7.7

$K_1 = 6.5$

$K_2 = 6.6$

20mL VOLUME

5cm DIAMETER

10mL/min

$\varepsilon = 0.3$

"JUST SEPARATE THE TWO COMPOUNDS"

INJECTION IS MADE OVER PERIOD OF 2 MINUTES;

THUS A SEPARATION OF 2 MINUTES WILL JUST SEPARATE THE COMPOUNDS.

$$V = \frac{10 cm^3/min}{\pi (2.5^2) cm^2} = 0.509 cm/min$$ SUPERFICIAL VELOCITY

ACTUAL VELOCITY OF #1

$$u_1 = \frac{V}{\varepsilon + K_1(1-\varepsilon)} = \frac{0.509}{0.3 + 6.5(0.7)} = 0.10495 cm/min$$

ACTUAL VELOCITY OF #2

$$u_2 = \frac{V}{\varepsilon + K_2(1-\varepsilon)} = \frac{0.509}{0.3 + 6.6(0.7)} = 0.10346 cm/min$$

LET $L$ = LENGTH ~~OF~~ OF COLUMN

#1 WILL TAKE A TIME OF $\frac{L}{u_1}$ TO TRAVEL THROUGH COLUMN

#2 WILL TAKE A TIME OF $\frac{L}{u_2}$ TO TRAVEL THROUGH COLUMN (THIS IS A LONGER TIME, SINCE #2 HAS A LOWER VELOCITY),

I WANT DIFFERENCE BETWEEN THESE TIMES TO BE 2 MINUTES:

$$2 min = \frac{L}{u_2} - \frac{L}{u_1} = L\left(\frac{1}{0.1035} - \frac{1}{0.1050}\right)$$

$$\underline{\underline{L = 14.6 cm}}$$