

 **Activity 4.2.2 On Your Mark, Get Set, FLOW!****Purpose**

Soil permeability is critical to understanding how water and soil interact. Soil permeability depends on the presence of pores that help water filter through the soil profile. If soils lack pores, or porosity, water moves through it very slowly, if at all. Slow movement of water through a soil caused by poor internal drainage can increase surface erosion. A soil needs to be permeable enough to allow water to flow through to prevent flooding and erosion of top soil, yet have the capability of holding water for plants.

Soil texture is a major contributor to permeability. The pore spaces in the soil are relative to the size of the soil particles. Which soil particles increase a soil's permeability? Which soil texture balances water holding capacity and permeability?

Materials**Per student:**

Pencil
Agriscience Notebook

Per pair of students:

Water
Hand magnifying glass
Profile tube

Per group of four students

4 soil samples

30ml graduated cup
100ml graduated cylinder
Stopwatch

Procedure

Work with a partner to compare water permeability rates of four soil samples. Share your soil samples with another pair of students.

Part One – Soil Observations

Use the magnifier to examine the physical appearance of each soil sample. Record observations, especially details related to pore space in Table 1 of *Activity 4.2.2 Student Worksheet*.

Predict the permeability of each soil sample by ranking them from highest to lowest in Table 1. The soil allowing the most water flow through would be given a 1 and the soil allowing the least would be given a 4.

Part Two – Permeability Tests

1. Use the graduated cup to add 30ml of gravel to a profile tube.
2. Fill the graduated cylinder with 100ml of water.
3. One partner will place their finger over the hole in the profile tube while the other partner pours 100ml of water into the profile tube.
4. Position the graduated cylinder under the profile tube so the water will drain from the tube into the cylinder and prepare the stopwatch for timing.
5. Remove your finger from the bottom of the profile tube and start the stopwatch to time how quickly the water filters through the soil sample.
6. Once most of the water has drained from the profile tube and the drips have stopped, record the time it took to drain in Table 1.

7. Record the amount of water collected from the permeability trial in Table 1.

8. Calculate retained soil water by subtracting the water collected from 100ml.

Retained Soil Water = 100ml – Water Collected

9. Remove all soil particles from the profile tube in the proper disposal area designated by your teacher.

10. Repeat Steps 1 – 9 for the sand, sandy clay, and loam.

11. Answer analysis questions on the student worksheet.

Conclusion

1. Explain how soil particle size influences soil porosity.

The more soil the more time it takes for the water to drain.

2. What effect would adding clay to soil have on the permeability of a soil? The water wouldn't drain.

Activity 4.2.2 Student Worksheet

Table 1. Permeability Test Data

Sample	Physical Characteristics	Permeability Prediction	Time of Filtration (Seconds)	Water Collected (ml)	Retained Soil Water (ml)
Gravel	looks like rocks	10	36.13	96	4
Sand	looks like really small pebbles	9	6:47.65	89	11
Sandy clay	Sand that has clay in it	7	3:00.00	94	6
Loam	soft dirt	8	3:00.00	1	99

Analysis Questions

Was your prediction correct? Why or Why not?

No because some of the tests were longer than I thought they were gonna be.

Which sample was associated with a high permeability rate? Why?

The gravel because the water drains fast.

What sample retained the most water? Why?

The sand because it took a long time for the water to drain.

Loam contains clay sediment. How does clay affect the water holding capacity of the soil? It stays in the soil instead of leaving it.