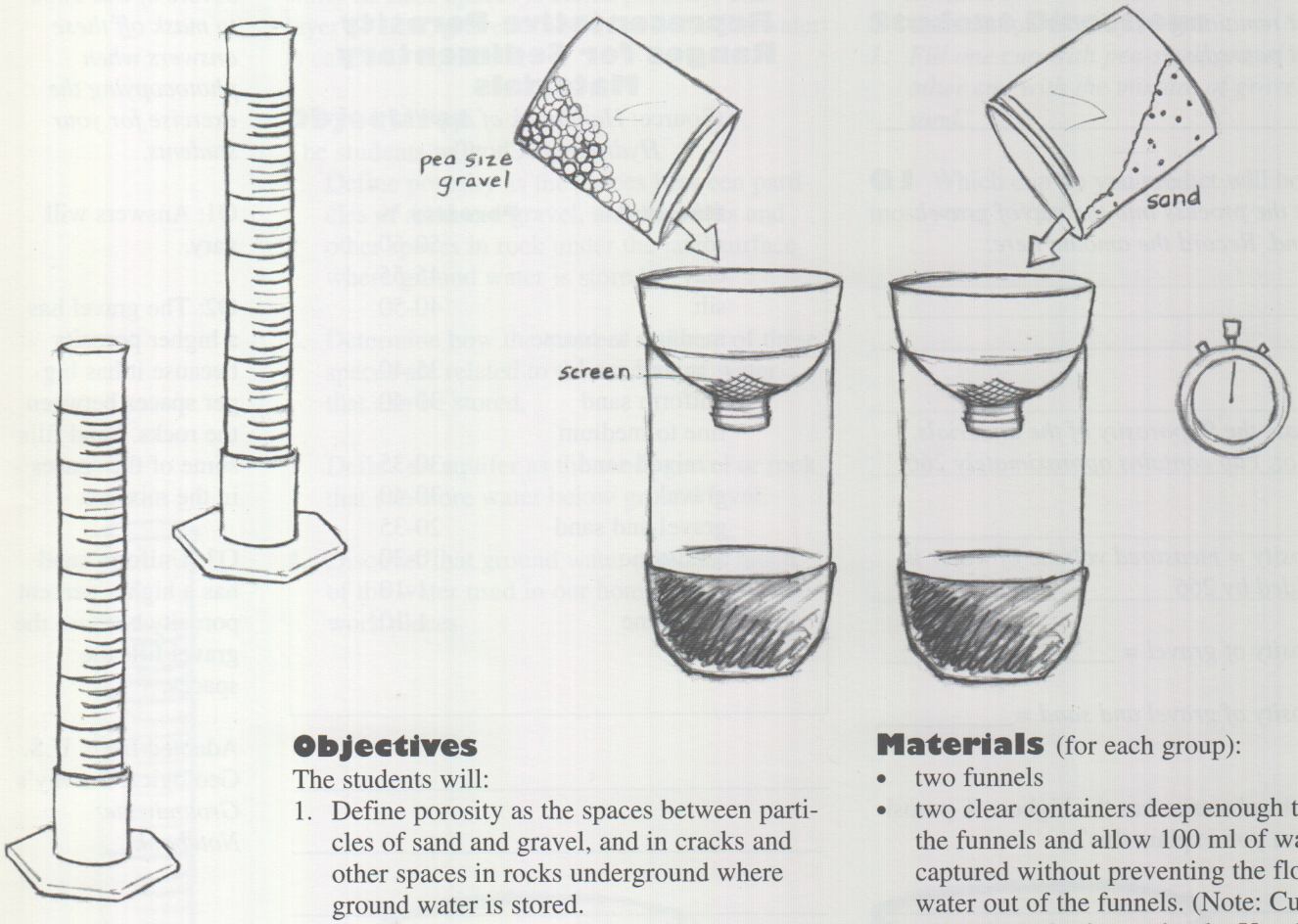
Lab Permeability

Introduction

Ground water is stored in the spaces or pores between sands and gravels, or in cracks in rocks below the surface of the earth. The capacity to hold water in these spaces is termed porosity. Water must move through these pore spaces into a well if it is to be pumped to the surface for use. The movement of water through pore spaces is termed permeability. Different materials have different permeabilities; with greater permeability, more water can be obtained from a ground water source (aquifer).



Objectives

The students will:

1. Define porosity as the spaces between particles of sand and gravel, and in cracks and other spaces in rocks underground where ground water is stored.

2. Identify an aquifer as the sand, gravel and rock beneath the earth's surface that can store ground water.

3. Identify the size of these spaces as the factor that determines the amount of water that can be stored.

4. Explain that permeability of an aquifer is related to the connections between these spaces and is the factor determining how much water can be pumped or flow from the aquifer.

5. Explain why different materials have different permeabilities.

Materials (for each group):

- two funnels
- two clear containers deep enough to support the funnels and allow 100 ml of water to be captured without preventing the flow of water out of the funnels. (Note: Cut the top off a clear plastic pop bottle. Use the top for the funnel, and the bottom for the clear container.)
- plastic bag pre-filled with approximately 6 oz. (by volume) of pea-sized gravel
- plastic bag pre-filled with approximately 6 oz. (by volume) of sand
- water
- two measuring cups or 100 ml graduated cylinders
- 2 small pieces of aluminum window screen, approximately one inch in diameter
- clock or watch

Student Directions

1. *Place the screens in the bottom of the funnels to prevent materials from plugging up the spout or slipping through.*

2. *Place a funnel in the top of each container.*

3. *Pour the bag of sand into one funnel.*

4. *Pour 100 ml or one cup of water into the funnel.*

5. *Time how long it takes for the water to drain into the bottom of the container.*

6. *Record the time it takes for the water to go through the sand. Stop timing when the stream turns to 2 drips per second.*

   _____

7. *Invert the container and pour the liquid back into the graduated cylinder or the measuring cup. Record the quantity of water that passed through the material.*

   _____

Subtract that amount from the total and record the amount of water remaining in the sand.

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8. *Repeat steps #2-7 with the gravel.*
   *Time*_____

   *Amount passing through*_____

   *Amount remaining in gravel*_____

Q1 Which material had the greatest permeability? Why?

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Q2 Why were there different quantities of water remaining after each experiment? What does this have to do with permeability?

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