

## AST 300B – Spring 2017

### In-class/take-home Problems Due: Friday April 21th

44. The ground state electronic configuration of Iron is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$  and the ground state term is  $^5D_4$ .
- For this term, what is S and L equal to?
  - What values of J are allowed for a  $^5D$  term?
  - What is the statistical weight (g) of the ground term  $^5D_4$  that would go into Boltzmann's equation. (Hint: think about how many projections on a space axis the total angular momentum can have.)
  - The ground state term of singly ionized Iron (FeII) is  $^6S_{3/2}$ . Does this term have fine structure splitting? Why or why not?
45. The ground state electronic configuration of Sodium is  $1s^2 2s^2 2p^6 3s^1$ .
- What is the term for the ground state?
  - Now consider the situation where the valence electron is excited in a 3p orbital:  $1s^2 2s^2 2p^6 3p^1$ . What are the terms for this state? Have a look at the spectrum of Sodium below of the 589.2 and 589.8 nm "doublet" which is due to transitions from  $1s^2 2s^2 2p^6 3p^1$  to  $1s^2 2s^2 2p^6 3s^1$ . Does it make sense now why there are two lines?

