Practice Problem Set on Modern Physics

Not to be turned in for credit!

Question 1 (1 point)

What is the uncertainty principle, and what fundamental constant does it relate to?

Question 2 (3 points)

The work function of aluminum is 4.08 eV. What frequency of X-ray needs to be incident on the surface of the aluminum in order to produce a photo-electron with a maximum kinetic energy of 1.5 eV. What is the resulting de Broglie wavelength of this electron?

Question 3 (3 points)

What is the lowest energy state possible for an electron in a one-dimensional harmonic oscillator with a length of 10^{-10} m? What is the lowest energy state possible for a proton in a one-dimensional harmonic oscillator with a length of 10^{-14} m?

Question 4 (3 points)

What is the transition energy between the n=4 and n=3 states of hydrogen? Is the photon emitted in this transition in the visible range? If not, where in the electromagnetic spectrum is it?