

Water Cycle Model

Purpose

To make a model of the water cycle.

Process Skills

Observe, Measure, Measure, Make a model,
Draw conclusions.

Background

The **water cycle** describes the changes water goes through as it moves from place to place around Earth. The processes of **evaporation** and **condensation** play an important role in the water cycle.

Time – 45 minutes

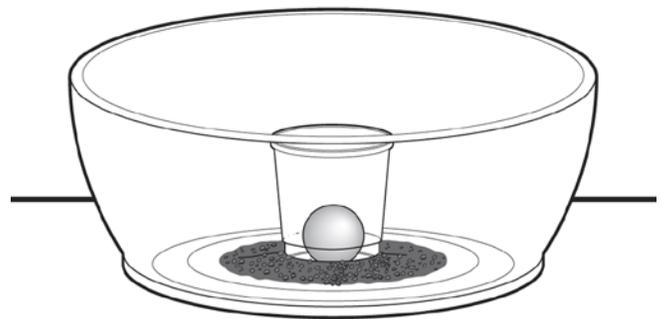
Grouping – class or groups

Materials

- marbles, golf balls, or other clean, solid objects (to fit in the plastic cup and hold it down)
- small plastic cup
- large plastic or glass bowl (clear if possible)
- tablespoon
- soil
- hot water (requires teacher supervision!)
- plastic cling wrap
- large rubber band or masking tape
- ice cubes (3–5)
- clear cup or glass

Procedure

1. Place the solid object inside the plastic cup and place the cup in the center of the bowl. Make sure there is about 5 cm (2 in.) between the top of the cup and the top of the bowl. You may have to use a smaller cup or a bigger bowl for this demonstration to work best.
2. Put 5 Tbsp. of soil in the bowl. Slowly add hot water to the bowl, so it mixes with the soil. Bring the water level to about halfway up the cup.





3. Quickly place the plastic wrap over the bowl and hold it in place with the rubber band or tape.

4. Place the ice cubes on top of the plastic above the cup.
5. Observe what happens inside the bowl. Once the motion of water slows or stops, take off the cover and examine the cup. There should now be water in it. Pour this water into a clear cup to see if it is clear or dirty.
6. If there is time, try changing one thing about the model and see what happens. Consider the amount of water, ice, or soil. Try adding salt to the water. Try other ideas.

Name _____ Date _____

Analyze Data

1. What happens to the water in the bowl? Why?
2. Do you think putting ice above the model made a difference? Why or why not?
3. Did the water in the cup have soil in it? Why do you think it did or did not?
4. Would this model have shown how the water cycle works with no cover on the bowl?
Why or why not?
5. Water is often seen on the *outside* of this model. Where could it have come from?
6. Ocean water is *not* hot, yet water evaporates from it. How can this be?

Draw Conclusions (Pick one)

1. How is this model similar to the real water cycle, *and* how is it different?
- OR –
2. Describe the path that one drop of water would travel in this model, starting in the dirt.

TEACHING TIPS

Water is one of Earth's most important resources and covers three-quarters of the Earth's surface. An appreciation for and understanding of Earth's water is important for students as consumers of this critical resource. These process activities explore the water cycle and the changes water undergoes as it moves through this cycle, as well as the effects these changes have on Earth. They also help students explore how what we do affects everyone's water.

SET-UP AND PROCEDURES

- If the model is set up properly, the warm water should evaporate upward and condense again as it cools against the underside of the cling wrap. The ice enhances this effect, and makes the wrap sag in the middle, making it "rain" clean water right into the cup.
- The dirt in the bowl is not required, but helps demonstrate the fact that only water turns to vapor, leaving the dirt particles behind.

MATERIALS

- Heat water in a microwave or on a well-supervised burner.
- Be sure the bowl is made to handle warm-to-hot water.
- A clear bowl is preferable, so students can see the model from the sides.
- Several water activities use sand, soil, and/or pebbles; when feasible, reuse them for the next lab. Spread them out on a broad tray to dry in the classroom overnight or in the sunshine.
- Saran Wrap™ is an example of cling wrap.
- Rocks are not recommended for placing in the cup, because students may confuse dirt that washes off them as having come from the evaporating water in the bowl.

SAFETY

- Do not allow students to drink the water.
- Only adults should handle the heated water.

EXTENSIONS AND VARIATIONS

- *Inquiry Science:* Add salt, sugar, and/or powdered drink mix to the warm water. Check to see whether either transferred to the catch cup (this is one occasion when you may have a student taste the water, at your discretion).
- *Inquiry Science:* Have students help propose ways to add onto the model to show other parts of the water cycle, such as runoff.
- *Research:* Help students investigate how water is distilled, and how ocean water can be made suitable for drinking.
- *Project:* As a class, develop a way to model a well.
- *Variation:* Try using cool tap water, but place the model outside on a warm day to see whether it still works.
- *Variation:* Try more or less ice.

ANSWER KEY AND EXPLANATIONS**Analyze Data**

1. What happens to the water in the bowl? Why?

Some of the water in the bowl evaporates because it is heated.

2. Do you think putting ice above the model made a difference? Why or why not?

Yes, it did make a difference. It helped cool the rising water vapor, making condensation occur more quickly. It also helped make the cling wrap sag in the middle, so the condensed water would drip into the cup.

3. Did the water in the cup have soil in it? Why do you think it did or did not?

No it did not, because only the water evaporated and then condensed and dripped into the cup. The soil did not move with the water.

4. Would this model have shown how the water cycle works with no cover on the bowl? Why or why not?

No, it would not have been an accurate model because the water vapor would have escaped, rather than condensing and returning to the bowl.

5. Water is often seen on the *outside* of this model. Where could it have come from?

There may be melted ice on top of the cling wrap. Also, there is water vapor in the air surrounding the model. This vapor may condense onto the outside of the bowl if the model is cooler than the surrounding air.

6. Ocean water is *not* hot, yet water evaporates from it. How can this be?

Water does not have to boil to evaporate. The Sun provides heating energy, which makes water molecules speed up and escape the surface of the liquid, becoming vapor.

Draw Conclusions (Pick one)

1. How is this model similar to the real water cycle, *and* how is it different?

It does model evaporation, condensation, and precipitation. But it does not repeat itself like the real water cycle does. Heat would have to be added to the water in the cup to restart the cycle. The model also does not show runoff, percolation, freezing, melting, and some other ways water returns to the atmosphere such as transpiration and respiration.

– OR –

2. Describe the path that one drop of water would travel in this model, starting in the dirt.

First the water evaporates and becomes water vapor. Then it rises, but gets trapped inside the model by the cling wrap. The ice helps it quickly condense back into liquid water. It drips (precipitates) back into the cup that was placed under the center of the cling wrap.