Worksheet # 1

(Monday, September 30, 2019)

Name

Question (5 pts):

You are an experimentalist in nanoscience who studies nanometer-size features. You have two microscopes: one is an optical microscope, in which you illuminate your sample with visible light ($\lambda \sim 400$ nm), another one is an electron microscope, in which you bombard your sample with electrons accelerated to energies of 10 keV. Estimate how many orders of magnitude you (in theory) can gain in the resolution of your experiment by choosing the electron microscope over the optical one. (In practice, electron microscope resolution is limited by aberrations of the electron optics, which reduces the resolution.)

Useful info: $h = 6.63 \times 10^{-34}$ J s, $1 \text{ eV} = 1.6 \times 10^{-19}$ J, $m_e = 9.1 \times 10^{-31}$ kg.