

Task 6-5 Darcy's Law Permeameter Demonstration Feb. 21, 2023

DATA TABLE FOR PERMEAMETER EXPERIMENT

$Q = K I A = K \frac{\Delta h}{\Delta L} A$
 $K = \frac{Q}{I A}$
 $Q = \frac{VOL}{TIME} = \frac{cm^3}{sec}$
 $I = \frac{\Delta h}{\Delta L} = \frac{3in}{3in}$
 $CROSS SECTIONAL AREA = \pi r^2$
 $A = 45.6 cm^2$
 $K = \frac{cm^3/sec}{(I)(45.6 cm^2)} = \frac{cm}{sec} = CONDUCTIVITY$
 $PERMEABILITY$

DIAMETER = 3in
 $r = \frac{D}{2} = 1.5in$
 Area Circle = πr^2
 $r = 3.81cm$
 $A = 45.6 cm^2$

#	Diameter	Time	Flow	Head	L
				cm	cm
1	3" = 7.62cm	30sec	350ml 350cm ³	38cm	8cm
2	3" = 7.62cm	20sec	500ml 500cm ³	1cm	8cm
3	3" = 7.62cm	20sec	500ml 500cm ³	0.5cm	8cm

A B C
 DH ✓ ✓ ✓
 L 3in 3in 3in
 A πr^2 ✓ ✓ ✓

Objective: given three different materials (1) fine sand, (2) coarse sand, and (3) very coarse sand-granules; determine the K (hydraulic conductivity value in units of cm/sec) by using the permeameter data from Feb. 21, 2023 and Darcy's Law Equation. Show all of your unit algebra and math work.

Answer Key:

(1) K (fine sand) = 0.05 cm/sec

(2) K (coarse sand) = 4.4 cm/sec

(3) K (very coarse sand) = 8.8 cm/sec

$$Q_1 = \frac{350 \text{ cm}^3}{30 \text{ sec}} = 11.7 \frac{\text{cm}^3}{\text{sec}}$$

$$Q_2 = \frac{500 \text{ cm}^3}{20 \text{ sec}} = 25 \frac{\text{cm}^3}{\text{sec}}$$

$$Q_3 = \frac{500 \text{ cm}^3}{20 \text{ sec}} = 25 \frac{\text{cm}^3}{\text{sec}}$$

~~TRK~~ 6-5
KEY

$$K = \frac{Q}{IA} = \frac{11.7 \frac{\text{cm}^3}{\text{sec}}}{4.75 (45.6 \text{ cm}^2)} = \boxed{0.05 \frac{\text{cm}}{\text{sec}}}$$

FINE

$$K = \frac{Q}{IA} = \frac{25 \text{ cm}^3/\text{sec}}{(0.125) (45.6 \text{ cm}^2)} = \boxed{4.4 \frac{\text{cm}}{\text{sec}}}$$

MEDIUM

$$K = \frac{Q}{IA} = \frac{25 \text{ cm}^3/\text{sec}}{(0.0625) (45.6 \text{ cm}^2)} = \boxed{8.8 \frac{\text{cm}}{\text{sec}}}$$

COARSE