

Analytical Solutions to the N-Dimensional Schrödinger Equation with a Collective Potential Model to Study Energy Spectra Andthermodynamic Properties of Selected Diatomic Molecules

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Abstract : In this work, the resolutions of the N-dimensional Schrödinger equation with the screened modified Kratzerplus inversely quadratic Yukawa potential (SMKIQYP) have been obtained with the Greene-Aldrich approximation scheme using the Nikiforov-Uvarov method. The eigenvalues and the normalized eigenfunctions are obtained. We then apply the energy spectrum to study four (HCl, N₂, NO, and CO) diatomic molecules. The results show that the energy spectra of these diatomic molecules increase as quantum numbers increase. The energy equation was also used to calculate the partition function and other thermodynamic properties. We predicted the partition function of CO and NO. To check the accuracy of our work, the special case (Modified Kratzer and screened Modified Kratzer potentials) of the collective potential energy eigenvalues agrees excellently with the existing literature.

Keywords : Schrödinger equation, Nikiforov-Uvarov method, modified screened Kratzer, inversely quadratic Yukawa potential, diatomic molecules

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