The Uncertainty Principle Example 1

- A proton is confined in a Uranium nucleus (diameter: d=16fm). Determine the minimum kinetic energy [non-relativistic] of the proton confined within the diameter of the uranium nucleus.

The Uncertainty Principle Example 2

- It is possible for some fundamental particles to "violate" conservation of energy by creating and quickly reabsorbing another particle. For example, a proton can emit a π^+ according to $p \rightarrow n+\pi^+$ when the n represents the neutron. The π^+ has a mass of 140 MeV/c^2. The reabsorption must occur within a time Δt consistent with the uncertainty principle.
  - Considering that example, by how much ΔE is energy conservation violated? [Ignore kinetic energy]
  - For how long Δt can the π^+ exist?
  - Assuming that the π^+ is moving at nearly the speed of light, how far from the nucleus could it get in the time Δt?