Extensive Atomic Structure Calculations and Study of Plasma Parameters using Line Intensity Ratios for the Spectra Ne VIII, Fe XXIV and Kr XXXIV in The Lithium Isoelectronic Sequence

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Extensive and accurate computations have been conducted on the energy levels, wavelengths, weighted oscillator strengths, transition rates, line intensity ratios and plasma parameters for the lowest 35 odd and even parity states arising from the $1s^2\ nl$ ($n = 1 - 6$, $0 \leq l \leq n - 1$) configurations of lithium-like neon, iron, and krypton. These calculations involved the Multiconfigurational Dirac-Hartree-Fock (MCDHF) method followed by the Relativistic Configuration Interaction (RCI) approach. Transition rates were also determined for electric-multipole (dipole (E1), quadrupole (E2)) and magnetic-multipole (dipole (M1), quadrupole (M2)). The calculations incorporated Breit interactions and quantum electrodynamics effects (QED) as perturbations within the extensive relativistic configuration interaction (RCI) approach. Our results were compared with other existing theories in the literature and the data from the NIST database revealing a significant level of agreement. Additionally, the line intensity ratios and plasma parameters specifically, plasma temperature and electron density were determined. Almost all atomic data of Li-like ions presented in this paper are calculated for the first time especially those for Fe XXIV and Kr XXXIV.