
**Problem 3:**
Calculate the de Broglie wavelength, $\lambda$, for:
(a) An electron with kinetic energy $E_k$ of (i) 1.0 eV, and (ii) 100 eV
(b) A singly ionized tungsten atom with kinetic energy $E_k$ of 1.0 eV.
(c) A 2000-kg truck traveling at 20 m/s.

**Problem 4:**
Formulate the Heisenberg uncertainty principle for the energy $E$ (in class, we considered the uncertainty in the momentum $p$). Try to find an example of this principle (for the energy).

**Problem 5:**
When the uncertainty principle is considered, it is not possible to locate a photon in space more precisely than about one wavelength. Consider a photon with wavelength $\lambda=1 \mu$m. What is the uncertainty in the photon’s (a) momentum and (b) energy.

**Problem 6:**
The solution to Schrodinger’s wave equation for a particular one dimensional situation is given by:
$$\psi(x) = \sqrt{2/a_0} * e^{-x/a_0}$$
(1) Determine the probability of finding the particle between the following limits: $0 \leq x \leq a_0/4$
(2) Determine the probability density of finding the particle exactly at $x=0$, if $a_0=2$

**Problem 7:**
An electron in free space is described by a plane wave given by $\Psi(x,t)=Ae^{i(kx-\omega t)}$, where $k=1.5\times10^9$ m$^{-1}$ and $\omega=1.5\times10^{13}$ rad/s.
Considering the wave and particle properties of electron (wave-particle duality), calculate the wavelength, momentum, and kinetic energy (in eV) of this particular electron.