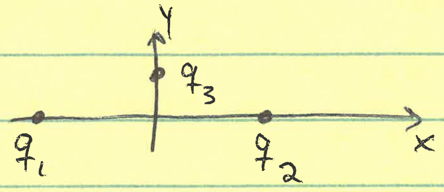
Ch 7 Solutions

30)



$\Delta k = -\Delta U = U_i - U_f$

$= kq_3\left[\left(\frac{q_1}{r_{13_i}} + \frac{q_2}{r_{23_i}}\right) - \right.$

if we define $q = q_1 = q_2$:

$= 2kqq_3\left(\frac{1}{r_i} - \frac{1}{r_f}\right)$

$\Delta k = \frac{1}{2}mv_f^2 - \cancel{\frac{1}{2}mv_i^2}^{\,0} \Rightarrow v_f = \sqrt{2\Delta k/m} = \boxed{472.0\,m/s}$

36) $\Delta V = E\Delta x \rightarrow E = \frac{\Delta V}{\Delta x} = \boxed{1.50 \cdot 10^6 \frac{V}{m}}$

46) a) $V = \frac{kQ}{r} \rightarrow r = kQ/V = \boxed{90.0\,m}$ b) $\boxed{45.}$

50) a) $V = kQ/r \rightarrow Q = Vr/k = \boxed{2.78 \cdot 10^{-7}\,C}$

b) $\Delta k = -\Delta U = kQq\left(\frac{1}{r_i} - \cancel{\frac{1}{r_f}}^{\,0}\right) = Vq \Rightarrow q = \frac{mv^2}{2V} =$

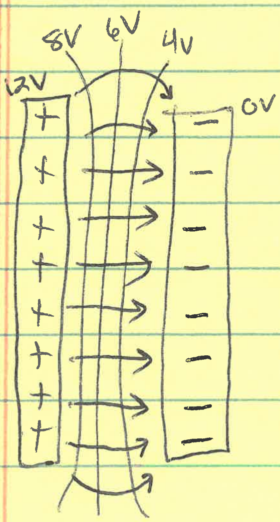
52) a) $V = \frac{kQ_1}{r_1} + \frac{kQ_2}{r_2}$ where $Q_1 = 5mC$, $r_1 = 2cm$, $Q_2 = -10mC$, $r_2 = 6cm$ $\boxed{V =}$

b) $Q_1 = 5mC$ $r_1 = 6cm$ $Q_2 = -10mC$ $r_2 = 2cm$ $\boxed{V = -3.75 \cdot 10^9}$

c) = d) where $r_1 = r_2 = 5cm$ $\boxed{V = -9.00 \cdot 10^8\,V}$

56) $\vec{E} = -\frac{\partial V}{\partial x}\hat{\imath} - \frac{\partial V}{\partial y}\hat{\jmath} - \frac{\partial V}{\partial z}\hat{k} = \boxed{(y^2z - 4y)\hat{\imath} + (2xyz - 4x)\hat{\jmath}}$

58)



see figure 7.35

60) a) $V(r\to\infty) = 0$ and since $\vec{E} = 0$ outside the shell,

b) $V(r=2cm) - \cancel{V(r=5cm)}^{0} = -\int_{5cm}^{2cm} \vec{E}\cdot d\vec{l} = -kq\int_{5cm}^{2cm} \frac{dr}{r^2} = -kq\left(\frac{1}{0.0\ldots}\right.$

c) $V(r) - \cancel{V(r=5cm)}^{0} = -\int_{5cm}^{r} \vec{E}\cdot d\vec{l} = -kq\int_{5cm}^{r} \frac{dr}{r^2} = kq\,\frac{1}{r}\Big|_{5cm}^{r} = \boxed{45\ldots}$

d) $\vec{E} = 0$ inside sphere $\Rightarrow$ $V(\text{inside}) = V(r=2cm) = \boxed{1.35 \times 10^6\,V}$

e) $\boxed{0}$

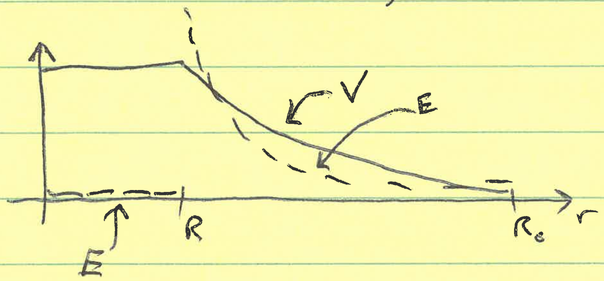
62) a) $\boxed{\vec{E}(r<R) = 0}$ since it's a conductor

$\boxed{\vec{E}(r>R) = \frac{\lambda}{2\pi\epsilon_0 r}\hat{r}}$ p.255 of Openstax

b) Choose $V(R_0)$ to be 0 where $R_0 > R$

$\rightarrow V(r) - \cancel{V(R_0)}^{0} = -\int_{R_0}^{r} \frac{\lambda}{2\pi\epsilon_0 r}\,dr\,\cos 0^\circ = \frac{-\lambda}{2\pi\epsilon_0}\ln r\Big|_{R_0}^{r}$

inside the conductor, $\vec{E} = 0$ and $V = \text{constant} = \boxed{\frac{\lambda}{2\pi\epsilon_0}\ln\ldots}$



78) $\Delta V = E\Delta x \Rightarrow \Delta x = \frac{\Delta V}{E} = \boxed{3.33\,m}$