

Quantum Physics PHY4215 - Exercise Sheet 7

0. Review last week's homework problems.
1. An charged pi meson has rest energy 140 MeV and a lifetime of 26ns. Find the energy uncertainty of the pi meson, expressed in MeV and also as a fraction of the rest energy.
[10 marks]
2. A billiard ball is confined to move on a billiard table of length 1.5m. Estimate the likely minimum speed of the ball.
[6 marks]
3. An electron is confined within a region of atomic dimensions of the order of 10^{-10}m . Find the uncertainty in the momentum and the likely value of the kinetic energy. Repeat the calculation for a proton confined to a region of nuclear dimensions of order 10^{-14}m .
[12 marks]
4. Calculate the relative frequency spread $\frac{\Delta f}{f}$ for a nanosecond (10^{-9}s) pulse from a CO_2 laser, in which the nominal photon energy is $hf = 0.112\text{eV}$.
[8 marks]