

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

DATA TABLE FOR PERMEAMETER EXPERIMENT

$Q = K I A = K \frac{\Delta h}{\Delta L} A$

$K = \frac{Q}{I A}$

$Q = \frac{VOL}{TIME} = \frac{cm^3}{sec}$

$I = \frac{\Delta h}{\Delta L} = \frac{3in}{3in}$

$K = \frac{cm^3/sec}{(I)(45.66cm^2)} = \frac{cm}{sec} = \text{CONDUCTIVITY}$

DIAMETER = 3in  
 $r = \frac{D}{2} = 1.5in$

Area Circle =  $\pi r^2$   
 $r = 3.81cm$   
 $A = 45.6cm^2$

A	B	C
$\Delta h \checkmark$	$\checkmark$	$\checkmark$
$L \checkmark$	$\checkmark$	$\checkmark$
$A \checkmark$	$\checkmark$	$\checkmark$

PERMEABILITY

#	Diameter	Time	Flow	Head	$L$
1	3" = 7.62cm	30sec	350ml 350cm <sup>3</sup>	38cm	8cm
2	3" = 7.62cm	20sec	500ml 500cm <sup>3</sup>	1cm	8cm
3	3" = 7.62cm	20sec	500ml 500cm <sup>3</sup>	0.05cm	8cm

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

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

~~TRK~~ 6-5  
KEY

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

FINE

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

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

MEDIUM

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

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

COARSE