1. [10 pts] A proton’s energy is 1.5 MeV below the top of a 15-fm-wide energy barrier. What is the probability that the proton will tunnel through the barrier?
1. [10 pts] An electron is confined in a harmonic potential well that has a spring constant of 1.5 N/m.
   a. [7 pts] What are the first two energy levels of the electron?

   b. [3 pts] What wavelength photon is emitted if the electron undergoes a transition from the n=2 to n=1 state?
1. [10 pts] An electrical discharge in a neon-filled tube maintains a steady population of $1.0 \times 10^8$ atoms in an excited state with a lifetime of $\tau=30$ ns. How many photons are emitted per second from atoms in this state?
   a. [5 pts] What is the minimum angle between $\vec{L}$ and the $z$-axis?
   b. [5 pts] What is the maximum angle between $\vec{L}$ and the $z$-axis?