

# Physics 25 Problem Set 8

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due Wednesday, May 31

Please make your work neat, clear, and easy to follow. It is hard to grade sloppy work accurately. Generally, make a clear diagram, and label quantities. Derive symbolic answers, and then plug in numbers after a symbolic answer is available.

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1. Find the approximate width in energy in electron-volts of a quantum state that has lifetime:
    - (a)  $\tau = 10^{-23}$  s, which is typical of short-lived nuclear levels.
    - (b)  $\tau = 10^{-8}$  s, which is typical of atomic levels.
    - (c)  $\tau = 10^9$  s, a typical human lifetime.
    - (d)  $\tau = 10^{17}$  s, near the age of the universe.
  2. Wichmann, p. 175, Chapter 4, Problem 1.
  3. Wichmann, p. 175, Chapter 4, Problem 4.
  4. Compute the wavelength in centimeters of:
    - (a) An electron with *kinetic* energy of 1 eV.
    - (b) An electron with *kinetic* energy of 100 KeV.
    - (c) An electron with *kinetic* energy of 100 MeV.
    - (d) A proton with *kinetic* energy of 100 MeV.
    - (e) A 1 kg mass moving with speed of 1 meter/second.
  5. Wichmann, p. 217, Chapter 5, Problem 2.
  6. Wichmann, p. 218, Chapter 5, Problem 3.
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