

UNIVERSITY OF CALIFORNIA, SANTA BARBARA
Department of Physics

Physics 233

Exercise 5 (Due Mon. March 3rd)

Winter 2014

Nebular Emission Lines

Consider a homogeneous nebula with solar abundance ratios, i.e. $O/H \approx 8 \times 10^{-4}$ by number. Estimate the strength of the [O II] $\lambda 3726, 29$ emission doublet relative to the $H\alpha$ emission line. Assume a temperature $T_e = 10,000$ K, and look up the relevant recombination coefficients and collision strengths (e.g., Osterbrock's book). [To simplify the problem, you may assume that $n_e < n_{e,crit}$ for all transitions and that the dominant ionization states are the first ion, i.e., $n(O) \approx n(O^+)$ and $n(H) \approx n(H^+)$.]