1. What characteristic property of light was discovered by Einstein when he considered the experimental features of the photoelectric effect?

2. You are radiating black-body radiation with a peak wavelength of $< \lambda >= 2.9 \times 10^{-3} m/T$, where $T = 310^0 K$ is your normal body temperature in Kelvin degrees. What is the typical energy of the photons that you are radiating?

3. The FM radio station KHPR broadcasts at a frequency of 88.1MHz (i.e. $88.1 \times 10^6 Hz$). What is the energy of photons that this station emits?

4. Suppose that you want to make a diffraction pattern using electrons ($m_e = 9.1 \times 10^{-31} kg$) with speeds of $2 \times 10^6 m/s$. Estimate the width of the slit that you would have to use. Compare this to the diameter of an atom (about $10^{-10} m$).

5. Suppose that you want to make a diffraction pattern using protons ($m_p = 1.7 \times 10^{-27} kg$) with speeds of $2 \times 10^6 m/s$. Estimate the width of the slit that you would have to use. Compare this to the diameter of an atomic nucleus (about $10^{-14} m$).

6. Rutherford discovered the atomic nucleus by looking at how α-particles, which have a mass $M_\alpha = 6.6 \times 10^{-27} kg$ and a speed of $v = 0.03c$, scattered from a gold foil. What is their deBroglie wavelength? Compare this to the diameter of a gold nucleus ($d_{gold} \simeq 10^{-14}m$).

7. A beam of electrons with DeBroglie wavelength $\lambda = 2.0 \times 10^{-10}m$ impinges on the single slit with width $w = 2.0 \times 10^{-10}m$ shown in the top figure below. Sketch the intensity pattern of electrons hitting the screen. Show how this intensity pattern changes when the same beam of electrons impinges on two slits of the same dimension (bottom figure).