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Polarizabilites and Rydberg states in the presence of a Debye potential A.K. BHATIA, RICHARD J. DRACHMAN, NASA/Goddard Space Flight Center — Polarizabilities and hyperpolarizabilities, α_1, β_1, γ_1, α_2, β_2, γ_2, α_3, β_3, γ_3, δ and ϵ of hydrogenic systems have been calculated by Drachman. We have now calculated these quantities by using pseudostates for the S, P, D and F states. All of them converge very fast as the number of terms in the pseudostates is increased, and are essentially independent of the nonlinear parameters. All the results are in good agreement with the results obtained by Drachman, except for δ, which is of the third-order in perturbation formalism. We have calculated Rydberg states of He for high N and L. The effective potential is $-\alpha_1/x^4+(6\beta_1-\alpha_2)/x^6$, where x is the distance of the outer electron from the nucleus. The exchange and electron-electron correlations are unimportant because the outer electron is far away from the nucleus. This implies that the conventional variational calculations are not necessary. The results agree well with the results of Drachman. We have generalized this approach in the presence of a Debye potential.

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