

Aquifer in a Cup

Build your own aquifer to discover how groundwater works

Objectives:

To create an aquifer model and observe the connection between surface water, groundwater, and drinking water wells.

To determine which can hold more water - an aquifer composed of sand or an aquifer composed of gravel.

To determine if pollution on the earth's surface can contaminate groundwater supplies.

Materials:

- *Two 10-oz clear plastic cups for each group.*
- *One resealable plastic sandwich bag filled with 3/4 cup of pea-size gravel for each group.*
- *One resealable plastic sandwich bag filled with 3/4 cup of coarse sand for each group.*
- *Two soap dispenser pumps for each group.*
- *One spray bottle for each group.*
- *One plastic measuring cup for each group.*
- *One 100-ml graduated cylinder for each group.*
- *Red food coloring.*

Procedure:

1. While one student holds a soap dispenser pump in one of the plastic cups, have another student pour the contents of the gravel-filled bag into the cup.
2. Explain to the students that they have created a small piece of land inside their cups and that they are now going to do an experiment to discover one of the places water can go when it rains. Have each student predict whether rain falling on their piece of land will stay on top and create a lake or sink down to the bottom. Record their responses.
3. Let students use spray bottles to make it "rain" onto their piece of land. Have them record what happens. (Water will sink to the bottom and accumulate in the spaces between the pieces of gravel.)
4. Explain to the students that they have created an aquifer and that the top of the water surface is called the water table. Ask them to predict what will happen if they dig a hole in the gravel below the water table. Have them do this and observe the results. Ask students what they have demonstrated. (A lake or a pond.)



5. Explain that the pump represents a well. Allow them to simulate groundwater extraction by pumping water from their aquifer into a measuring cup.

6. While one student holds a soap dispenser pump in the other plastic cup, have another student pour the contents of the sand-filled bag into the cup.

7. Ask the students to predict which cup, the one with the gravel or the one with the sand, will hold the most water. Allow them to make it "rain" into each cup, until the water level in each cup rises to the top of the sand and gravel.

8. Have the students pump all the water from the cup containing the gravel and measure it in a graduated cylinder. Have them do the same with the cup containing the sand. Which aquifer holds the most water? (The cup containing the gravel because the pore spaces are larger.)

9. Place two drops of food coloring on the sand aquifers. Explain to the students that this represents pollution (such as motor oil or cleaning solutions dumped in their backyard). Ask the students to predict if this pollution will contaminate groundwater in their sand aquifer.

10. Allow the students to make it "rain" onto their sand aquifer. When the cup is half full, let them begin pumping. Is the water polluted? (Yes. Rain carried the surface pollution into the groundwater.)



Vocabulary:

Aquifer: An underground layer of porous sand, gravel or fractured rock capable of storing and supplying water to a well or spring.

Groundwater: Water beneath the land surface.

Pore Space: That portion of rock or soil not occupied by solid material matter and that may be occupied by groundwater or other liquids or gases.

Surface Water: Water on land surfaces such as oceans, streams, lakes, etc.

Water Table: The top of the water surface in the saturated zone of an aquifer.

Well: A pit, hole or shaft sunk into the earth to observe or tap an underground supply of water.

