ABSTRACT

Chapter I outlines a brief overview of some biologically important compounds with special reference to their applications. This chapter contains highlights on water activity, solvent effect and preferential solvation, solute-solvent and solute-solute interactions. Objectives and applications have also been outlined in this chapter.

Chapter II describes a brief theoretical background of the research works included in this thesis. In chapter III, different experimental methods, used for the measurement of various properties like density, viscosity, *etc*., have been mentioned. This chapter also includes purity and provenance of the different chemicals used as solutes and cosolutes in the works.

Chapter IV describes the solvation characteristics of nicotinic acid in aqueous sodium malonate solutions at T = (298.15-318.15) K. In this chapter, viscosity B-coefficient, standard partial molar volume (ϕ_V^0), the standard partial molar expansibility (ϕ_E^0) and it's temperature dependence at constant pressure, $(\partial\phi_E^0/\partial T)_P$ were investigated from the experimentally viscosities, densities and various derived properties were used to study different possible interactions in the experimental solutions. UV-VIS absorption spectra of the ternary solutions were further used to substantiate the results obtained.

Chapter V presents Solution behavior of L-ascorbic acid in aqueous sodium malonate solutions at different temperatures. Various derived parameters like the viscosity B-coefficient, standard partial molar volume (ϕ_V^0), the slope (S_V^*), apparent molar volume (ϕ_V), standard transfer volume ($\Delta_t\phi_V^0$), *etc*., were used to analyze the influence of the solvent composition on the ion-ion and ion-solvent interactions. Thermodynamics of viscous flow was also discussed based on the transition state theory. The results were also corroborated in term of UV-VIS absorption spectra of the ternary solutions.

Chapter VI represents the volumetric and transport properties of paracetamol in aqueous uracil solutions at T = (298.15-318.15) K. Here in this chapter effects of paracetamol on the solute-solvent and solute-solute interactions in the aqueous uracil solutions were studied. Viscosity B-coefficients, apparent molar volumes (ϕ_V) and

standard partial molar volumes (ϕ_V^0), *etc*., derived from viscosities and densities were used to interpret the various molecular interactions in the solutions.

Chapter VII elucidates solution thermodynamics of sodium pyruvate in aqueous glycine solutions at T = (298.15-313.15) K. The standard partial molar volume (ϕ_V^0) and the slope (S_V^*) were derived from Masson equation and viscosity *B*-coefficient were obtained from Jones-Dole equation and these were used to interpret different interactions in the ternary solutions. The activation parameters of viscous flow for the ternary solutions were also determined and discussed by the transition state theory applications.

Chapter VIII narrates the solution behavior of sodium pyruvate in aqueous L-alanine solutions by volumetric and viscometric methods. In the experimental temperature range, different properties like viscosity *B*-coefficient, standard partial molar volume (ϕ_V^0), standard partial molar expansibility (ϕ_E^0), *etc*., were used to understand the ion-ion and ion-solvent interactions occurring in the solutions.

Chapter IX illustrates physico-chemical effects of caffeine in aqueous uracil solutions through volumetric, viscometric and spectroscopic study. The slopes (S_V^*) and standard partial molar volumes (ϕ_V^0) evaluated from the Masson equation were used to study the nature of solute-solute and solute-solvent interactions, respectively. Jones-Dole equation was used to analyse Solution viscosities and the viscosity *A* and *B*-coefficients were discussed for rationalising the solute-solute and solute-solvent interactions, respectively. The activation parameters of viscous flow for the experimental solutions were also explained on the basis of transition state theory.

Chapter X describes the solution thermodynamics of nicotinic acid in aqueous sodium gluconate solutions at T = (298.15-318.15) K. Using the various derived transport and thermodynamic properties like apparent molar volume (ϕ_V), standard partial molar volume (ϕ_V^0), the slope (S_V^*), apparent specific volumes (ϕ_{Vsp}), standard isobaric partial molar expansibility (ϕ_E^0) and its temperature dependence $(\partial\phi_E^0/\partial T)_P$ and the viscosity *B*-coefficient, *etc*., the various possible molecular interactions were studied. Effects of molality, solute structure and

temperature and taste behavior were analyzed in terms of solute-solute and solute-solvent interactions. The obtained results were also correlated with UV-VIS absorption spectra of the solutions.

Finally the dissertation was concluded in Chapter XI with some remarks on the research works embodied to this thesis.