Physics 201, Fall 2018
Problem Set #10 (due Friday, Nov. 16)

MMS 9.4 (10 pnts)

A1 (10 pnts): How many electrons can be accommodated in an electron energy level with ℓ=2? How many if ℓ =3? Give a formula (in terms of ℓ) for the number of electrons that can be accommodated in a level with arbitrary ℓ?

A2 (10 pnts): Imaging a neutron (s=1/2) confined in a one-dimensional rigid box. What are the degeneracies of its energy levels? Make a sketch of the lowest few levels, showing their occupancy for the lowest state of nine neutrons confined in the same box.

MMS 9.9 (10 pnts)

A3 (20 pnts) Imaging several identical <u>spin-half particles</u> of mass m all confined inside the two-dimensional rigid square box of size L. Assume that the particles do not interact with one another.
(a) What is the lowest four allowed energies for any one particle? How many particles can be accommodated in each of these levels, given that they obey the Pauli Exclusion Principle? [*Hint: in figuring degeneracies, do not forget that each particle has two possible orientations of its spin.*]
(b) Assuming that these are <u>six</u> particles in the box, draw an energy-level diagram, showing distribution of lowest energy for the system as a whole. Calculate its total energy.
(c) Repeat (b) for the case where there are <u>ten</u> particles in the box.
(d) Repeat (b) for the case of <u>ten</u> spin 1 particles in the box.

MMS 9.17 (10 pnts)