PERMEABILITY – Activity 2

INTRODUCTION

The ability of various soils and rocks to allow water to move through them depends on several factors. That property is called permeability. Depending upon how porous a particular soil or rock is, it may act as a water-transporting layer called an aquifer. In this investigation, you will investigate the permeability of earth materials.

OBJECTIVES - - Upon completion of this activity, the student should be able to . . .

1. Define permeability
2. Measure the permeability of different types of earth materials
3. Explain how permeability affects fluid movements in the earth's crust
4. Explain how porosity, permeability, retention, and capillarity are interrelated (after completing the four activities in this set of activities)

STATE STANDARDS ADDRESSED

12.E.2a -- Identify and explain natural cycles of the earth's land, water and atmospheric systems
12.E.2b -- Describe and explain short term and long term interactions of the earth's components
12.E.3a -- Analyze and explain large-scale dynamic forces, events and processes that affect the earth's land, water, and atmospheric systems.

MATERIALS NEEDED

1 plastic column (with drain tube and pinch clamp)
1 ring stand
2 burette clamps
1 500 mL beaker
1 stopwatch or timing device
100 mL of pea gravel*
100 mL of sand
1 graduated cylinder (100 mL)
water supply

* Aquarium gravel can be easily substituted for pea gravel

PROCEDURES

A. Attach the two burette clamps to the ring stand. Place one clamp near the middle of the ring stand, and place the other clamp near its top. Open both clamps as wide as they will widen.

B. Place the plastic column in the burette clamps, and tighten the clamps. Be sure the tube-end of the plastic column is down. Also, be sure the drain tube is clamped closed (using the pinch-clamp). The bottom of the plastic column should be high enough above the base of the ring stand that you can easily move the 500 mL beaker beneath it (to catch water coming out of the plastic column). See Figure 1 on the next page.

C. Using the 100 mL graduated cylinder, measure out 100 mL of pea gravel.

D. Carefully pour the pea gravel into the plastic column.

E. Measure and pour 300 mL of water into the plastic column with the pea gravel inside.

F. Get ready to use the stopwatch or timer. Begin draining the water from the plastic column. Be sure to time how long it takes for the water to drain out. Record this time in the Data Table on the next page.

G. Next, repeat Procedures A-G, but this time use sand rather than pea gravel. Be sure to record the measured time in the Data Table on the next page. This time is a measure of the permeability of the sand.

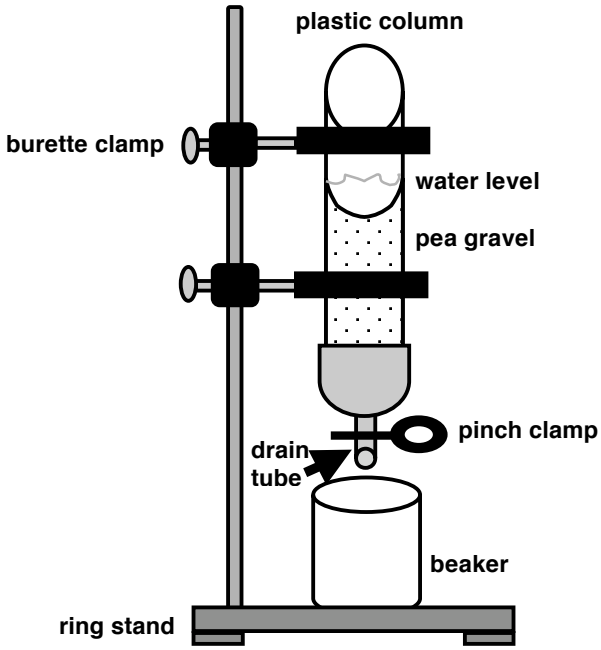

Figure 1

Data Table for Permeability

Earth Material Size	Permeability (time to drain water, in seconds)
Pea Gravel (12 mm diameter)	
Sand (7 mm diameter)	

QUESTIONS

1. Compare the permeability of pea gravel and that of sand. Which size of particle allows water to move through it most easily (fastest)?
2. If you wanted to find an aquifer to use as a water supply (based on permeability), which earth material would you seek: one with particles having a larger diameter of those having a smaller diameter? Explain your answer.
3. Which type of rock do you think would be most permeable: sandstone, limestone, or granite? Explain your answer.

RESOURCE:

American Geologic Institute. (1967). *Investigating the earth*. Boston: Houghton Mifflin Company.