Lesson 3: Infiltration, Porosity & Moisture Retention

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In this lesson you are asked to conduct a simple “experiment” in the laboratory, classroom, or your home. Your experiment will illustrate the relationships between sediment characteristics and infiltration, porosity and moisture retention. You will build a test apparatus (TA) for each sample.

Materials:
3 small (250 mL – 1 L) plastic bottles or beakers
3 paper cone “water cooler” cups (100mL)
3 varieties of dry sand or soil
1 thumbtack
Scale or balance (up to about 1000g capacity)

Preliminary Calculations:
• Measure the diameter (d) and height (h) of the conical cups.
• Calculate the volume (V) of the cups (Hint: Use formula where d = 2r)

Procedure/Calculations:
• Place the empty cups inside the bottles to form each test apparatus.
• Weigh each test apparatus, record the mass into row A of the data table.
• Fill each cup with a different variety of sediment.
• Weigh each test apparatus, record the mass into row B of the data table.
• Slowly add water to each cup until the sediment samples are saturated.
• How quickly did the water infiltrate into each sample?
• Calculate the volume of water added into each test apparatus and record into row D of the data table. (Hint: D = C – B because 1mL H2O weighs 1g)
• Calculate the porosity of each sample, record into row E of the data table. (Hint: E = 100 * D / volume of cup)
• Carefully punch a hole in the tip of one cone and allow the water to drain by gravity into a measuring cup or graduated cylinder for 5 minutes.
• Immediately after 5 minutes of gravity drainage, reassemble the test apparatus. Weigh the test apparatus, record into row E of the data table.
• Repeat the 5-minute gravity drainage for the other test apparatus.

How quickly did water drain out of each sample?
Which sample retained the most water? (i.e., higher percent saturation)

<table>
<thead>
<tr>
<th>Row</th>
<th>Measurement/Calculation</th>
<th>TA 1</th>
<th>TA 2</th>
<th>TA 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mass when empty (g)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Mass with dry sediment (g)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Mass when saturated (g)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Volume of water added (mL)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Porosity (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Mass after drainage (g)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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*Program details will be communicated through email.