

COLLISIONAL EXCITATION OF THE 10830 HE I LINE AND THE POPULATION OF
THE 2^3S HE I STATE IN GASEOUS NEBULAE

M. Peimbert and S. Torres-Peimbert
Instituto de Astronomía
Universidad Nacional Autónoma de México

ABSTRACT. From the study of the $\lambda\lambda 5876, 7065$ and 10830 He I line intensities in NGC 6572, NGC 6803, NGC 7009, NGC 7027, NGC 7662 and IC 418, it is found that the $I(10830)/I(5876)$ ratio is weaker than expected. By considering estimates of the optical depth at $\lambda 10830$ due to dust absorption and by determining the optical depth at $\lambda 10830$ due to atomic absorption, it is argued that dust absorption of $\lambda(10830)$ photons is not the cause for the low $I(10830)/I(5876)$ ratios. By assuming that the 2^3S He⁰ state is depopulated only by radiative transitions to the 1^1S state and by triplet-singlet exchange collisions, it is found that its population is about a factor of two smaller than expected. This result is in agreement with a previous study of the $\lambda\lambda 3889, 4472, 5876, 6678$ and 7065 line intensities in a group of thirteen Type I planetary nebulae. One of the main implications of the underpopulation of the 2^3S level is that the collisional effects in the $N(\text{He})/N(\text{H})$ abundance ratios of planetary nebulae and O-poor extragalactic H II regions are smaller than previously thought.