FLINN SCIENTIFIC

Name_____

Activity A. Permeability and Porosity

Observations and Results

Data Table. Permeability and Porosity

Soil Type	Initial Time (s)	Amount of Water Remaining in Graduated Cylinder (mL)	Pore Space Volume (mL)	Water Drained from Tube (mL)	Water Retained (mL)
Sand					
Gravel					

1. Define porosity and permeability. How do they compare?

2. Use Equation 1 from the previous page to calculate the percent porosity of each soil sample. Show all work.

   Sand _____

   Gravel _____

3. What is the relationship between the porosity and the grain (particle) size of each soil sample?

4. Which type of soil retained more water? Why?

5. Calculate the permeability of each soil type using the following equation:

   Permeability = 1/Initial time for water to reach the bottom of tube

   Sand _____

   Gravel _____

6. What is the relationship between the permeability and the grain (particle) size of each soil sample?

7. Which soil type tested in this activity would cause the most water runoff? The least?

Activity B. Groundwater Simulation Model

Observations and Results

1. Where is the aerated zone located in the assembled groundwater model?

2. Where is the saturated zone located in the assembled groundwater model?

3. What portion of the model best defines a confined aquifer?

4. What type of groundwater withdrawal was performed when the syringe was used to remove the water from the model?

5. Describe what happened to the water in the pond during this activity.

6. Would the leaking barrel (sponge) in this model be considered a point or non-point pollution source? What about the fertilizer runoff (blue dye) from the farm?

7. Compare and contrast the water withdrawn from tubes (wells) #1, #2 and #3. Detail any contamination that occurred near the three tubes.

Activity C. Permeable Reactive Barriers

Observations and Results

1. Describe the color and appearance of the methylene blue and indigo carmine solutions before and after mixing with iron powder. What are the colors of the oxidized form and the reduced form of each dye? Why does the original color of the dye solution gradually reappear upon standing?

2. What characteristics of an organic redox indicator allow it to function as a model substrate for the reduction of pollutants using metallic iron?

3. Predict how (a) the "mesh" or grain size of the iron particles and (b) the concentration of a pollutant in contaminated groundwater would affect the performance of a permeable reactive barrier.