Problem Set #6

Reading: Rohlf 5.4, 5.5, 6.1, 6.2.

Problem 1:
Consider the potential $V(\vec{r}) = -\frac{a}{r^{3/2}}$. Using the Bohr model for this potential, find an expression for the quantized energy levels; E_n.

Problem 2:
The one-electron Bohr model can be applied to heavier atoms from which all but one electron have been stripped, ions. Consider an Oxygen atom with only one electron present. What is the wavelength of the photon emitted in the transition from $n = 3$ exited state to the ground state? Compare this value with the corresponding one for an ordinary hydrogen atom.

Problem 3:
Consider a container filled with hydrogen *atoms*. Assuming it is an ideal gas at temperature T, what is the *average* deBroglie wavelength of the hydrogen atoms in this container?

Problem 4:
At what speed should an electron travel in order to have a deBroglie wavelength of **a)** 30 cm **b)** 30 fm?

Problem 5:
A muon and a photon have the same wavelength and the total energy of the muon is 200 MeV. What is the energy of the photon?