Phys102 (Sec # 42) Quiz # 8 (Ch. ~~23&24~~ 25/26)

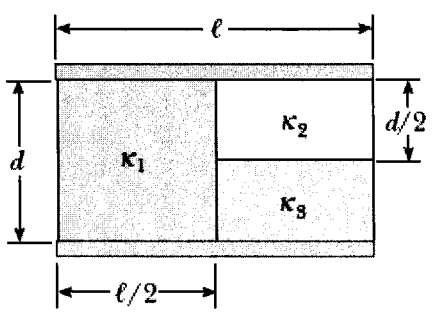
Name: Key ID #

1- A 10 V battery is applied across a 15 W device. How much charge goes through the device in 4.0 hours? (Ans: 2.2×10^4 C)

$$q = it = \frac{P}{V}t = \frac{15}{10}\frac{C}{s}(3600\,s)\times 4$$

$$= 2.16 \times 10^4\ C$$

2- A parallel-plate capacitor is constructed by filling the space between two square plates with blocks of three dielectric materials, as in the Figure. You may assume that ! ,, *d*. (a) Find an expression for the capacitance of the device in terms of the plate area *A* and *d*, κ_1, κ_2, and κ_3.



$$C_1 = \frac{\kappa_1 \epsilon_0 A/2}{d};\ C_2 = \frac{\kappa_2 \epsilon_0 A/2}{d/2};\ C_3 = \frac{\kappa_3 \epsilon_0 A/2}{d/2}$$

$$\left(\frac{1}{C_2}+\frac{1}{C_3}\right)^{-1} = \frac{C_2 C_3}{C_2+C_3} = \frac{\epsilon_0 A}{d}\left(\frac{\kappa_2\kappa_3}{\kappa_2+\kappa_3}\right)$$

no need

$$C = C_1 + \left(\frac{1}{C_2}+\frac{1}{C_3}\right)^{-1} = \boxed{\frac{\epsilon_0 A}{d}\left(\frac{\kappa_1}{2}+\frac{\kappa_2\kappa_3}{\kappa_2+\kappa_3}\right)}$$

up to here is enough.

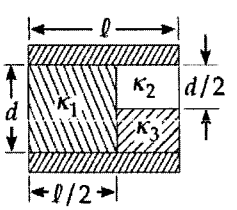


FIG. P26.61