$$Q = KiA$$

$$K = \frac{Q}{iA}$$

$$K = \frac{\left[\dfrac{\text{Volume ml}\ \dfrac{1\text{cm}^3}{1\text{ml}}}{\text{time sec}}\right]}{\left[\dfrac{(h2 - h1)\text{in}}{\text{distance in}}\right]\left[\pi\left(\text{radius in}\ \dfrac{2.54\text{cm}}{\text{in}}\right)^2\right]} = \frac{\text{XX cm}}{\text{sec}}$$

Reasonable for sand?

Our error last class was that we used a tracer travel time of 7 min for 30cm but it was the length of the tube which is 30 inches

SO calculation of K was fine BUT effective porosity was not

$$Q = KiA$$

$$Q = \frac{1.5\text{cm}^3}{\text{sec}}$$

$$K = \frac{Q}{iA}$$

$$K = \frac{\left[\dfrac{90\ \text{ml}\ \dfrac{1\text{cm}^3}{1\text{ml}}}{60\ \text{sec}}\right]}{\left[\dfrac{(17.5 - 10.8)\text{in}\ (2.54\text{cm/in})}{(45\text{cm})}\right]\left[\pi\left(1\ \text{in}\ \dfrac{2.54\text{cm}}{\text{in}}\right)^2\right]} = \frac{0.2\ \text{cm}}{\text{sec}}$$

Reasonable for sand?

$i = 0.37$

$A = 20\text{cm}^2$

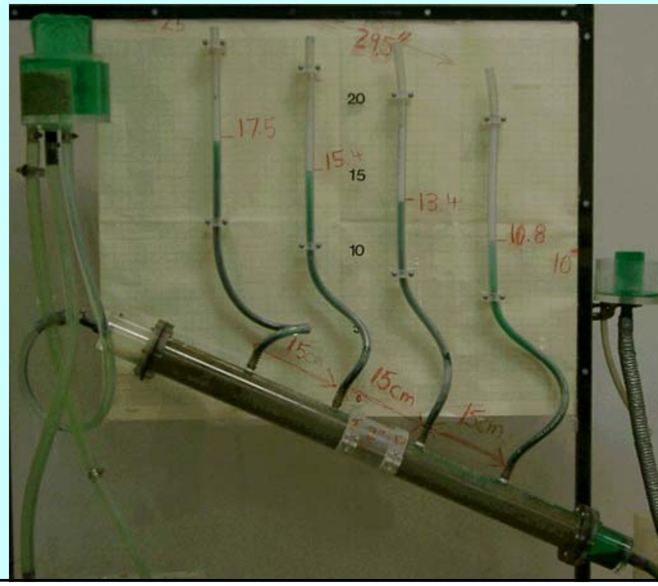
Yes see:

http://en.wikipedia.org/wiki/Hydraulic_conductivity#Ranges_of_values_for_natural_materials

How will flow change if we rotate the sand column? What if we bend the column?

Flow will not change if we rotate column

Average flow will not change if we bend column but will be slower on short side and faster on long side



Our error last class was that we used a tracer travel time of 7 min for 30cm but it was the length of the tube which is 30 inches
SO the effective porosity calculation was wrong, correcting that:

Calculate Effective Porosity using data from Darcy Apparatus

What measurements will you need?

Travel time of a tracer through the sand =

What equation will you solve?

$$\phi = \frac{V_{darcy}}{V_{tracer}} = \frac{\dfrac{Q = \frac{1.5\,cm^3}{sec}}{A = 20\,cm^2}}{\dfrac{30in \cdot 2.54cm/in}{7min \cdot 60sec/min}} = \frac{0.075\ cm/sec}{0.18\ cm/sec} = 0.41$$

I got the column up and running again after class and collected new data

$Q = KiA$

$K = \dfrac{Q}{iA}$

$Q = \dfrac{2.3\,cm^3}{sec}$

Recall the sand has been removed and replaced since the prior measurements, so we do not expect the same value of K

$$K = \frac{\left[\dfrac{140\ ml\ \dfrac{1cm^3}{1ml}}{60\ sec}\right]}{\left[\dfrac{(\ 2.5\ )in}{(45cm)\ (1in/2.54cm)}\right]\left[\pi\left(1\ in\ \dfrac{2.54cm}{in}\right)^2\right]} = \frac{0.8\ cm}{sec}$$

$i = 0.14$

$A = 20cm^2$

Reasonable for sand?

Yes see:

http://en.wikipedia.org/wiki/Hydraulic_conductivity#Ranges_of_values_for_natural_materials

Calculate Effective Porosity using data from Darcy Apparatus

What measurements will you need?

Travel time of a tracer through the 30 inch tube = 300 sec

What equation will you solve?

$$\phi = \frac{V_{darcy}}{V_{tracer}} = \frac{\dfrac{Q = \dfrac{2.3cm^3}{sec}}{A = 20cm^2}}{\dfrac{30in\ \dfrac{2.54cm}{in}}{300\ sec}} = \frac{0.1\ cm/sec}{0.254\ cm/sec} = 0.39$$