Erratum: Geometric thermodynamic fields and the generalized ensemble in colloidal physics [Phys. Rev. E 73, 010402(R) (2006)]

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The Appendix is invalid beyond the level of the second virial coefficient because it is inconsistent with evaluating the canonical partition function Q from the maximum term in the fundamental definition of the grand partition function; i.e., it fails to yield $\ln Q = \beta pV - \beta\Sigma_\nu N_\nu \mu_\nu$. A correct evaluation alters conjecture (8) such that each phase-space reduction factor ζ_ν is now multiplied by an additional factor $\tilde{p}^{-1}e^{\tilde{p}-1}$, where $\tilde{p}$ denotes the compressibility factor pV/Nk_BT of the entire mixture. It should also have been stated that the explicit form of this conjecture is $\zeta_\nu = x_\nu \beta p \Lambda_\nu^3 e^{-\beta\mu_\nu}$, where x_ν denotes the mole-fraction of species ν, which makes ζ_ν / x_ν a thermodynamic field but not ζ_ν. This special solution of Eq. (7) is equivalent to a factorization of the configurational integral into separate factors for each component of the hard-sphere mixture. One can readily check consistency with statistical mechanics by inserting ζ_ν into the corrected version of Eq. (8) and taking the logarithm. This yields the standard relation between the Helmholtz free energy, the grand potential and the Gibbs free energy, as required. Of course, we have not thereby proved the physical validity of the conjecture, as there are other solutions of Eq. (7).

