



The Water Cycle

Making a Terrarium

What is a Terrarium?

A terrarium is a collection of small plants growing in a transparent, sealed container. A terrarium is a closed environment, and can actually be used to illustrate how an ecosystem works. Inside a terrarium's walls, many different natural processes may be observed: photosynthesis, respiration, and the water cycle. The water in the terrarium is constantly recycled, passing from liquid form to gas and back again. As the moisture in the air condenses on the glass walls, it returns to the soil and is absorbed by the plants' roots.

Materials:

- Clear glass or plastic container
- Small stones
- Activated charcoal (from aquarium or orchid supply store)
- Sphagnum moss (optional)
- Potting soil
- Plants
- Decorative objects (optional)



Choosing your container:

Terrariums come in many different and creative shapes and sizes. Most terrariums are made from a clear glass jar with a wide mouth. However, a plastic 2-L bottle can also be used by cutting it in half, and sliding the top half over the bottom half to cover. It is important to consider that the wider the opening of your container, the easier it will be to place the plants.

Choosing your plants:

Often, terrariums are made with small mosses, lichens and ferns. However, there are several other types of plants that can be used, depending on the size of the terrarium, including begonias, miniature violets, coleuses, pilea (baby tears) and others. Plants need not be purchased, but can be collected from your yard and neighborhood. Get creative! For additional suggestions of plants, see resources below.

Building Your Terrarium:

1. Place a thin layer (approx. 1 inch) of small stones in the bottom of the terrarium to help drainage.
2. Place a thin layer (approx. 1/2 inch) of activated charcoal over the stones. This acts as a filtration substrate and keeps the water cleaner.
3. Place a thin layer of sphagnum moss or a fine screen over the charcoal to act as a barrier to prevent settling of the soil. (Optional)



4. Place a layer of potting soil approximately 2" deep.
5. Make small holes for roots and carefully plant your plants in the soil.
6. Finishing touches – add ornaments or decorations to give your terrarium a special theme. (Optional)
7. Lightly mist with water, approximately 10 sprays to the soil and sides of the jars.
8. Close container tightly with lid or cover.

Caring for your Terrarium:

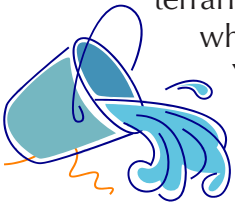
Terrariums come in many different and creative shapes and sizes. Most terrariums are made from a clear glass jar with a wide mouth. However, a plastic 2-L bottle can also be used by cutting it in half, and sliding the top half over the bottom half to cover. It is important to consider that the wider the opening of your container, the easier it will be to place the plants.



The two most important factors you must consider when caring for your terrarium are sunlight and water.

Sunlight: Place your terrarium in a bright area with indirect sunlight, such as a windowsill. Because the terrarium is a closed system, it can get too hot if it is in direct sun and the plants may burn.

Water: A properly maintained terrarium can go for weeks or months without needing water. As the terrarium heats up, water will be pulled up from the rocks and soil to the top of the container where it will form a mist and then drip back down to water the plants.



You should be able to see some mist on the sides of the container as well as some fog inside; however, if the sides are constantly wet, and there is so much condensation that you cannot see your plants, then you will need to open the top of the container temporarily to allow it to dry.

Pruning: Plants may need to be pruned to keep them small enough to fit the container. You can do this with a pair of scissors.

Fertilizer: You should not add any fertilizer to your terrarium. The goal is to keep the plants very small, so you do not want to encourage rapid growth. The plants will get the nutrients they need from the soil.

Other Resources:

“Plants and Youth: Designing and Building a Terrarium”, Kathleen C. Ruppert and Robert J. Black, University of Florida. http://edis.ifas.ufl.edu/BODY_MG356

“Building a Terrarium”, Kids Garden News. <http://www.kidsgardening.com/2006.kids.garden.news/jan/pg3.html>

“Make a Cool Terrarium!” National Geographic. http://www.nationalgeographic.com/ngkids/trythis/trythis_terrarium.html



Follow Up Activity with Terrariums

Objective:

