Sample Problem 25.06

Main Problem 48-52, 70

25.06

a) $$C_0 = \frac{\epsilon_0 A}{d}$$

$$= \frac{8.854 \times 10^{-12} \times 115 \times 10^{-4}}{1.24 \times 10^{-2}} \text{ F}$$

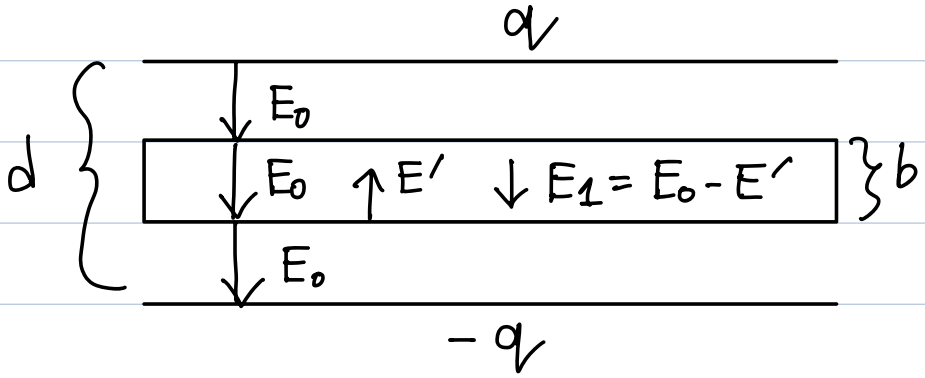
$$= 8.21 \times 10^{-12} \text{ F}$$

b) $$q = C_0 V_0$$

$$= 8.21 \times 10^{-12} \times 85.5$$

$$= 7.02 \times 10^{-10} \text{ C}$$

c)



$$k \oint \vec{E_0} \cdot d\vec{A} = \frac{q}{\epsilon_0}$$

$$\Rightarrow \oint \cdot \vec{E_0} \cdot d\vec{A} = \frac{C_0 V_0}{\epsilon_0}$$

$$\Rightarrow \oint E_0 \, dA \cos 0° = \frac{C_0 V_0}{\epsilon_0}$$

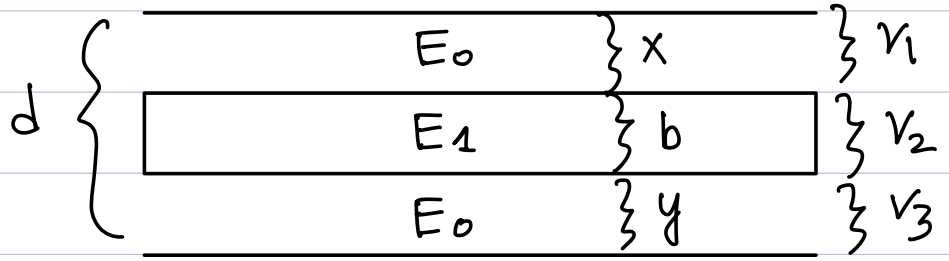
$$\Rightarrow E_0 \oint dA = \frac{C_0 V_0}{\epsilon_0}$$

$$\Rightarrow E_0 A = \frac{C_0 V_0}{\epsilon_0}$$

$$\therefore E_0 = \frac{C_0 V_0}{\epsilon_0 A}$$

d) $$E_1 = E_0 \frac{1}{k} = \frac{C_0 V_0}{A \epsilon_0} \times \frac{1}{k}$$

e)



$$V = V_1 + V_2 + V_3$$

$$= E_0 x + E_1 \cdot b + E_0 y$$

$$= E_0 (x+y) + E_1 \cdot b$$

$$= E_0 (d-b) + E_1 \cdot b$$

$$x + b + y = d$$

$$x + y = d - b$$

f) $q_V = C_0 V_0 = CV$

$$\Rightarrow \frac{C_0 V_0}{V} = C$$

48) Area ডাস হলে Parallel

Separation হলে Series

$$C_1 = \frac{\epsilon A}{d}$$

$$= \frac{K_1 \epsilon_0 A/2}{d}$$

$$C_2 = \frac{K_2 \epsilon_0 A/2}{d}$$

$$C_p = C_1 + C_2$$

40) $$C_1 = \frac{k_1 \epsilon_0 A}{d/2}$$

$$C_2 = \frac{K_2 \epsilon_0 A}{d/2}$$

$$\frac{1}{C_3} = \frac{1}{C_1} + \frac{1}{C_2}$$

50) Try this at home

51) $C = 100 \times 10^{-12}\ F$

$A = 100 \times 10^{-4}\ m^2$

$K = 5.4$

$V = 50\ V$

a) $V = Ed$ $\qquad C = \frac{K\epsilon_0 A}{d}$

$V = E\,\frac{K\epsilon_0 A}{C}$ $\qquad \Rightarrow d = \frac{K\epsilon_0 A}{C}$

$\Rightarrow \frac{VC}{K\epsilon_0 A} = E$

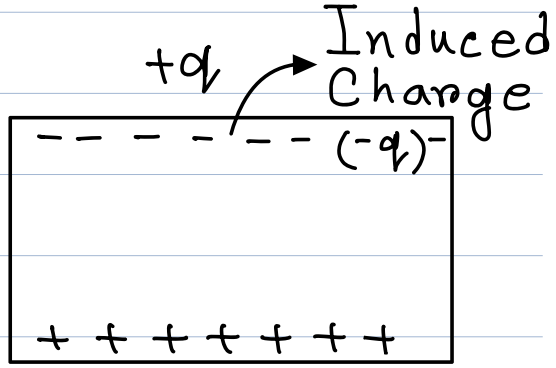
$\Rightarrow E = \frac{q}{k\epsilon_0 A}$

$k \oint \vec{E} . d\vec{A} = \frac{q}{\epsilon_0}$

$\Rightarrow kEA = \frac{q}{\epsilon_0}$

$\Rightarrow E = \frac{q}{K\epsilon_0 A}$

b) $q = CV$



c) $\frac{q}{k} = q - q'$

$\Rightarrow q' = q - \frac{q}{k}$

$\Rightarrow q' = q\left(1 - \frac{1}{k}\right)$

52)

a) Try this at home.

b) Try this at home.

c) Try this at home.

d) Try this at home.

70) Try this at home.