulary**
  Sublimation
  Dry ice
  Solid
  Gas

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CENTRAL UTAH WATER CONSERVANCY DISTRICT

Activity Summary

When discussing the water cycle, evaporation, condensation, and precipitation usually come to mind. This leaves out some lesser-known ways water can move through the environment. Of these, sublimation is often one of the most difficult to wrap your head around. During the sublimation process, a solid goes directly to a gas and completely skips the liquid stage.

In today's experiment, you will witness sublimation in action.

Materials

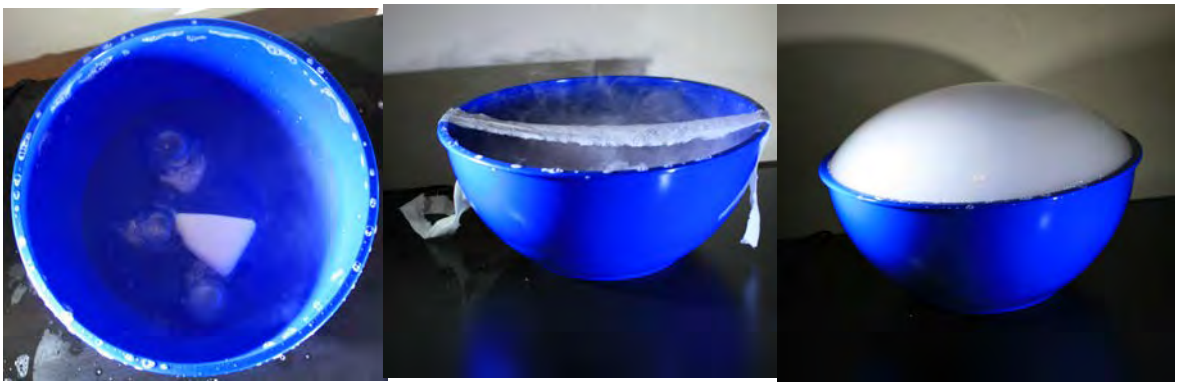
- Student worksheets
- Small container
- Dish soap
- Warm water
- Strips of cotton cloth
- Heavy gloves
- Plastic bowl with wide rim
- Dry ice

Instructions

1. To prep for the experiment, combine two tablespoons dish soap with one cup warm water in a small container. Put strips of cotton cloth in the soapy solution and allow to soak.
2. Have students fill out the pre-experiment section of the worksheet.
3. Wearing heavy gloves, place a small chunk of dry ice inside a large plastic bowl that has a wide rim.
4. Add two cups warm water to the bowl.
5. Quickly moisten the top of the bowl by rubbing a soapy strip of cloth along the rim.
6. Acting fast, take another soapy strip, extend it lengthwise, and pull it across the top of the bowl. ~ This should create a bubble that will trap the gases the dry ice makes as it sublimates inside the bowl.

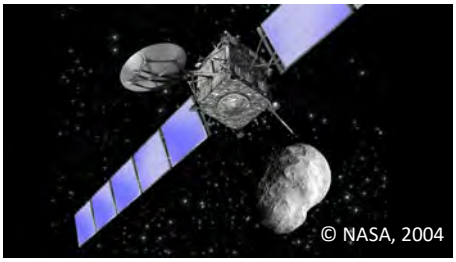
Instructions-Continued

7. Sit back and observe.
8. The instructor can choose to make additional bubbles until the dry ice in the bowl completely sublimates away or you can have students focus on the worksheet and discussion the questions.



Discussion Questions

1. Do you think warmer water temperatures will increase or decrease the rate the dry ice sublimates?
2. What kinds of conditions are necessary for sublimation to occur in nature?
3. In what types of ecosystems do you think sublimation plays a role?



Dive Deeper

Sublimation isn't just important on Planet Earth. Head over to NASA's 'How to Cook A Comet' video at https://svs.gsfc.nasa.gov/11384 to get a scientist's explanation about how sublimation occurs in space.

Additional Resources

- USGU Water Science School- https://water.usgs.gov/edu/watercyclesublimation.html
- Q&A Sublimation- http://van.physics.illinois.edu/QA/listing.php?id=1700
- Sublimation of Snow…the Basics- http://arc.lib.montana.edu/snow-science/objects/issw-1992-011-017.pdf

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The Science of Sublimation

When discussing the water cycle, evaporation, condensation, and precipitation usually come to mind. This leaves out some lesser-known ways water can move through the environment. Of these, sublimation is often one of the most difficult to wrap your head around. **During the sublimation process, a solid goes directly to a gas and completely skips the liquid stage.** In today's experiment, you will witness sublimation in action.

1. Draw your observations.

2. Write a description of your observations.

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