ABSTRACT OF THE THESIS

This thesis is concerned with theoretical investigations of some of the aspects of Auger electron Spectroscopy (AES) of free, gaseous, unpolarized, rotating linear molecules belonging to $C_{\infty v}$ or $D_{\infty h}$ point groups and also of atoms. The Auger emission has been assumed to take place following the absorption of a single photon in electric dipole (E1) approximation. The essential theoretical techniques' used in these studies are, among others, the non-relativistic quantum mechanics, density matrix theory with state multipoles, and Racah algebra.

The whole thesis is organised in nine chapters, in addition to an appendix at the end. First and the last chapters contain, respectively, introduction to and the summary of the thesis. Chapter 2 gives a brief description of the density matrix and of state multipoles. In each of the 3 to 6 chapters, we have studied different, and also hitherto uninvestigated, aspects of AES following photoabsorption in rotating linear molecules. Chapters 7 and 8 describe the outcome of our investigations of some of these aspects of AES when the target happens to be a free, gaseous, unpolarized atom.

The theoretical expressions developed both for linear molecules and for atoms in this thesis are exact and in their most general forms. These are applicable to AES of any linear molecular system and atom. The studies presented herein show that the same set of equations with, of course, different dynamical terms, describe AES following photoabsorption in atoms and in rotating linear molecules. Thus our studies put the atomic and molecular AES on the same footing wherein identical geometrical analysis can

be used.

It is our hope that the results presented in this thesis would be of considerable utility in understanding the structure and dynamics of rotating linear molecules and of atoms, as well as in unraveling the hitherto unknown aspects of the mechanics of these two different target systems.