

Homework #11 (due Nov. 18)

Each problem is 10 points

Textbook problems 12.1, 12.3, 12.12

Problem A1: a) Estimate your de Broglie wavelength when you are jogging at 5 km/hour.

b) How fast have you move to be able to experience a diffraction if you bounce off a crystal wall with average distance between atoms approximately 1 Angstrom = 10^{-10} m.

Problem A2: Let's imagine you are playing quantum coin toss, where two eigenstates can be identified: $|t\rangle$ (tail) and $|h\rangle$ (head). Assuming that someone prepared the quantum coin in the state:

$$|\psi\rangle = \frac{4}{5}|h\rangle + \frac{3}{5}|t\rangle,$$

what are the probabilities to find the coin in each of two states?

How would you describe the state in which the two outcome are equally probable?

Textbook problems 13.6 (modified)

An electron in a hydrogen atom drops from $n=3$ excited state to its ground state. What is the energy of the photon emitted? What is the momentum and the wavelength of this photon?