EMISSION LINES OF CI AND N II IN PLANETARY NEBULAE

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ABSTRACT. A model potential method (Caves and Dalgarno, 1972, *J. Quant. Spect. Rad. Transf.*, **12**, 1539) was used to calculate accurate non-hydrogenic radiative recombination rates and transition probabilities of singly excited states of CI and N II. The results can be used to determine the excitation mechanism of emission lines and to estimate N III concentrations in nebulae with CI and N II emission lines. In most nebulae, observed permitted lines of N II are produced by radiative recombination, but sometimes stronger recombination lines are missing in their spectra. The [CI] lines observed in NGC 7027 cannot be explained by simple radiative and dielectronic recombination. The low [CI] λλ9850 + 23/ λ8727 value may indicate that the emission is produced in high density ($N_e \gtrsim 10^5$ cm^{-3}) condensations where partial collisional deexcitation of metastable levels, takes place. N III concentrations were determined using published data of NGC 3242, NGC 3918, and NGC 6572. The procedure outlined by Wilkes *et al.* (1981, *M.N.R.A.S.*, 197, 1) to determine N abundances from $(N^+ + N^{++})/He^+$ ratios does not always give consistent results with UV or [N II] data. The problem may be due to errors in the calculation of transition probabilities involving the doubly excited levels $2s2p^3\ ^3P^0$ and $^3D^0$ of N II that affect the branching and effective recombination rate of the multiplet N II λ5680.

S. Torres-Peimbert (ed.), Planetary Nebulae, 225.