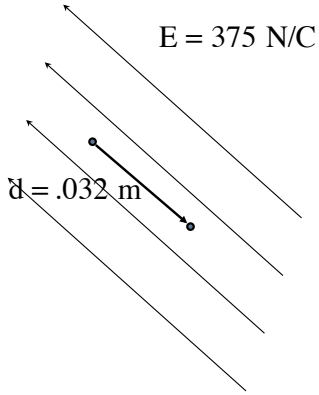
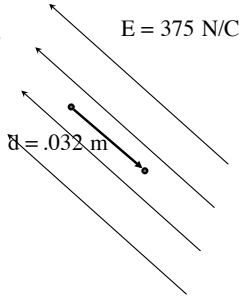
16.1)



a.) how much work done?
b.) potential energy change of electron?
c.) final velocity
d.) potential difference moved through

1.) (con't)

a.) How much work is done on electron's motion?



$$W = F \bullet d$$

$$\Rightarrow \frac{W}{q} = \frac{F \bullet d}{q}$$

$$\Rightarrow \boxed{\frac{W}{q} = E \bullet d} \leftarrow \text{On a test, start here}$$

$$\Rightarrow W = q \quad E \quad d \quad \cos\phi$$

$$= (-1.6\text{x}10^{-19})(375)(.032)\cos 180^\circ$$

$$= 1.92\text{x}10^{-18}\ \text{J}$$

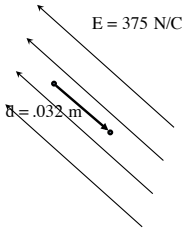
Electrons accelerate opposite the direction of the electric field that accelerates them, as is the case here. The work being done should, therefore, be positive. It is. It wouldn't have calculated that way, though, if you hadn't included the sign of the charge in the numeric calculation. NOTE THIS. It's important!

1.) (con't)

b.) What's electron's potential energy change?

From $W = -\Delta U$, it's equal to minus the answer to part a.

c.) What's the final velocity?



$$W_{net} = \Delta KE$$

$$\Rightarrow W_{net} = \frac{1}{2}mv^2$$

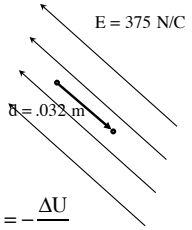
$$\Rightarrow v = \left(\frac{2W_{net}}{m}\right)^{1/2}$$

$$\Rightarrow v = \left(\frac{2\left(1.92\text{x}10^{-18}\ \text{J}\right)}{\left(9.1\text{x}10^{-31}\ \text{kg}\right)}\right)^{1/2}$$

$$\Rightarrow v = 2.05\text{x}10^{6}\ \text{m/s}$$

1.) (con't)

d.) What's the electrical potential change?



We've already done the derivation relating work and electric fields (see right).

$$W = F \bullet d$$

$$\Rightarrow \frac{W}{q} = \frac{F \bullet d}{q}$$

$$\Rightarrow \boxed{\frac{W}{q} = E \bullet d}$$

The relationship between E-flds and voltage differences is derived to the right.

$$W = -\Delta U$$

$$\Rightarrow \frac{W}{q} = -\frac{\Delta U}{q}$$

$$\Rightarrow \boxed{\frac{W}{q} = -\Delta V}$$

Combining the two relationships yields

$$E \bullet d = -\Delta V$$

$$\Rightarrow E\,d\cos\phi = -\left(V_{final} - V_{initial}\right)$$

$$\Rightarrow (375)(.032)\cos 180^\circ = -\Delta V$$

$$\Rightarrow \Delta V = (375)(.032)\ \text{volts.}$$

or

You could take the answer to Part a (i.e., the work done) and divide it by "-q."