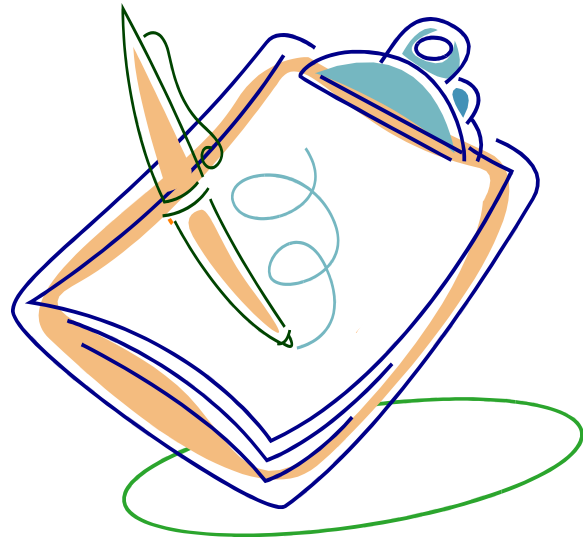
Students will record observations compare and contrast their observations with those of others. Students will be able to name and explain the stages of the water cycle.

Vocabulary:

Condensation
Ecosystem
Evaporation
Precipitation
Transpiration

Materials:

Individual terrariums
"My Terrarium Journal" worksheet for each student
"The Water Cycle" worksheet for each student



Procedure:

Part I - Terrarium observation

1. After creating the terrariums, distribute the "My Terrarium Journal" handout for students to draw their observations. For the first week, students should observe their terrariums several times daily and record when the terrarium is cloudy, and when it is clear. Compare results with class.
2. Ask the students what they expect to happen to their terrariums. Record their predictions.
3. Two weeks later, students should again make observations and draw their terrarium in their journal. If time allows, continue bi-weekly observations.

As a class, you may test the effect of different variables on the terrariums such as temperature, light levels, or the effect of salt water. Have the students decide what question they would like to test, how to set up the experiment, and make predictions about what they expect to happen. Make observations every few days and compare results to the predictions.

Part II - The Water Cycle

1. The terrariums can be used as models to understand the global water cycle. Organize the class into cooperative learning groups and give them the following questions to discuss:
How is the terrarium like an ecosystem? In what ways is it different? What would happen if the top of the jar was removed? How is it possible that the terrarium may not require watering for years? How do the plants inside get the water they need to grow?
2. Discuss the circulation of the water within the terrariums. Draw a simple diagram of the water cycle on the board or use the diagram provided) and ask students to describe what is represented in the diagram.

The Water Cycle

What is The Water Cycle?

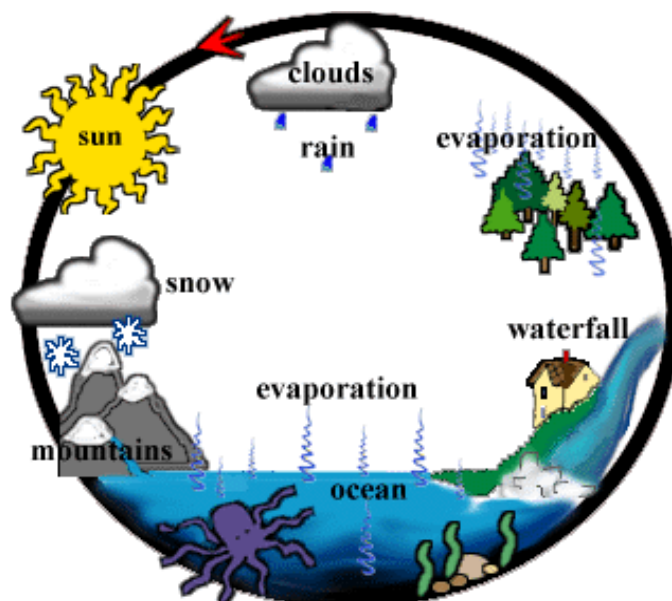
In the global water cycle, the sun heats the Earth's surface water, causing that surface water to evaporate (gas). This water vapor then rises into the earth's atmosphere where it cools and condenses into liquid droplets. These droplets combine and grow until they become too heavy and fall to the earth as precipitation (liquid if rain, solid if snow).

