## SUMMARY

The thesis embodies systematic analyses of the emission spectra of iodides of Calcium, Indium and Zinc ( CaI, InI and ZnI ). A high frequency discharge tube source was found most suitable to excite the molecules under the study. A preliminary survey of the spectra was carried out on a Hilger medium quartz spectrograph and $E_2$-glass spectrograph. Having established the conditions of excitation, the spectra were photographed on a Carl Zeiss two meter plane grating spectrograph at a dispersion of about 7.5 A°/mm to 1.55 A°/mm for the purpose of studying the vibrational structure of the different band systems. Three bands of A - X system and one band of B - X system of InI molecule were photographed at higher dispersion to study the rotational structure of these bands.

The thesis is divided into two parts. Part I includes an introduction to the subject, a historical survey of the work reported by earlier workers and the

experimental techniques to obtain the spectra. In order to make the thesis self contained a brief account of the vibrational structure of bands and intensity distribution in a band system along with that of rotational structure of a simple band are given. The main object in selecting the molecule is elucidated. The sources which are generally employed in the study of the spectra of diatomic molecule in emission are discussed. The high frequency discharge tube source is described in detail as it served to excite the spectra of the molecules reported here.

The results obtained in the present study and vibrational and rotational analyses of the different band systems are included in Part II. Electron configurations of various electronic states of the molecule and conclusions drawn from the present study are also included in Part II.

Chapter IV deals with the vibrational analyses of the band systems of iodides of Calcium and Zinc.

From the vibrational analysis of B $^2\Sigma$ - X $^2\Sigma^+$ system of CaI molecule spin splitting is established. The vibrational constants are also improved by observing a number of new bands in A $^2\Pi$ - X $^2\Sigma^+$ system of CaI molecule. In ZnI molecule the correctness of the vibrational assignments of near ultraviolet bands are checked by the vibrational isotopic effect due to $^{64}Zn$, $^{66}Zn$ and $^{68}Zn$.

Chapter V deals with vibrational analyses of InI molecule. In InI molecule a new band system in the ultraviolet region has been analysed for the first time and vibrational constants are evaluated. The vibrational analysis suggests that the states involved in this transition are two excited states ( D $\longrightarrow$ B $^3\Pi_1$ ). The upper state-D involved is observed for the first time. A $^3\Pi_0$ - X $^1\Sigma^+$ and B $^3\Pi_1$ - X $^1\Sigma^+$ systems of this molecules were also photographed at a higher dispersion and vibrationally analysed.

Chapter VI deals with the fine structure analysis

of A $^3\pi_0$ - X $^1\Sigma^+$ system of InI molecule. 0,0 ; 1,0 and 0,1 bands were selected for rotational analysis and rotational constants have been reported. The 0,0 band of B $^3\pi_1$ - X $^1\Sigma^+$ system of the molecule was also photographed at the highest dispersion which the grating spectrograph could offer. However the fine structure of the band was not properly resolved. The rotational constants of this band are approximately evaluated from observed values of second differences of wavenumbers of some of the inadequately resolved lines of the band.

In last chapter the electron configuration of various electronic states of the molecules under study are discussed. The observed phenomena in the present investigation are correlated with the theory and structure of the bands are interpreted.