It is now a truism that, during last four decades, the cancer chemistry has experienced an impressive renaissance. A wide variety and large number of chemicals, viruses and radiations that can induce cancer in mammalian species have been discovered. It would now be beneficial to mankind if the facts and hypothesis of chemical carcinogenesis could crystallise into concepts and principles that would provide an understanding of the formation of tumors at the molecular level.

Cancer has been defined as an abnormal mass of tissue the growth of which exceeds and is uncoordinated with that of normal tissue and persists in the same excessive manner after the cessation of the stimuli which evoked the change. Several theories have been proposed for the chemical initiation of cancer. The charge-transfer interaction between carcinogen and macromolecule as a first step in the chemical initiation of cancer is one of them. Thus the work described in the present thesis aims to study the role of molecular complexes and metals in the chemical initiation of cancer at the molecular level. The subject matter of this thesis has been described into six chapters. A brief account of each chapter is given below:

In the introductory chapter (Chapter I), some aspects of molecular complexes, their role in cancer induction and metal carcinogenesis which are of relevance to the investigations
reported in this thesis have been briefly reviewed.

In Chapter II, some more reliable and accurate non-spectroscopic methods (refractometric, differential refractometric and conductometric) have been developed to calculate the equilibrium constant ($K_1$) and some other interaction parameters, such as, extent of polarization ($\mathcal{P}$) and extent of electronic polarization ($\mathcal{Q}$). These developed models have first been verified on some well known systems and later on these were applied to study the charge-transfer interaction of some biomolecules with $\pi$- and $\sigma$-acceptors in order to investigate the role of molecular complexes in the chemical initiation of cancer on molecular level. A part of the work presented in this chapter has already been published.$^{1-6}$

Chapter III deals with the refractometric and differential refractometric studies on the molecular interaction of biomolecules with some $\pi$- and $\sigma$-acceptors. The ion-pair formation resulted from interactions have also been investigated. On the basis of these studies, the charge-transfer interaction process as a step of chemical initiation of cancer has been explored and discussed. A part of the work presented in this chapter has been published.$^{7,8}$

In Chapter IV, the electrical conductance measurement technique has been used to study the charge-transfer interaction of the systems reported in Chapter III. The results obtained through this technique have again supported the conclusion of Chapter III. A part of the material reported in this chapter
has already been published.⁷

The use of symmetry of charge-transfer complexes for carcinogenesis and for the mutagenesis has been studied in Chapter V by measuring the dipole moment of some charge-transfer complexes mentioned in Chapters III & IV. It is observed that the change in symmetry may lead to mutagenesis but in long turn in carcinogenesis. A part of the work presented in this chapter has been accepted for publication.⁹

Chapter VI deals with the role of complexation process of some carcinogenic metals with genetic bases in the chemical initiation of cancer. It has been explored on the basis of stability constant data. The role of anticancer drugs and their potentiality towards cancerous cell have also been explored. HSAB principle has also support the results obtained through these experiments. A part of the material presented in this chapter has been published.¹⁰

The important results and conclusions from the studies reported in Chapters II - VI, have been summarized towards the end of the thesis under "summary".

The thesis contains 60 figures and 36 tables, all of which have been inserted at appropriate places.

Care has been taken to give due credit to the authors of the work quoted in this thesis from the existing literature. The author would like to apologize for any omission which may have occurred by oversight or error in judgement.
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9. Dielectric Studies of Molecular Complexes of DDT with Some Compounds of Biological Interest,
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