**Hydrogeology Exercise**

**Hydraulic Conductivity of Porous Media**

**Station A, B, or C: At each station you have dish of the material that the Darcy column is filled with (corresponding to the marked container).**

 **Directions:**

There are dishes of the porous material in a dish in front of each column. Make sure to take a close look at this material and describe it in terms of size, sorting, and grain shape.

You will have a bottle filled with a saturated material (filled with the same material as seen in the corresponding dish). Tubing to a fluid reservoir on one end and an outflow tube on the other end connects the porous medium. You will perform an experiment to measure the hydraulic conductivity of a certain material and compare that to other porous media. Measure the hydraulic head (height) at each end of the Darcy tube (Use the table top as your datum, ie. zero point, ground level) as well as the length of the darcy tube (the whole bottle).

Unclamp to allow flow. Measure time necessary for 10 cm3 of outflow (you can adjust this volume). Run a trial at each material at least 3 times, changing the head (or height) difference each time (gently moving the water reservoir or porous medium up or down with the stand).

1. Characterize the material in each dish (A, B, and C) for grain size, sorting, mineralogy that corresponds to the material in each darcy apparatus.

2. Create a labeled sketch of the Darcy Apparatus (make sure to include h1, h2, and L). Describe the porous medium at your station (and each subsequent station). What grain size is it? Is it angular or rounded? Is it well sorted or poorly sorted?

3. Fill in the table of your experimental data for each run. Also record the diameter, radius, and length or the Darcy Tube (bottle). \*Note: You will not need to measure the amount of water in the reservoir- you will measure the volume of water traveling through the material by collecting it in the graduated cylinder at the outflow tube.

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| --- | --- | --- | --- | --- |
| Material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |
|  |  |  |  |  |  |
| Run # | Head of water reservoir (cm) | Head of bottle (cm) | Fluid Amount | Time Needed | Difference in Head (cm) |
| 1 |   |   |   |   |   |
| 2 |   |   |   |   |   |
| 3 |   |   |   |   |   |
| Material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |
|  |  |  |  |  |  |
| Run # | Head of water reservoir (cm) | Head of bottle (cm) | Fluid Amount | Time Needed | Difference in Head (cm) |
| 1 |   |   |   |   |   |
| 2 |   |   |   |   |   |
| 3 |   |   |   |   |   |
| Material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |
|  |  |  |  |  |  |
| Run # | Head of water reservoir (cm) | Head of bottle (cm) | Fluid Amount | Time Needed | Difference in Head (cm) |
| 1 |   |   |   |   |   |
| 2 |   |   |   |   |   |
| 3 |   |   |   |   |   |

4. Calculate specific discharge (q= Q/A) for each run for each material. Plot you results as a function of -Δh/Δl for each material. Are the results linear for any of the materials?

5. Calculate the hydraulic conductivity (K) based on your relationship between specific discharge and gradient. Provide your answer in both m/s and ft/day. Use Darcy’s Law: Q= -KA (dh/dl).

6. Compare the hydraulic conductivity for each material. Describe which materials (a-c) had the fastest and slowest. Explain why.

7. Add a few drops of food coloring to the water reservoir before a flow run. Describe how the colored water moves through the sediment.