1. T&L 5-7

2. 5-22

3. An atom at rest emits a photon. What is the wavelength of the atom?

4. a) Use the DeBroglie hypotheses for energy and momentum to determine the relationship between frequency and wavelength for a relativistic particle of rest mass \( m \). b) Show that your answer leads to the proper relations between frequency and wavelength for light, and for nonrelativistic particles.

5. Estimate the minimum kinetic energy for a proton (mass 938 MeV/c\(^2\)), confined to a nucleus of size \( 5 \times 10^{-15} \) m. b) Repeat the calculation for an electron. c) Based on your calculations for part b), do you expect electrons to be a basic constituent of nuclei? Explain.

6. A beam of Rb atoms with velocity \( v \) and mass \( m \) is normally incident on a slit of width \( d \). The atoms are detected on a screen a distance \( D \) from the slit. Estimate, using the uncertainty principle, the value of \( d \) such that the width of the beam on the screen is a minimum.