HOMEWORK 1
ASTR 605
SPRING 2010
DUE MONDAY FEB 1, 2010

Examine Figure 1.2 from handout of Chapter 1, "What is the Diffuse Universe?" from the book "Astrophysics of the Diffuse Universe", by Michael Dopita and Ralph Sutherland. Note that the x-axis is log T [K] and the y-axis is log n [cm^{-3}], where n is the number density of hydrogen. Note that each labeled "plasma" also includes a label for the logarithm of the characteristic size, S, in [cm]. Omitting the Tokamaks, there are 13 classes of objects.

1. With your own graphics, duplicate this plot. Including <u>all</u> the labels. You can omit the Tokamaks.

2. With your own graphics, create a similar plot for which the x-axis is log S and the y-axis is log T. Label each class of object, including its range of log n. Again, you can omit the Tokamaks.

3. With your own graphics, create a similar plot for which the x-axis is log S and the y-axis is log n. Label each class of object, including its range of log T. Omit the Tokamaks.

4. As you can see, in the log n - log T plane, there is a somewhat clean demarcation between the LTE and non-LTE regimes. (i) Very briefly, from a physical standpoint of the sub-atomic processes, when can you apply LTE and when can you not apply LTE? (ii) In what log n, log T, and log S regimes/conditions do the Boltzman and Saha Equations apply?

5. Make a table with three columns. The first column will be the classes of objects, thus there will 13 rows. In the second, third, and fourth column, provide the density, temperature, and size ranges (in log) for each class of object.

For making the plots, you may use which ever graphics package you wish. I recommend that you use mongo to make a blank graph with the tick marks and scales on it. Then,, insert this into xfig and hand insert the ellipses and labels.