What to expect from your terrarium

The terrarium water cycle works in miniature the same way the water cycle works on a large scale for our planet. The plants take up the water through their roots and release it through their leaves (transpiration). The water molecules will condense on the glass (condensation), and run down the sides of the terrarium. Some of these water molecules will also be evaporated by the sun. The plants will use the moisture in the soil for photosynthesis, a process that occurs in the plants' cells and provides energy for the plants' growth. Some terrariums may develop a problem with mold. If this occurs, have the students try to figure out what caused the mold by comparing moldy terrariums to mold-free ones. Generally, the mold is caused by excessive moisture; open the terrarium to let it dry out a bit.

How plants transpire

Most people don't realize how much water evaporates from plants each day. Although we may notice the higher humidity in the forest, it's hard to imagine that 90-95% of the water a typical plant absorbs through its roots passes into the air as water vapor. The water evaporates through tiny pores on leaves called stomata. The stomata open during the day to allow carbon dioxide needed for photosynthesis to enter the leaf. The oxygen produced by leaves exits through the same stomata. "Transpiration" is the term that describes water evaporating from leaves.



Name _____

Date _____

My Terrarium Journal



Draw a picture of your terrarium

Day 1

Date _____



When is it:
Cloudy Clear

Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7



Draw a picture of your terrarium

Two weeks later

Date _____

Describe any changes in your terrarium and the date you observed the change.



Name _____

Date _____

The Water Cycle

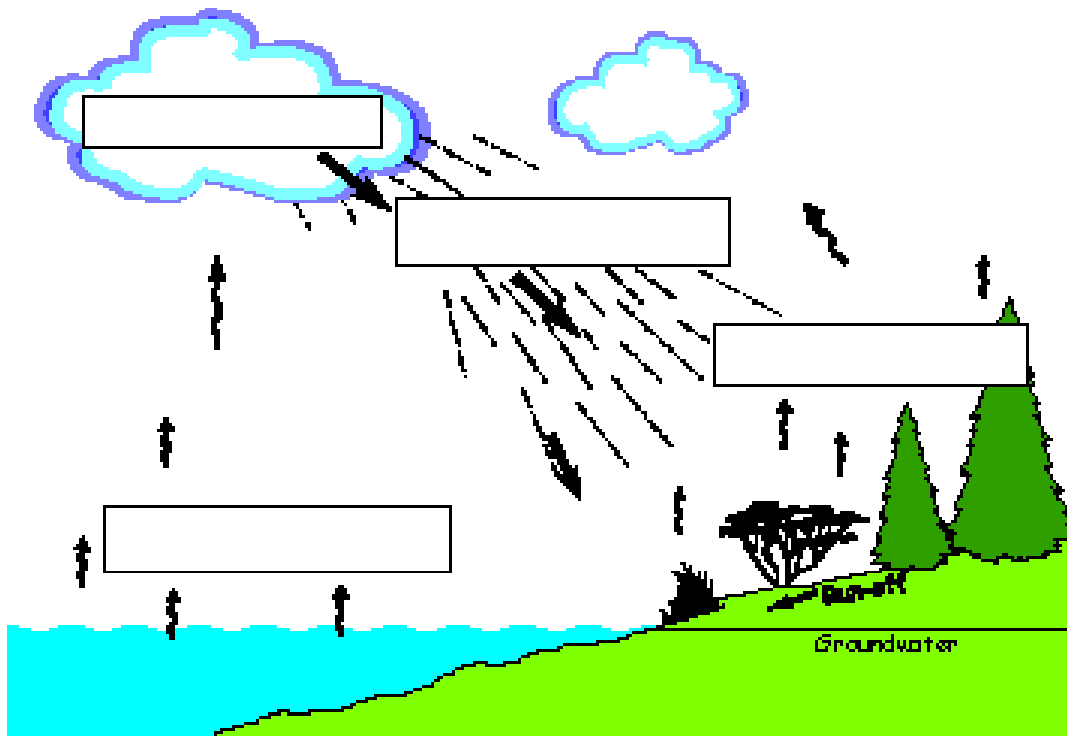
This is a diagram of the water cycle. Put the correct word in each box to label what happens to water. Use these words:

condensation

evaporation

precipitation

transpiration



Define the terms used to describe the water cycle:

condensation _____

evaporation _____

precipitation _____

transpiration _____