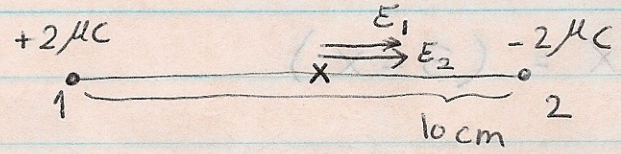
1-



$$E_1 = k_e \frac{2\times10^{-6}}{(5\times10^{-2})^2}\ N/C \qquad E_2 = k_e \frac{2\times10^{-6}}{(5\times10^{-2})^2}\ N/C$$

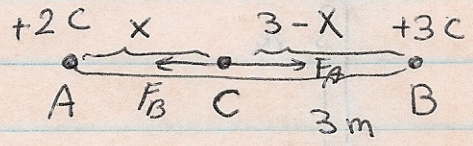
$$E_{tot} = E_1 + E_2 = k_e \frac{2\times2\times10^{-6}}{(5\times10^{-2})^2} = \boxed{14.4\times10^{6}\ N/C}$$

2-

$$F = k_e \frac{q_1 q_2}{r^2}$$

$$[N] = k_e \frac{[C][C]}{[m^2]} \Rightarrow [k_e] = \boxed{\frac{[N][m^2]}{[C^2]}}$$

3-



$$F_A - F_B = 0 \qquad F_A = F_B$$

$$F_A = k_e \frac{q_A q_C}{x^2} = k_e \frac{2q_C}{x^2}$$

$$F_B = k_e \frac{q_B q_C}{(3-x)^2} = k_e \frac{3q_C}{(3-x)^2}$$

$$k_e \frac{2q_C}{x^2} = k_e \frac{3q_C}{(3-x)^2}$$

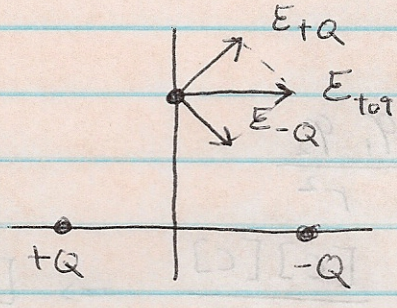
$$\frac{3}{2}x^2 = (3-x)^2$$

$$\sqrt{\tfrac{3}{2}}\,x = (3-x)$$

$$x\left(\sqrt{\tfrac{3}{2}}+1\right) = 3 \quad \Rightarrow \quad x = \frac{3}{\sqrt{\tfrac{3}{2}}+1}$$

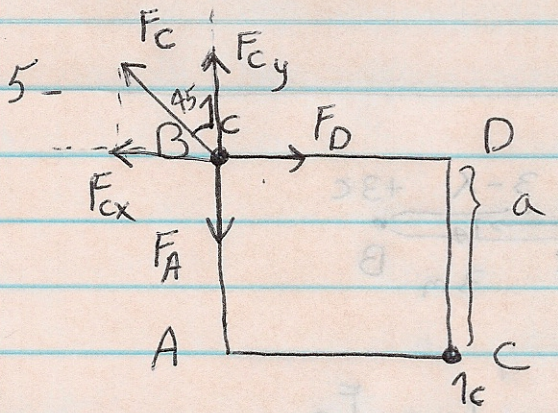
$$\boxed{x = 1.35\ \text{m}}$$

4-



$\Rightarrow$ the answer is E_A

5-



$$F_A = F_{cy} \qquad F_{cy} = F_c \cos 45 = \frac{\sqrt{2}}{2} F_c$$

$$F_A = k_e \frac{(q_A)(1)}{a^2} = \frac{\sqrt{2}}{2} k_e \frac{(1)(1)}{(\sqrt{2})^2 a^2} \Rightarrow q_A = \frac{\sqrt{2}}{4}$$

$$\Rightarrow q_A = \boxed{-0.35\,\text{C}}$$

6. b

The electric field inside a conductor is zero
Section 15.6

7. $v_e = 2 \times 10^6 \ m/s$

$E = 500 \ N/C$

$F = qE = 1.6 \times 10^{-19} \times 500 = 8 \times 10^{-17} \ N$

$F = ma \Rightarrow a = \frac{F}{m} = \frac{8 \times 10^{-17}}{9.11 \times 10^{-31}} = 8.78 \times 10^{13} \ m/s^2$

$a = \frac{v_f - v_i}{t} = \frac{0 - 2 \times 10^6}{t} = 8.78 \times 10^{13}$

$t = \frac{2 \times 10^6}{8.78 \times 10^{13}} = \boxed{2.3 \times 10^{-8} \ s}$

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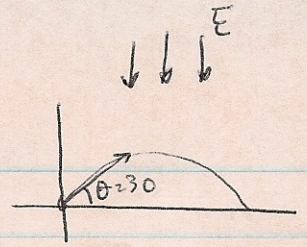
8. $E = 6 \times 10^5 \ N/C$

$F = qE = 1.6 \times 10^{-19} \times 6 \times 10^5 = 9.6 \times 10^{-14} \ N$

$F = ma \Rightarrow a = \frac{F}{m} = \frac{9.6 \times 10^{-14}}{9.11 \times 10^{-31}} = \boxed{1.0 \times 10^{17} \ m/s^2}$

9-



$$F = qE = ma \Rightarrow a_y = \frac{qE}{m} = \frac{1.6\times10^{-19}\times400}{1.6\times10^{-27}}$$

$$a_y = 3.83\times10^{16}$$

$$y = v_{oy}t - \tfrac{1}{2}a_y t^2 = 0 \Rightarrow t = \frac{2v_{oy}}{a_y}$$

$$v_{oy} = v_o \sin\theta \Rightarrow t = \frac{2(3\times10^{4})\sin30}{3.83\times10^{16}} = \boxed{7.8\times10^{-7}\ s}$$

10-

$$2ax = v_f^2 - v_i^2$$

$$(2)a(2\times10^{-2}) = (1.6\times10^{+7})^2$$

$$a = \frac{(1.6\times10^{7})^2}{4\times10^{-2}} = 6.4\times10^{15}\ m/s^2$$

$$F = ma = 9.11\times10^{-31}\times6.4\times10^{15} = 5.83\times10^{-15}\ N$$

$$E = \frac{F}{q} = \frac{5.83\times10^{-15}}{1.6\times10^{-19}} = 36437.5\ N/C$$

close to $\boxed{36400\ N/C}$