

Groundwater Flow Experiment

Introduction: This lab will allow you to explore the effects of different materials on the flow of groundwater water through aquifers. As we have learned, aquifers are layers of underground, water-bearing permeable rock, rock fractures, or unconsolidated materials (sand, gravel, soil, clay). Understanding how aquifers work is important because they provide 98% of our drinking water and can be both directly and indirectly affected by pollution. During this experiment, feel free to embrace your curiosity and test different materials. Consider how the permeability and porosity of each material affects the percolation of water through the aquifer.

For more information about aquifers, watch this video: https://www.youtube.com/watch?v=g7R0yLX0V9E

Important Terms:

Groundwater: Water held underground in the soil or in pores and crevices in rock.

Water table: The level below which the ground is saturated with water.

Impervious: Not allowing fluid to pass through.

Permeable: Allowing liquids (or gases) to pass through connected pores in the material.

Aquifer: Any geological unit that can contain or transmit groundwater.

You will need:

- Sand (sandbox, stream bank, nonclumping kitty litter)
- Gravel (driveway gravel, aquarium rocks)
- Clay (natural clay/molding clay/playdoh/bread dough/putty)
- 2 Clear plastic cups (when stacked together, there should be sufficient space under the top cup for ¼ cup of water) – see image below
- Push pin
- Water
- Stopwatch
- Measuring cup

• Soil

Instructions:

- 1. Obtain the plastic cup that will sit inside of the other cup and the push pin. Carefully use the push pin to create 5 holes in the bottom of the cup. Fill the bottom of the cup with a thin layer of gravel (~1/2 inch).
- 2. On top of the thin layer of gravel, add a material and pack it in with your fingertips until it's around 2 inches high in the cup. This is our aquifer!
- 3. Once the aquifer is set up, place it in the larger cup. Now, measure around a quarter cup of water and get the stopwatch ready!
- 4. Start the stopwatch as you pour the water into your aquifer and stop it once the water has drained all the way through. Record how long it took for the water to drain in the table.
- 5. Remove the aquifer from the large cup and use the measuring cup to estimate the amount of water that drained through. Record your measurement in the table.
- 6. Empty the wet material from the aquifer, rinse out the remaining particles, and replace the thin layer of gravel in the bottom.
- 7. Repeat steps 2-6 with any other aquifer materials that interest you. You can also combine multiple materials in the same cup with different layer thicknesses!



Data Table:

Aquifer Type	Cups of Water In	Time to Drain	Estimated Amount of
(Material added to			Water Out
cup)			
	1/4		
	1/4		
	1/4		
	1/4		
	1/4		
	1/4		
	1/4		
	1/4		

Reflection:

Using what you have learned, think about the following questions.

Which "aquifer" drained the fastest? The slowest? What can you observe about the material in each one that could help explain why?

Which "aquifer" retained the most water? Do you think that aquifer would be a good one for a well? Why or why not?

Did the clay layer drain quickly? Why or why not?

Why is the variability of drain times through different materials significant regarding groundwater plumes? How is this typically addressed?