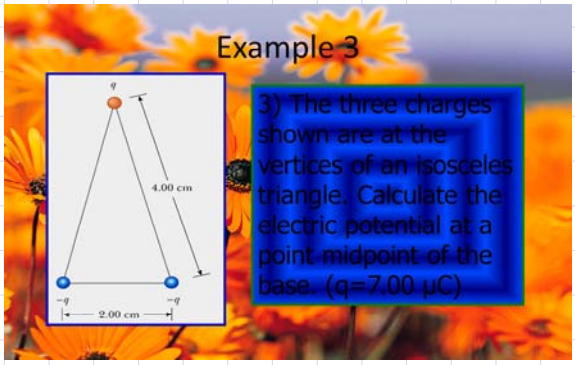
Example 3

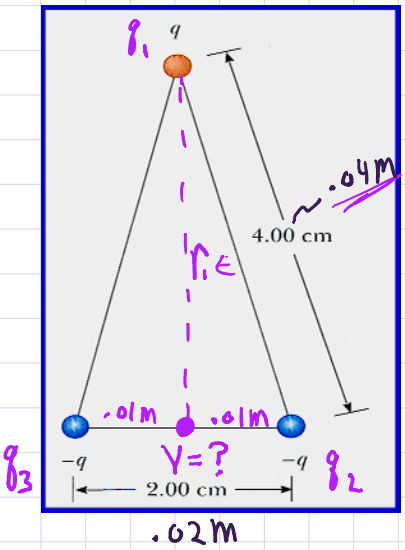
Monday, February 16, 2015 7:37 AM

$V \Rightarrow \frac{J}{C}$

$q = 7 \times 10^{-6} C$

$V = k\frac{q}{r}$





$r_1^2 + (.01m)^2 = (.04m)^2$

$r_1 = \sqrt{(.04m)^2 - (.01m)^2}$

$r_1 = .122m$

$V = V_1 + V_2 + V_3$

$V = k\frac{q_1}{r_1} + k\frac{q_2}{r_2} + k\frac{q_3}{r_3}$

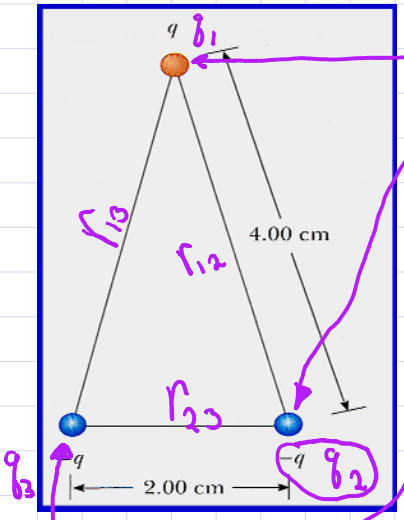
$V = kq\left(\frac{1}{r_1} - \frac{1}{r_2} - \frac{1}{r_3}\right) = \left(9\times10^9 N\frac{m^2}{C^2}\right)(7\times10^{-6}C)\left[\frac{1}{.122m} - \frac{1}{.01m} - \frac{1}{.01m}\right]$

$V = -1.2\times10^7 V$

$W = Fd\cos\theta$

-12083606.55737704918032786852459

What is the Total PE?



∞ q_1 q_2 q_3

$V_i = 0$

$W_1 = 0$

$W_2 = q_2\Delta V_1 = q_2(V_f - V_i)$

$W_2 = q_2\left(k\frac{q_1}{r_{12}}\right) = \left(9\times10^9 N\frac{m^2}{C^2}\right)\frac{(-7\times10^{-6}C)(+7\times10^{-6}C)}{.04m}$

$W_2 = -11.03 J$

$W_3 = q_3\Delta V = q_3(\Delta V_1 + \Delta V_2)$

$W_3 = q_3\left[(V_{1f} - V_{1i}) + (V_{2f} - V_{2i})\right]$

$W_3 = q_3(V_{1f} + V_{2f})$ (−)

$W_3 = q_3\left[k\frac{q_1}{r_{13}} + k\frac{q_2}{r_{23}}\right]$

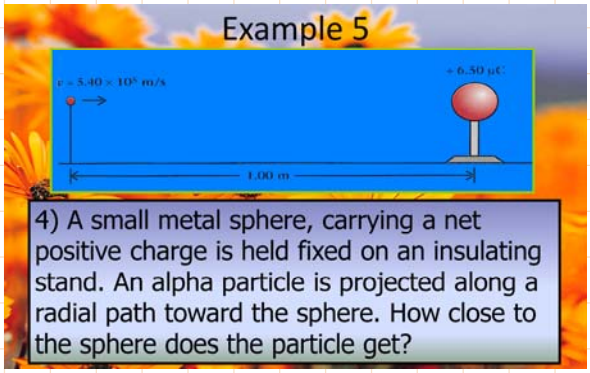
$W_3 = -(7\times10^{-6}C)^2\left(9\times10^9 N\frac{m^2}{C^2}\right)\left[\frac{1}{.04m} - \frac{1}{.02m}\right]$

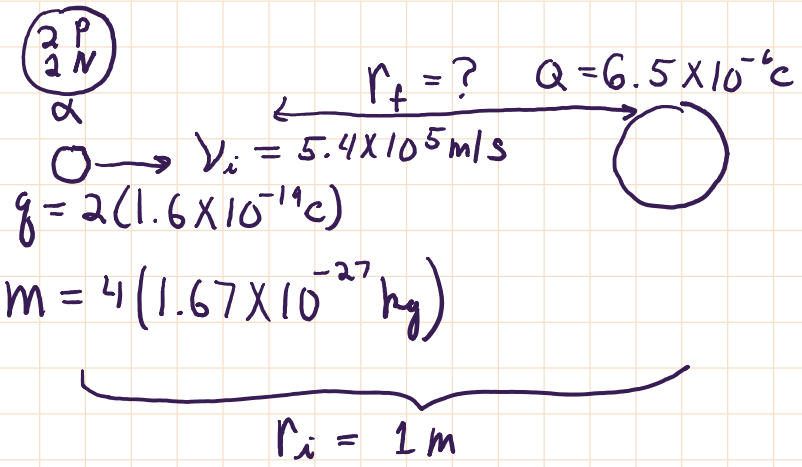
$W_3 = 11.03\ J$

$W_{tot} = W_1 + W_2 + W_3 = 0$

Example 5

Monday, February 16, 2015 7:39 AM





$$\Delta KE + \Delta PE = 0$$

$$KE_f^{\nearrow 0} - KE_i + PE_f - PE_i = 0$$

$$-\tfrac{1}{2} m v_i^2 + q V_f - q V_i = 0$$

$$-\tfrac{1}{2} m v_i^2 + q\left[k\frac{Q}{r_f}\right] - q\left[k\frac{Q}{r_i}\right] = 0$$

$$qQk\left[\frac{1}{r_f} - \frac{1}{r_i}\right] = \tfrac{1}{2} m v_i^2$$

$$\frac{1}{r_f} - \frac{1}{r_i} = \frac{m v_i^2}{2qQk}$$

$$\frac{1}{r_f} = \frac{1}{r_i} + \frac{m v_i^2}{2qQk}$$

$$\frac{1}{r_f} = \frac{1}{1m} + \frac{(4)(1.67\times10^{-27} kg)(5.4\times10^5 m/s)^2}{2(2)(1.6\times10^{-19} C)(6.5\times10^{-6} C)\left(9\times10^9 N\frac{m^2}{C^2}\right)}$$

$$\frac{1}{r_f} = 1.052/m$$

$$r_f = .95\ m$$