

Name _____

Date _____

PH 102 Quiz 8: Quantum Physics

$$\begin{array}{ll}
 E = hf = \frac{hc}{\lambda} & \Delta E \Delta t \geq \frac{h}{4\pi} \quad \Delta x \Delta p \geq \frac{h}{4\pi} \\
 e\Delta V = KE_{\max} = hf - \phi & h = 6.624 \times 10^{-34} \text{ J} \cdot \text{s} \\
 \lambda_{\text{out}} - \lambda_{\text{in}} = \frac{h}{m_e c} (1 - \cos \theta) & e = 1.602 \times 10^{-19} \text{ C} \\
 h = \lambda |\vec{p}| & c = 3.00 \times 10^8 \text{ m/s} \\
 |\vec{p}| = m |\vec{v}| & m_e = 9.11 \times 10^{-31} \text{ kg}
 \end{array}$$

- The resolving power of a microscope is proportional to the wavelength used. A resolution of $1.0 \times 10^{-11} \text{ m}$ (0.010 nm) would be required in order to "see" an atom. If electrons were used (electron microscope), what minimum kinetic energy would be required for the electrons? Ignore relativity.
 - 15 keV
 - 10 MeV
 - 3 keV
 - 125 keV
- Same question as above, but using *photons* in place of electrons.
 - 15 keV
 - 10 MeV
 - 3 keV
 - 125 keV
- Suppose Fuzzy, a quantum-mechanical duck, lives in a world in which $h = 2\pi \text{ J} \cdot \text{s}$. Fuzzy has a mass of 1.75 kg and is initially known to be within a pond 1.00 m wide. What is the minimum uncertainty in his speed?
 - 0.134 m/s
 - 0.571 m/s
 - 0.875 m/s
 - 0.286 m/s
- Calculate the energy of a photon of wavelength 710 nm
 - 75 eV
 - 1.75 eV
 - 2.5 eV
 - 5.0 eV
- A pulsed ruby laser emits light at 694.3 nm. For a 13.6 ps pulse containing 3.40 J of energy, find the number of photons in the pulse.
 - 1.2×10^{19}
 - 9.1×10^{21}
 - 1.9×10^{12}
 - 2.1×10^{91}