This thesis reports the efforts made in the improvisations of certain benzothiazole/benzimidazle functionalized receptors towards colorimetric and/or fluorescent cation and anion sensing in biologically relevant medium. Ninhydrin functionalized benzothiazole probe **L_1** is an excellent Zn^{2+} sensor and emits in the NIR (near infrared) region without no interference from the other metal ions. A visual distinction of $H_2PO_4^-$ from other phosphate related anion was also achieved with the probe-Zn^{2+} ensemble. Such long wavelength emissive chemosensors are very important for fluorescent imaging as they can penetrate much deeper into the sample. Next benzothiazole functionalized schiff base probe **L_2** senses Zn^{2+} and Cd^{2+} ion in physiological medium. The metal ensembles are further found to sensitive to both $H_2PO_4^-$ and PPi anion. Dipodal benzothiazole Schiff base **L_3** also selectively sense Zn^{2+} ion in nanomolar level. Furthermore, PPi anion could be separated from $H_2PO_4^-$ with this '**L_3**-Zn^{2+}' ensemble even in the presence of other interfering anions.Direct anion sensing is always superior to that of metal assisted anion sensing but an intriguing task in pure aqueous medium. Aggregation induced emission (AIE) phenomenon could boost the emission intensity in aqueous medium. Benzimidazole functionalized probe **L_4** demonstrate AIE induced PPi sensing in physiological medium with any assistance from the metal ion. In addition, apart from metal based selectivity study, such benzimidazole functionalized AIE probes could also be applied to study sensing behavior of certain H-donor molecules, such as inorganic acids, organic acids like picric acid, amino acids etc.