Preface

Coordination chemistry and Organic chemistry play crucial role in biological and biomedical processes, and it is evident that many organic compounds used in medicine do not have a purely organic mode of action, some are activated or bio-transformed by metal ions metabolism. Schiff bases are condensation products of primary amines with carbonyl compounds. The simple concept of coordination chemistry applies in the imine (C=N) containing ligands where the lone pair of electrons attaches to the central metal ion. The lone pair of electrons on nitrogen is readily available for sharing with metal centre to from a dative covalent bond. Hence, the adsorbed Schiff bases will cover and protect the metal surface from the corrosive environment in acidic solutions. The common structural feature of these compounds is the azomethine group with a general formula RHC=N-R’ where R and R’ are alkyl, aryl, cyclo alkyl or heterocyclic groups which may be variously substituted. These compounds are also known as anils, imines or azomethines. Several studies showed that the presence of a lone pair of electron in SP\(^2\) hybridized orbital of nitrogen atom of the azomethine group is considerable chemical and biological importance. Because of the relative easiness of preparation, synthetic flexibility, and the special property of C=N group, Schiff bases are generally excellent chelating agents, especially when a functional group like –OH or –SH is present close to the azomethine group so as to form a five or six membered ring with the metal ion. Versatility of Schiff base ligands and biological, analytical and industrial applications of their complexes make further investigation in this area highly desirable.

Lots of researchers studied the synthesis, characterization and structural activity relationship (SAR) of Schiff bases. Schiff bases, derived mostly from variety of heterocyclic rings, were reported to possess a broad spectrum of pharmacological activities with a wide variety of biological properties; development of new chemotherapeutic Schiff bases is now
attracting the attention of medicinal chemist. They are known to exhibit a variety of potent activities. The pharmacologically useful activities include antibacterial, anticonvulsant, anti-inflammatory, anticancer, anti-hypertensive, anti-fungal, antipyretic, antimicrobial, anti-HIV, cytotoxic activity, hypnotic and herbicidal activities. Metal complexes of Schiff bases have been reported and these are used as chelating ligands in the coordination chemistry of transition metals as radiopharmaceuticals for cancer targeting and agrochemicals. Here we present a review on the results of various studies and it may be useful to researchers attempting to gain more understanding of the activity of Schiff base compounds.

Schiff bases, having azomethine (RHC=N-R’) group and their metal complexes are widely used for industrial purposes and also reveal a wide range of biological applications. This review describes the most promising biological activities of Schiff bases and their metal complexes of cerium. A general idea for synthetic methodological used for the synthesis of Schiff bases and their metal complexes is also discussed. Schiff base compounds and their metal complexes have been extensively investigated due to their wide range of applications including catalysis, medicine crystal engineering, anti-corrosion agent. Schiff bases are studied widely due to their synthetic flexibility, selectivity and sensitivity towards the central atom; structural similarities with natural biological compounds and also due to presence of azomethine group (-N=CH-) which imports in elucidating the mechanism of transformation and racemization reaction biologically. Schiff bases having chelation with oxygen, nitrogen etc. donors and their complexes have been used as drugs and reported to possess a wide variety of biological activities against bacteria, fungi and certain type of tumors and also, they have many biochemical, clinical and pharmacological properties. Imine or azomethine groups are present in various natural naturally derived and non-natural compounds. The imine group present in such compounds has been shown to be critical to their biological activities. Schiff
base complexes are considered to be among the most important stereo chemical models in main group and transition metal coordination chemistry and structural variety. A considerable number of Schiff base complexes have potential biological interest, being used as more or less successful models of biological compounds. Not only have they played a seminal role in the development of modern coordination chemistry, but also they can also be found at key points in the development of inorganic biochemistry, catalysis and optical materials.

The main of the study is to prepare as such new Schiff bases from an amine having considerable important applications on its own with the hope that the resultant azomethines may possess much more applications and find a place in major fields of interest. Keeping all the above facts in view, the author has carried out a detailed investigation on spectral characterization of metal-new azomethine complexes.

In the view of the above facts the author in the present investigation has synthesized new Schiff bases with substituted aldehydes and ketones by employing p-Toulic Hydrazide as a common amine further the author provided a new series of metal complexes of Cu and La with newly developed Schiff base ligands from p-Toulic Hydrazide with 2-Hydroxy Benzophenone, 2,4-Dihydroxy Benzophenone, 2-Hydroxy Benzaldehyde, 4-Hydroxy 3-methoxy Benzaldehyde, 2,4,5-Trimethoxy Benzaldehyde (Asaronaldehyde) and 3,4,5-Trimethoxy Benzaldehyde. Further author has been interested to select a ligand with important solid metal ions like Co, Ni, Mn, Mo and Pd.

In view of innumerable applications of azomethines as such and their metal complexes in general the author has carried out the synthesis of new Schiff-bases and their metal complexes and have been characterized by employing techniques like elemental analysis, IR, NMR, UV, ESR, Powder XRD, TGA-DTA, VSM, Conductivity studies and Biological activity.
The work carried out in the present investigation has been desired in the following manner. The thesis is divided into nine chapters.

**Chapter - I**

This chapter briefly describes the theoretical aspects of instrumental analytical methods (Spectroscopic techniques) employed in the research work.

**Chapter - II**

This chapter highlights the detailed literature survey and the chemistry of Schiffbase metal complexes as well as their applications and objectives of the present work.

**Chapter - III**


Preparation of azomethine of various ligands:

1) 2-Hydroxy Benzophenone + p-Toluic Hydrazide (OHBPPTH)
2) 2,4-Dihydroxy Benzophenone + p-Toluic Hydrazide (DHBPPTH)
3) 2-Hydroxy Benzaldehyde + p-Toluic Hydrazide (OHBAPTH)
4) 4-Hydroxy 3-methoxy Benzaldehyde + p-Toluic Hydrazide (VPTH)
5) 2,4,5-Trimethoxy Benzaldehyde + p-Toluic Hydrazide (2-TMBAPTH)
6) 3,4,5-Trimethoxy Benzaldehyde + p-Toluic Hydrazide (3-TMBAPTH)

And also explained the preparation of metal complexes with the above mentioned ligands with metals like Cu and La for all ligands in addition to the above author has been interested to select a ligand (DHBPPTH) with several metal ions like Co, Ni, Mn, Mo and Pd.
Chapter - IV

This chapter deals with the analysis of azomethine metal complexes by using the data obtained from elemental analysis and IR and NMR spectral studies.

Chapter - V

This chapter deals with interpretation of azomethine metal complexes by using UV and ESR spectral studies.

Chapter - VI

This chapter deals with the analysis of azomethine metal complexes by using the data obtained from VSM and Thermal analysis TGA/DTA.

Chapter - VII

This chapter deals with the analysis of Schiff bases metal complexes by using Conductometric analysis and Powder XRD.

Chapter – VIII

This chapter discussing about the metal complexes of DHBPPTH with various metal ions like Cu, La, Co, Ni, Mn, Mo and Pd.

Chapter - IX

This chapter exhibits the antibacterial activities of newly synthesized azomethine metal complexes.

Finally the thesis ends with separate heading conclusions, which includes the importance of azomethine metal complexes, their characterization by using different analytical methods and its biological activities.