p. 656 (39, 40, 43, 52, 55)

39. 7.0×10^{13} ⊕ $- 4.0 \times 10^{13}$ ⊖

$= 3.0 \times 10^{13}$ ⊕ surplus

$$\frac{3.0 \times 10^{13} \text{ protons}}{1 \text{ proton}} \left| \frac{+1.60 \times 10^{-19} \text{ C}}{} \right. = \boxed{+4.8 \times 10^{-6} \text{ C}}$$

40. a) $a = 6.3 \times 10^3 \frac{m}{s^2}$ $\quad F = ma$

$m_{e^-} = 9.109 \times 10^{-31} \text{ kg}$ $\quad F = (9.109 \times 10^{-31} \text{ kg})(6.3 \times 10^3 \frac{m}{s^2})$

$= \boxed{5.7 \times 10^{-27} \text{ N} \text{ direction opposite to } \vec{E}}$

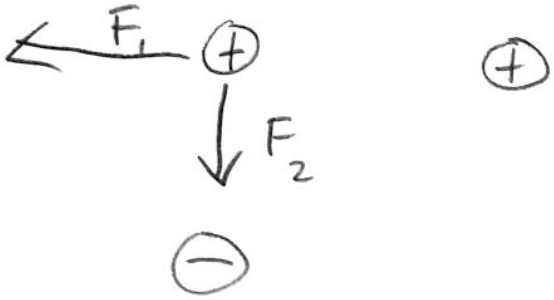
b) $E = \frac{F_{elec}}{q_0}$ $\quad q_0 = -1.60 \times 10^{-19} \text{ C}$

$F_{elec} = 5.7 \times 10^{-27} \text{ N}$

$$E = \frac{5.7 \times 10^{-27} \text{ N}}{-1.60 \times 10^{-19} \text{ C}} = \boxed{3.6 \times 10^{-8} \frac{N}{C}}$$

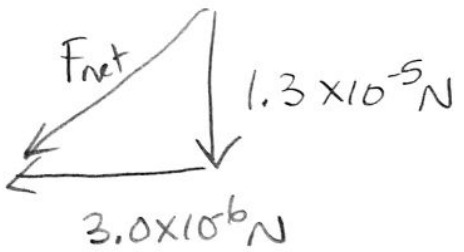
p. 656

43. a) $F_{elec} = ?$ $\quad F_{elec} = K_c \frac{q_1 q_2}{r^2}$



$$F_1 = \frac{(8.99\times10^9 \frac{N m^2}{C^2})(5.0\times10^{-9} C)(6E-9}{(.30m)^2}$$

$$= 2.9967 \times 10^{-6} N \text{ left}$$



$$F_2 = \frac{K_c (5.0\times10^{-9} C)(3.0\times10^{-9} C)}{(.10m)^2}$$

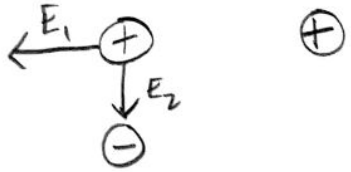
$$= 1.3485 \times 10^{-5} N \text{ down}$$

$F_{net} =$ **1.4×10^{-5} N**

77° below x-axis

(13° from y-axis)

43 b) $\quad E = \frac{K_c q}{r^2}$



$$E_1 = \frac{K_c (6.0\times10^{-9} C)}{(.30m)^2} = 599.3 \frac{N}{C}$$

$$E_2 = \frac{K_c (3.0\times10^{-9} C)}{(.10m)^2} = 2697 \frac{N}{C}$$

$E_{net} =$ **$2.8 \times 10^3 \frac{N}{C}$ @ 77° below x-axis**

or 13° from y-axis

52. a) $0.0 \frac{N}{C}$

b) @ surface $r = 1.0\,m$

$$E = \frac{k_c q}{r^2} = k_c \frac{(2.0\times10^{-4}C)}{(1.0m)^2}$$

$$= \boxed{1.8\times10^{6}\frac{N}{C}}$$

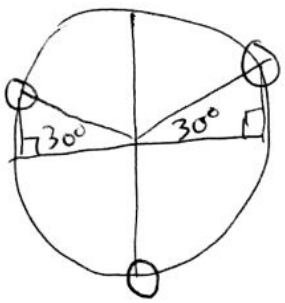
b) $r = 4.0\,m$

$$E = k_c \frac{(2.0\times10^{-4}C)}{(4.0m)^2} = \boxed{1.1\times10^{5}\frac{N}{C}}$$

55. $q_1 = q_2 = q_3 = 5.0\,\mu C$

$r = 2.0\,m$ $\quad E_1 = E_2 = E_3 = k_c \frac{(5.0\times10^{-6}C)}{(2.0m)^2}$

$= 11,238\frac{N}{C}$



	x-component	y-component
E_1	$(11,238\frac{N}{C})\cos(30°)$ = 9732 N/C right	$(11,238\frac{N}{C})\sin(30°)$ = 5618.8 N/C down
E_2	9732 N/C left	5618.8 N/C down
E_3	0 N/C	11,238 N/C up
	$9732\frac{N}{C} - 9732\frac{N}{C} = 0$	$11,238\frac{N}{C} - 2(5618.8\frac{N}{C}) = 0$

$\boxed{0\,N/C}$