Soil Porosity and Permeability Lab

Materials:

-1 Graduated Cylinder, Beaker, or Measuring Cup per group – (100 mL)

-1 Cup - that can hold more than 100 mL per group

-1 Cup with small holes in bottom per group

-Water

-Marker/Sharpie

-Stopwatch/Timing Device

-Data Sheet (below)

-Sand

-Gravel (at least 1 size)

-Soil (clay/loam type soil)

Vocab:

Porosity - the amount of empty space in a rock or other earth substance; this empty space is known as pore space. Porosity is how much water a substance can hold. Porosity is usually stated as a percentage of the material's total volume.

Permeability - is how well water flows through rock or other earth substance. Factors that affect permeability are how large the pores in the substance are and how well the particles fit together.

Percolation - the downward movement of water from the land surface into soil or porous rock

Infiltration – when the water enters the soil surface after falling from the atmosphere.

Procedure for measuring porosity

1. Measure out 100 mL of water in the graduated cylinder.

2. Pour the 100 mL of water in one of the cups and use the marker to mark the level.

3. Pour the water back into the graduated cylinder. Dry the cups interior

4. Fill the same cup with sand up to the mark you drew.

5. Pour the 100 mL of water slowly into the sand. Stop when the water level just reaches the top of the sand.

6. Record the amount of water left in the graduated cylinder in the right column.

7. Calculate the pore space by subtracting the amount left in the graduated cylinder from the original 100mL.

8. Repeat steps 4-7 with the pea gravel and yard soil.

9. Calculate the % porosity and record in the table.

Use this formula: porosity = pore space volume x 100 total volume

Procedure for measuring permeability (method 1)

1. Measure out 100 mL of water in the graduated cylinder.

2. Pour the 100 mL of water in a cup and use the marker to mark the level.

3. Pour the water back into the graduated cylinder. Dry the cups interior

4. Fill the now dry cup with sand up to the mark you drew.

5. Transfer sand to a second cup that has small holes in the bottom

6. Get a timer ready. Hold the cup over a beaker to catch the water.

7. Pour 100 mL of water quickly into the cup of sand. Start the timer as soon as the water hits the sand.

8. Stop timing as soon as the first drop of water comes out of the hole in the bottom.

9. Record how many seconds it takes for the water to reach the bottom.

10. Repeat steps 1-9 with gravel and again with soil (clay/loam like soil).

Procedure for measuring permeability (method 2)

1. Measure out 100 mL of water in the graduated cylinder.
2. Pour the 100 mL of water in a cup and use the marker to mark the level.
3. Pour the water back into the graduated cylinder. Dry the cups interior
4. Fill the now dry cup with sand up to the mark you drew.
5. Transfer sand to a second cup that has small holes in the bottom
6. Get a timer ready. Hold the cup over a beaker to catch the water.
7. Pour 100 mL of water quickly into the cup of sand. Start the timer as soon as the water hits the sand.
8. Continue timing for 1 minute
9. Record total mL of water passed through the sand in 1 minute
10. Repeat steps 1-9 with gravel and again with soil (clay/loam like soil).

	Porosity Data				Permeability Data	
Sediment Type	Starting Volume (mL)	Volume Left (mL)	Pore Space Volume (starting volume – volume left)	% Porosity	Time (sec) for water to pass through	Volume (mL) of Water passed through in 1 min
Example	100mL	65mL	100 – 65 = 35	(35/100) X 100 = 35%	30 sec	50 mL
Sand	100mL					
Soil	100mL					
Gravel	100mL					