

Transpiration - Aspiration

Objectives

Students will:

- Observe the processes of evaporation, transpiration and evapotranspiration
- Record and interpret observations of the water cycle

Background

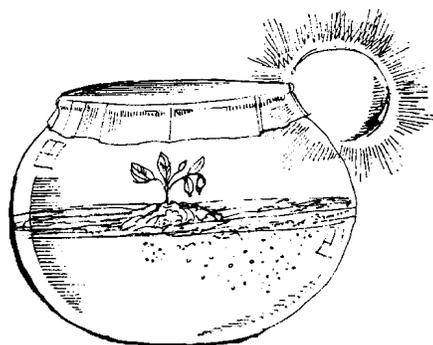
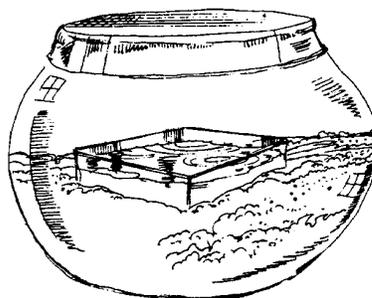
Transpiration and evaporation, together termed "evapotranspiration," are important steps in the water cycle. "Transpiration" is actually evaporation of water from plants - 95% of all the water absorbed by plants is transpired. The remaining 5% is used in plant processes. Up to 80 gallons of water per day can be transpired from an average size tree.

Water enters the air either by evaporation or transpiration. Heat from the sun aids the change from liquid water to gaseous water (vapor). This can happen directly, as when water from the ocean, a lake, or a river enters the air (evaporation), or indirectly via plants (transpiration). The condition of these two is termed "evapotranspiration."

When the air temperature is cool enough, water vapor condenses and returns to earth as "precipitation" (rain, snow, sleet). Precipitation percolates into the ground and becomes available to plants, or falls directly on rivers, streams, and lakes to begin the cycle again.

Procedure

- Place approximately 1" of stones in the base of the aquarium or jar. On top of the stones, put a 4"-5" layer of topsoil.
- Place the plastic container, with water in it (the pond) on top of the soil in the aquarium or jar.
- Put the plastic wrap or glass cover on top of the aquarium or jar and place it in a window that receives sun for a day.
- Observe what occurs over the course of a portion of the day.



- Remove the water-filled plastic container from the aquarium or jar. With the hand shovel, dig a small hole for each plant.
- Place each plant in a hole and cover the roots completely with soil.
- Put new plastic wrap or the wiped-off glass cover on top of the aquarium or jar and place it in a window that receives sun for a portion of the day.
- Observe what occurs over the course of a portion of the day.

Materials

- Aquarium or large glass jar
- Small stones and pebbles
- Topsoil
- Small hand shovel
- Small plastic container
- 2-3 shade-loving plants
- Plastic wrap or glass to cover jar or aquarium
- Record of Observation Student Activity Page

Adapted with permission from *Groundwater: What It Is and How to Protect It*, Instructional Materials Service, Daryle E. Foster, Director, Cornell University.

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The Water Cycle Song (Tune of: She'll Be Coming Around the Mountain)

**Oh we have a water cycle, yes we do.
(Yes we do!)**

**Oh we have a water cycle, yes we do.
(Yes we do!)**

**It's goes up as evaporation,
Forms clouds as condensation,
Falls down as precipitation, yes it does!
(Yee Haw!)**

**Oh we have a water cycle, yes we do.
(Yes we do!)**

**Oh we have a water cycle, yes we do.
(Yes we do!)**

**It's goes up as evaporation,
Forms clouds as condensation,
Falls down as precipitation, yes it does!
(Yee Haw!)**

Additional Activity

Cover a plant with a plastic bag secured around the stem with a string or a rubber band. Use caution not to tie the string too tightly. Put a straw in the bottom of the bag to serve as a drain into a cup. Place the plant in a sunny location for a day.

Measure the water collected during the day. Measure the water collected overnight. Compare the two measurements and discuss the reasons for the difference.

Discussion and Evaluation

In the aquarium or jar with the pond, the heat from the sun warmed the water and evaporated some of it. Because the aquarium or jar was covered, the water vapor did not enter the atmosphere, but instead, remained inside the aquarium or jar. Once the air inside became saturated with water vapor, some of the vapor condensed on the cover surface. A similar process took place in the aquarium or jar with the plants, but instead of water evaporating, the plants transpired water into the air.

These evaporation and transpiration processes are often called evapotranspiration and are an integral part of the water cycle.

Record of Observations

Teacher's Key

1. What changes did you notice in your aquarium/jar when the water-filled plastic container (pond) was in it?

Answer: Water droplets collected on the cover.

2. Where did the moisture come from?

Answer: Evaporation of water from the "pond."

3. What changes did you notice in your aquarium/jar when the plants were in it?

Answer: Water droplets collected on the cover.

4. Where did the moisture come from?

Answer: Transpiration of water from the plants.



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Record of Observations

Student Activity Page



1. What changes did you notice in your aquarium/jar when the water-filled plastic container (pond) was in it?

2. Where did the moisture come from?

3. What changes did you notice in your aquarium/jar when the plants were in it?

4. Where did the moisture come from?

