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Critical Nuclear Charge of the Quantum Mechanical Three-Body Problem[1] MICHAEL BUSUTTIL, AMIRREZA MOINI, GORDON W.F. DRAKE, University of Windsor — The critical nuclear charge (Z_c) for a three-body quantum mechanical system consisting of positive and negative charges is the minimum nuclear charge that can keep the system in a bound state. Here we present a study of the critical nuclear charge for two-electron (heliumlike) systems with infinite nuclear mass, and also a range of reduced mass ratio (μ/m) up to 0.5. The results help to resolve a discrepancy in the literature for the infinite mass case, and they are the first to study the dependence on reduced mass ratio. It was found that Z_c has a local maximum with $\mu/m = 0.3525$. The critical charge for the infinite mass case is found to be $Z_c = 0.911\,028\,224\,076\,8(1\,0)$. This value is more accurate than any previous value in the literature [1, 2, 3, 4], and agrees with the upper bound $Z_c = 0.911\,03$ reported by Baker et al. [1]. The critical nuclear charge outside this range [0.5 – 1.0] still needs to be investigated in future works.

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