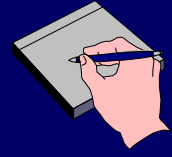
Comparison:
Wavelength of *Photon* vs. *Electron*



You have a photon and an electron, both with 1 eV of energy. Find the de Broglie wavelength of each.

Equations are different - be careful!

- Photon with 1 eV energy:

$$E = \frac{hc}{\lambda} \Rightarrow \lambda = \frac{hc}{E} = \frac{1240\ \text{eV nm}}{1\,\text{eV}} = 1240\ \text{nm}$$

- Electron with 1 eV kinetic energy:

$$\text{KE} = \frac{1}{2}mv^2 \quad \text{and} \quad p = mv, \quad \text{so} \quad \text{KE} = \frac{p^2}{2m}$$

Solve for $p = \sqrt{2m(\text{K.E.})}$

Big difference!

$$\lambda = \frac{h}{\sqrt{2m(\text{KE})}} = \frac{hc}{\sqrt{2mc^2(\text{KE})}} = \frac{1240\ \text{eV nm}}{\sqrt{2(511{,}000\ \text{eV})(1\,\text{eV})}} = 1.23nm$$