

PHYS 451: Quantum Mechanics I - Spring 2016
Homework #2, due January 28, in class

Schrödinger equation, wave function, probability density, expectation values, and de Broglie wavelength

1. Problem 1.7 in Griffiths
2. Problem 1.8 in Griffiths
3. Problem 1.14 in Griffiths
4. Problem 1.16 in Griffiths
5. It is well known that no microscope can resolve the details or features whose size is smaller than the wavelength of light by which those features are looked at. For example, with an optical microscope that uses 500 nm light it is impossible to see a virus of 20 nm in diameter. However, one could use an electron microscope for that purpose. Calculate the minimum voltage through which electrons must be accelerated in an electron microscope so that their de Broglie wavelength is 1000 times smaller than the diameter of the virus. Determine whether the nonrelativistic expression for the total energy is sufficiently good for your estimate, otherwise you will need to use the relativistic expression.