INTRODUCTION

The main aim of this work is to analyse spectra of many times ionized zirconium atoms as a part of the program of analyses of the atomic spectra started at Aligarh in 1969. Some of the neighbouring isoelectronic spectra were already worked out in our laboratory or elsewhere recently, others were totally unknown. As the work progressed, it was found imperative to effect improvements in the formers and to carry out the latters with the help of line lists of yttrium, niobium and molybdenum established by colleagues or by myself with their help.

The work started with up-dating of the theory of np^k configurations as finally developed by Edlén referred to later, the interesting new features discovered on that, as described in chapter I, provided great stimulus to the analysis work that followed on the spectra having np^k (k=2-5) as ground configurations. It also helped a lot in checking the accuracy of our and others work to the extent of the all important ground intervals. Progress of our analysis work on Se I-like spectra and the availability of data by other authors on the same, made it possible to develop the precise extrapolation formulae for these intervals as described in chapter I.
In this thesis, we have then described our analysis work chapter by chapter in separate isoelectronic sequences. Relevant figures and tables of term analyses are given in each chapter, but the line lists are appended at the end of the thesis in increasing order of wavelengths. Zr line list as established by me is given in full, while those of Y and Nb are restricted to classified lines only. The complete line list of Y is reported in the Ph.D. thesis of Zahid-Ali, while that of Nb is reserved for my colleagues.

Work on molybdenum spectrum carried out by Sabra Khatoon, and S.P. Singh has been of great help to mine in making the necessary isoelectronic comparisons. Mo line list, complete for the region 50 to 440 Å, is appended to S.P. Singh’s thesis.