Extra practice problems related to lectures 7 and 8.
**** The solutions are given in a separate file. ****

The next two problems pertain to the following situation.

An electron sits in the lowest energy state in an infinite 1-D well.

1. The well is 2×10^{-10} m wide. What's the electron's kinetic energy?

(a) 3.4×10^{-21} J
(b) 1.5×10^{-18} J
(c) 4.6×10^{-17} J
(d) 7.6×10^{2} J
(e) 2.1×10^{42} J

2. If the well were made three times as wide as in the preceding problem, by what factor would the kinetic energy change?

(a) 1/9
(b) 1/3
(c) 1
(d) 3
(e) 9

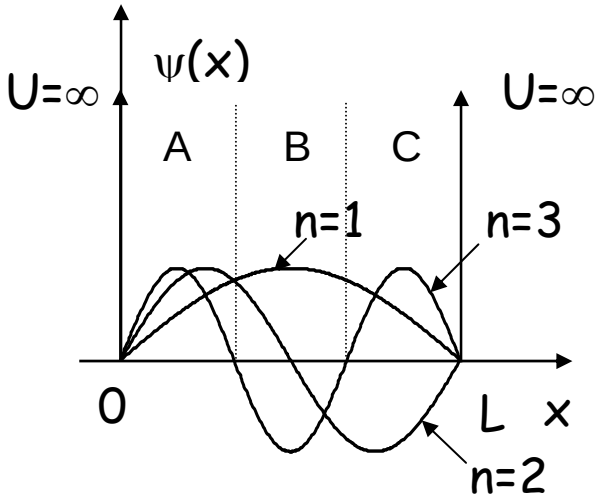
3. An electron drops from the n = 6 to the n = 5 level of an infinite square well that is 1.5 nm wide. What is the wavelength of the photon emitted as a result?

(a) 80 nm
(b) 673 nm
(c) 1.5 nm
(d) 7340 nm
(e) 16 nm

4. An electron is confined to an infinite square well of width L. An experiment is done in which a photon is absorbed promoting the electron from a lower state to a higher state. It is found that the longest wavelength photon that can be absorbed is 500 nm. What is the width of the well?

(a) 0.23 nm
(b) 0.67 nm
(c) 0.93nm
(d) 2.3 nm
(e) 4.6 nm

The next two problems are related to the following situation:



5. If a particle in the first excited state (n = 2) of the infinite square well potential, which of the following statements is correct?

(a) The particle is more likely to be found in the central region of the well (B) than in the left region (A) of the well.
(b) The particle is less likely to be to be found in the central region of the well (B) than in the left region (A) of the well.
(c) The particle is as likely to be found in the central region (B) of the well as it is to be found in the left region (A) of the well.

6. If a particle in the second excited state (n = 3) of the infinite square well potential, which of the following statements is correct?

(a) The particle is more likely to be found in the central region of the well (B) than in the left region (A) of the well.
(b) The particle is less likely to be to be found in the central region of the well (B) than in the left region (A) of the well.
(c) The particle is as likely to be found in the central region (B) of the well as it is to be found in the left region (A) of the well.

7. Consider a particle of energy E confined in a one-dimensional box having a width L and infinitely high walls. If the width of the well is reduced, the Heisenberg uncertainty principle tells us:

(a) that the energy of the particle must decrease.
(b) that the energy of the particle must increase.
(c) nothing; the Heisenberg uncertainty principle tells us nothing about this situation.

8. If the well in the previous problem is changed to a finite well of height V_0, for a fixed value of L,

(a) the energy of the particle must decrease.
(b) the energy of the particle must increase.
(c) the change in energy depends upon the details and there is not enough information to know whether the energy increases or decreases

9. Compare the following two cases of a particle in the ground state in an infinite well: 1) an electron and 2) a muon which is a particle like an electron but more massive, *i.e.*, $m_{muon} > m_{elec}$.

(a) the energy of the muon is higher than the energy of the electron since he more massive particle has more energy
(b) the energy of the muon is lower than the energy of the electron which can be understood using the uncertainty principle
(c) the energy of the muon and the electron are the same since they have the same wavelength