THE IONIZATION STRUCTURE OF NGC 6720 AND NGC 7009

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Measurements of line intensities over a spectral range generally as great as 1300 Å to 11,000 Å have been made in four positions in the Ring Nebula and eight positions in NGC 7009. Ionic abudances determined from optical and UV lines are in good agreement, except that the C^{2+} abundance inferred from the optical 4267 Å recombination line is as much as 10 times higher than that measured from the 1906, 1909 Å CIII) lines. In both nebulae, this discrepancy is greatest nearest the central star. At the present time the most attractive explanation seems to be that the 4267 Å line is affected by resonance fluorescence due to light from central stars of planetaries.

The standard ionization correction formulae applied to O^{+}, O^{2+}, and N^{+} abundances give consistent total O and N abundances in all positions in both nebulae. This result is particularly gratifying for NGC 7009 because previous studies have found that the standard formula for N gives erroneous results. These O and N abundances agree well with those found by including O^{3+}, N^{2+}, and N^{3+} abundances measured using the UV lines. The standard formula does not work for Ne, probably as a result of the different charge exchange rates for O and Ne. The average logarithmic abundances for NGC 6720 are: He = 11.04, O = 8.79, N = 8.34, Ne = 8.23:, C = 8.59, S = 6.99, Ar = 6.57. Preliminary estimates for NGC 7009 are: He = 11.06, O = 8.70, N = 8.07, Ne = 8.17:, C = 8.18, S = 7.19:, Ar = 6.40. The slightly higher N/O and C/O ratios in NGC 6720 suggest the possibility of enrichment due to mixing of processed material in the progenitor star.

The work on NGC 6720 has been published (1980, Ap. J. 240, 99; 1982, Ap. J. 253, 167); the results for NGC 7009 will be submitted to Ap. J.