Water and Soil Management Lab

# Purpose:

Using given materials, write a proposal for an experiment designed to test the percolation rate of different soil materials. Carry out your experiment and report the results.

**Background:**

Most of the rain that falls on land soaks into the ground. The rest runs off into streams and rivers. How well rain soaks into the ground depends on a number of factors including: the slope of the land, the amount of open space between the soil particles, (it’s **porosity**), and the soil or rock’s capability to allow water to pass through it (**permeability**).

Porosity is determined by the shape of the particles, how tightly the particles are packed, and how many different sizes of particles there are. These characteristics and changes in the amount and rate that water soaks in can vary among different soil layers.

This activity will demonstrate the variation in the rate that water moves through various soil layers by testing the rate at which water moves through clay, topsoil and sand. The rate that water moves through a soil is called the **percolation rate**.

To determine the percolation rate of the sample, divide the amount of percolated water by the amount of time (30 sec.)

**EX: 30 mL percolated through a sample in 30 sec. 30mL/30 sec. = percolation rate Percolation rate = 1 mL/sec.**

**Checkpoint:** *Define the following terms in your own words*

**Porosity-**

**Permeability-**

**Percolation rate-**

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# Materials:

|  |  |
| --- | --- |
| * **3 samples (topsoil, sand, clay)**
* **1 6 oz. paper cup (use same cup for all 3 samples)**
* **water**
* **pencil**
 | * **1 50 mL graduated cylinder**
* **1 100 mL beaker**
* **stopwatch**
* **tweezers**
* **3 cotton balls**
 |

# Proposal:

Use the following questions to propose an experiment that demonstrates all steps of the scientific method. Your proposal must be approved before you can experiment. 

 Teacher approved:

1. My **independent variable** (the one thing I am testing in this experiment) will be:

2. My **dependent variable** (what I am measuring in this experiment) will be:

3. **Constants** (things I will be keeping the same) throughout my experiment will be (*list as many as you can think of!*):

4. The **research question** I will be using to guide my experiment is: (for example: “What is the effect of...?”)

5. Cite 3 literary research references using APA format:

6.. Give an explanation of the **procedure** you will follow for your experiment:

7. My **hypothesis** for my experiment is (use proper format such as “If…then…”):

# Observations/Data Collection:

Use the following data table to record your data.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **Water Volume (mL)** | **mL/ sec.**  | **Percolation rate (mL/sec.)** |
| **Topsoil** |  | **/30 sec.** |  |
| **Sand** |  | **/30 sec.**  |  |
| **Clay** |  | **/30 sec.**  |  |



Create a bar graph displaying your data.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

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# Conclusions:

1. Which soil component had the fastest percolation rate?
2. Why does the soil component from question #1 percolate the quickest? What properties/characteristics does it have that may contribute to its percolation rate?
3. Which soil component had the slowest percolation rate?
4. Why does the soil component from question #3 percolate the slowest? What properties/characteristics does it have that may contribute to its percolation rate?
5. List at least 3 people or occupations that may find knowing the percolation rate of various soil components to be useful. For each, explain how they would use this information.

a)

b)

c)

6. Suppose you are a farmer and you have 2 samples of soil—one is mostly sand and the other is mostly clay. You want to grow soybeans in one of these 2 soils. What questions would you need to ask before choosing the soil in which to plant your soybeans? (Write at least 2 questions).

a)

b)

**Instructor Notes:**

**This lab is designed to be split into at least (2) 55 minute periods.**

The first day should be research, experimental design, and writing the proposal.

Day 2 will be conducting the experiment, gathering data, analyzing and reporting data.

Optional day 3 could be presenting data in small groups or to the class.

**Teacher lab materials:**

* **2 gallons of each medium (Topsoil, Sand, Clay) in a container all students can access**

**For lab procedure reference download the reference lab:**  [http://wjokiel.wikispaces.com/file/view/Soil+Percolation+lab.pdf](http://wjokiel.wikispaces.com/file/view/Soil%2BPercolation%2Blab.pdf)

This lab is designed to have students generate and test their own lab procedure however it can be scaffolded based on situation using the procedure in the reference lab.