#1, 7, 13, 22, 28, 33, 41 Alex Yeoh

(a) $2\,nC \left|\frac{1\,C}{1\cdot10^{9}\,nC}\right|\frac{1\,e}{1.6\cdot10^{-19}\,C} = 1.25\cdot10^{10}$ electrons

b) $0.5\,\mu C \left|\frac{1\,C}{1\cdot10^{6}\,\mu C}\right|\frac{1\,e}{1.6\cdot10^{-19}\,C} = 3.125\cdot10^{12}$ electrons

7) Total electrons: $50\,g \left|\frac{1\,mol}{63.5\,g}\right|\frac{6.022\cdot10^{23}\,atoms}{1\,mol}\left|\frac{29\,e}{1\,atoms}\right. = 1.38\cdot10^{25}$ electrons

removed electrons: $2\,\mu C \left|\frac{1\,C}{1\cdot10^{6}\,\mu C}\right|\frac{1\,e}{1.6\cdot10^{-19}\,C} = 1.25\cdot10^{13}$ electrons

fraction removed $= \frac{1.25\cdot10^{13}}{1.38\cdot10^{25}} = 9.09\cdot10^{-13}$

13) $F_1 = \frac{kq_1q_2}{r_1^2}$ $F_2 = \frac{kq_1q_2}{r_2^2}$ $F_1 = 25F_2$

$$\frac{kq_1q_2}{r_1^2} = 25\frac{kq_1q_2}{r_2^2}$$

$$r_2^2 = 25r_1^2$$

$$\frac{r_2}{5} = r_1$$

distance was decreased by a factor of $\frac{1}{5}$

22) $F = mg = k\frac{q_1q_2}{r^2}$

$$r^2 = k\frac{q_1q_2}{mg}$$

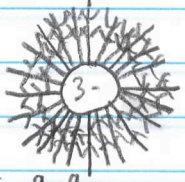
$$r = \sqrt{k\frac{q_1q_2}{mg}} = \sqrt{9\cdot10^{9}\cdot\frac{1.6\cdot10^{-19}\cdot1.6\cdot10^{-19}}{1.67\cdot10^{-27}\cdot9.8}} = 0.119\,m$$

28) $F = Eq = 250\cdot(3.50\cdot10^{-6}) = 8.75\cdot10^{-4}$ N, east

33a)

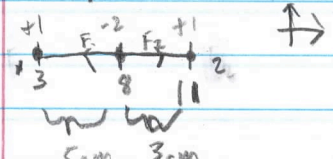
pointing outwards

b)



3x more lines pointing inwards

41) $F = \frac{q_1q_2}{r^2}k$



$F_1 = 9\cdot10^{9}\left(\frac{1\cdot10^{-6}\cdot2\cdot10^{-6}}{0.05^2}\right) = 7.2N$

$F_2 = 9\cdot10^{9}\left(\frac{1\cdot10^{-6}\cdot2\cdot10^{-6}}{0.03^2}\right) = 20N$

Net Force $= -F_1 + F_2 = -7.2 + 20 = 12.8N$ ~~in the positive x direction~~