Semi-conductor physics is one of the comparatively young and rapidly developing branches of physics. In the understanding of physical phenomena in semi-conductors, great advances have been made in the past twenty-five years. The rapid development of physical ideas about semi-conductors has contributed to the deepening and broadening of knowledge in neighbouring domains of physics and technology.

One of the characteristic features of the physics and chemistry of semi-conductors is that the results of fundamental researches in these fields rapidly find technological applications. Practical applications of semi-conductors have revolutionized many branches of technology. It can be justifiably claimed that semi-conductors play a determining role in the development of radio-electronics, and in particular, on electronic computer technology. The present day progress in the automation and technology of communications is due to the application of semi-conductor devices. Semi-conductor micro-electronics, together with quantum electronics, has become one of the general directions in the development of electronic engineering. The miniaturization of semi-conductor devices has made possible the construction of reliable compact and economic computing systems.
New applications of these devices in different areas of science and technology open up fresh possibilities for the solution of many technical problems of very complex nature. New problems promote the development of semiconductor physics. All these stimulate the further development of fundamental and applied researches in this field.

The list of most investigated crystalline semiconductors includes:

- **Elements** - Diamond, Si, Ge
- **III - V Compounds** - GaP, GaAs, GaSb, InAs, InSb.
- **II - VI Compounds** - HgSe, HgTe, CdS, CdSe, CdTe.
- **IV - VI Compounds** - PbS, PbSe, PbTe.

Aside these, amorphous semiconductors like vitreous Se, As₂Se₃, Tl₂Se₃, As₂Se₃, As₂Se₃, As₂Te₃ and others have, in recent investigations exhibited interesting properties.

This thesis contains an account of our investigations on some problems related to charge transport in semiconductors. The emphasis in the work has been laid mostly on charge transport in Ge and hot carrier transport and allied phenomena mainly in GaAs and to some extent in GaSb, InAs and InP. Most of the results obtained in our research on carrier drift mobility, Hall coefficient, plasma frequency, intervalley population transfer, etc., have been compared with recent experimental results and have been found to be in satisfactory agreement.
Some portions of this work have already been published.

Publications by the author relevant to the title of this thesis only are listed below.


