

The Permeability Of Soil

Where does rainwater go? It may flow into streams and rivers, gutters and sewers, form puddles, or soak into the ground. Although rock, sand, and soil are solid, there are spaces between the grains of the material called pores. Water may flow into these pores. The measure of how much open space there is in a solid is called its "porosity." (Look at the Absorbency of Rock experiment to learn more about porosity.)

Another important measure is permeability, which is the rate at which fluid can flow through the pores of a solid. If soil has high permeability, rainwater will soak into it easily. If the permeability is low, rainwater will tend to accumulate on the surface or flow across the surface if it is not level.

In this experiment you will be measuring the permeability of soil. You will put a bottomless metal can into soil and see how quickly the water you pour into the can flows into the ground below it.

For comparison purposes you can try more than one area or type of soil. You can also share you results with others who have tried this experiment to compare permeability rates of different soil types in different parts of the world.

Tools and Materials

You will need:

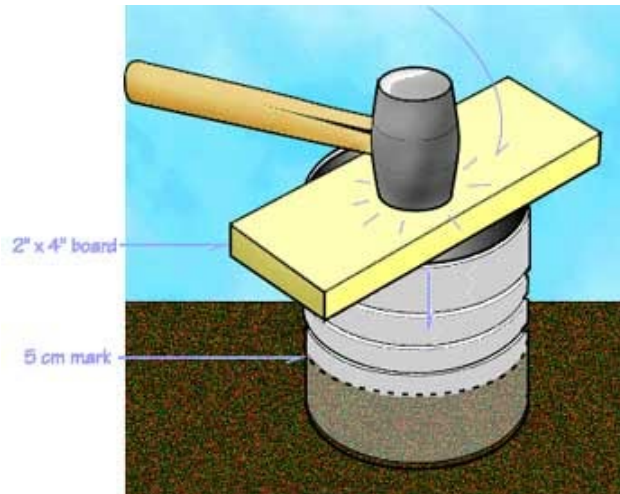
- a fruit or vegetable juice can, 1.5 liters or larger, with both ends removed
- a hammer
- a wooden board
- a ruler
- a bucket, jar, or bottle to hold 1 to 2 liters of water
- a watch
- a 10 cm long piece of masking tape or electrical tape
- pencil and paper or a computer to record your observations and result

Procedures

Here's what to do:

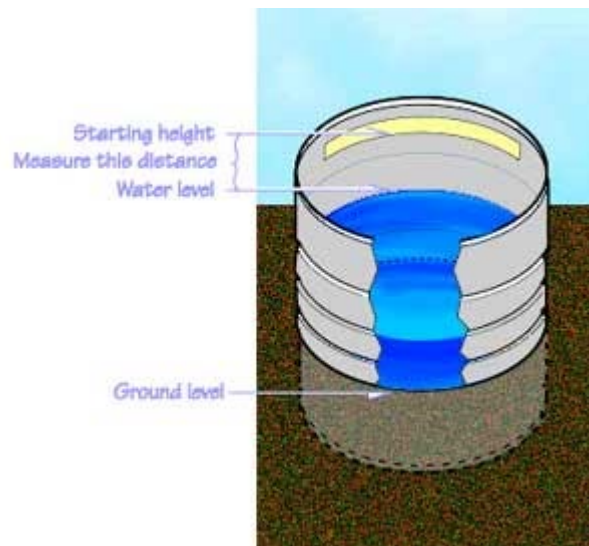
1. Before you disturb the soil in any way, describe it as best you can. Think about the location (pasture, riverbank, beach, etc.), the plant material that may be present (grass, moss, dead leaves, etc.) and the soil condition (dry/moist, sandy, loose granular, hard clay, etc.). Write down your observations.

2. Set the can on the ground and place the piece of wood on top. By hitting the board with the hammer, drive the can about 5 cm into the ground.
3. Put the piece of tape on the inside of the can near the top so that it is parallel with the top edge.
4. Measure the distance for the bottom of the tape to the ground and write this down.



5. Pour water into the can until it reaches the level of the bottom of the tape inside the can. Record the time.

6. As the water permeates through the soil, the water level will drop. You can determine how many centimeters of water are permeating through the soil by measuring the distance between the starting height marker and the surface of the water. Using a ruler, measure this distance 30 minutes and 60 minutes from the time you first poured the water into the can.



7. Record your measurements in the data table.
8. (If the water runs out during the course of the experiment, immediately fill it up to the tape marker again. Measurements you make after that should be recorded as the full the distance from the ground to the tape, plus the distance from the water level to the tape. If you have to fill the can again, make sure to add the distance from the ground to the tape to your measurements again.)
9. Divide the amount of water absorbed in one hour by 60 to get the permeability in centimeters per minute for the entire hour.
10. Divide the amount of water absorbed in 30 minutes by 30 to get the permeability in centimeters per minute for the first half hour. Is this the same rate as for the entire hour?