The entire research work is chapter wise summarized as follows:

Chapter 1 deals with enlightenment on fundamentals of fluorescence spectroscopy. It includes the origin of luminescence, fluorescence and phosphorescence phenomena, characteristics of fluorescence, instrumental set up for fluorescence measurements, thermodynamic parameters, theoretical aspects of energy transfer and various terms involved in calculations. etc. As our main goal is the studies on photophysical behaviour of nitrogen containing heterocyclic compounds, the schematic representation of synthesis of desired compounds and their fluorescence behaviour is summarised. To start with the research problem, the literature survey is carried out which is briefly outlined in this chapter.

In chapter 2, Spectroscopic studies between model transporter protein, Human serum albumin (HSA) and a antibacterial pyrimidine derivative (AHHPPC) has been investigated by fluorescence and UV-VIS absorption spectroscopy. It was found that the quenching of fluorescence of HSA is due to the formation of non-fluorescent complex between them. The results indicated that the probable mechanism of interaction is a static quenching process. The binding constant \( K \), binding site number \( n \) and corresponding thermodynamic parameters like free energy change \( \Delta G \), enthalpy change \( \Delta H \) and entropy change \( \Delta S \) were determined according to van’t Hoff equation. The binding process was endothermic, entropy driven and spontaneous, and the major part of the action force is hydrophobic interactions. Using FRET, the distance \( r \) between donor (HSA) and acceptor (AHHPPC) was obtained. Such interactions seem to slightly induce microenvironmental changes and alteration in protein conformation as shown by synchronous fluorescence, circular dichroism (CD) and three-dimensional studies.

Chapter 3 includes the study of binding interaction of Bovine serum albumin (BSA) with (AHDMAPPC), a pyrimidine derivative investigated by spectroscopic techniques. The results revealed that pyrimidine derivative (quencher) caused the fluorescence quenching of BSA (donor) by the formation of complex. The binding parameters and corresponding thermodynamic
parameters $\Delta H$, $\Delta G$ and $\Delta S$ at different temperatures were calculated. The positive enthalpy ($\Delta H$) and positive entropy ($\Delta S$) values indicated that both hydrogen bond and hydrophobic forces played a major role in the binding. The distance $r$ between donor and acceptor was obtained according to the Forster’s theory of non-radiative energy transfer. In addition, the conformational changes of BSA are discussed on the basis of UV-visible spectroscopy, synchronous fluorescence (SF), circular dichroism (CD) and three-dimensional spectroscopy.

The study in the chapter 4 was designed to investigate the interaction of AHDMPPC, a pyrimidine derivative with human serum albumin (HSA) by using fluorescence spectroscopic technique including fluorescence quenching, synchronous fluorescence and three dimensional fluorescence and circular dichroism methods under simulative physiological conditions. The mechanism of fluorescence quenching of HSA was discussed from validity of Stern-Volmer equation and binding parameters were calculated. The thermodynamic parameters at different temperatures were calculated according to van’t Hoff relationship which indicated that the binding of was spontaneous process and hydrophobic interaction had a main role in binding process. The effect of on the conformation of HSA was analyzed.

Chapter 5 comprises the study of a novel pyrimidine derivative (DMAB) as a efficient fluorescent chemosensor for selective detection of $\text{Al}^{3+}$ in aqueous solution. The spectroscopic properties of the chemosensor (I) were investigated using UV-visible and fluorescence spectroscopy. It includes the effect of pH and competition experiments to investigate the impact of different coexisting cations. It also contains the schematic representation of the chemosensing process. The applications of the proposed method were evaluated for determination of $\text{Al}^{3+}$ in different water samples collected from local region of campus.

Chapter 6 deals with the photophysical behaviour of (AHDPC), a pyrimidine derivative as a probe for water composition in binary aqueous solution. The effect of solvents on the spectral properties (solvatochromism) was investigated by spectroscopic methods including calculations of Stokes
Summary

shift, quantum yield. The effect of pH and water composition is also studied. It includes the proposed mechanism of fluorescence in different pH of the solution. The observed solvatochromic fluorescence characteristic of AHDPC could used as a new probe for micro-environmental polarity changes as well as a sensitive sensor for the determination of water composition in binary aqueous solutions.