



**Erratum: Two-body neutral Coulomb system in a magnetic field at rest:
From hydrogen atom to positronium [Phys. Rev. A **103**, 032820 (2021)]**

J. C. del Valle, A. V. Turbiner , and A. M. Escobar Ruiz

 (Received 4 April 2022; published 14 April 2022)

DOI: [10.1103/PhysRevA.105.049901](https://doi.org/10.1103/PhysRevA.105.049901)

We present some corrections to our paper. The following are errors in math expressions:

(i) Throughout the text, e has the meaning of the magnitude of the electron charge. Therefore, e is always positive. The absolute value in (2.3), (2.8), (2.12), (3.5), (3.9), and (6.24) is not needed.

(ii) On the left-hand side of Eq. (4.3), there is a missing factor 2 in the last term. The correct equation reads

$$\partial_{ss}\Phi_n + \frac{2s}{t}\partial_{st}\Phi_n + \partial_{tt}\Phi_n + \left(\frac{1}{s} - \frac{2s}{t}\right)\partial_s\Phi_n + 2\left(\frac{1}{t} - 1\right)\partial_t\Phi_n = \varepsilon_n - Q_n. \quad (4.3)$$

(iii) In the definition of $\sigma_3(\lambda^2)$ in (4.9), the first subindex in a has to be modified from n to $n - 1$. The correct expression reads

$$\sigma_3(\lambda^2) = \sum_{n=1}^{\infty} a_{n-1,n-1}^{(n)} \lambda^{2n}. \quad (4.9)$$

(iv) In Eq. (4.18), the last two terms: the subindex $n - k - 1$ should be $n - k$. The correct expression reads

$$q_n = \partial_u^2 \phi_{n-1} + \left(\frac{1}{u} - \partial_u \phi_0\right) \partial_u \phi_{n-1} - \sum_{k=1}^{n-1} \left\{ \partial_u \phi_{n-k-1} \partial_u \phi_k + \frac{2u}{v} \partial_u \phi_{n-k} \partial_v \phi_k + \partial_v \phi_{n-k} \partial_v \phi_k \right\}. \quad (4.18)$$

(v) The first term in equality (4.22) should be removed. The correct expression for (4.22) reads

$$\phi_n(\lambda s, t)|_{s=\alpha t}. \quad (4.22)$$

The following are clarifications:

(i) Equation (4.32) is correct. However, for completeness it is necessary to add that $a_{0,0}^{(0)} = 1$ and $b_{0,0}^{(0)} = 0$.

(ii) For the gauge-rotated Hamiltonian $\hat{\mathcal{H}}$ defined in (6.14), we look for eigenfunctions with \mathbf{r} -dependence (i.e., \mathbf{R} -independent) only. This information is essential when deriving (6.16).

(iii) p. 9, right column, after Eq. (5.4), it is written: “This function leads to very accurate energies at $\gamma \leq 1$ a.u., see below, Table II, but it fails for larger γ .” However, there are no results about this function in Table II presented. This sentence should be complemented with Table II.A as the addition to Table II; see below.

The following are minor typographical errors:

(i) p. 5, left column, after Eq. (4.2), third line: “ $e = -1$ ” should be replaced by “ $e = 1$.”

TABLE II.A. Variational energy $E^{(\infty)}$ obtained through trial function (5.4). Results are presented in Ry.

γ (a.u.)	$E^{(\infty)}$
0	-1.000 000 000 000
0.01	-0.999 950 005 31
0.1	-0.995 051 191 1
0.5	-0.89 421 726
1.0	-0.659 657 07
2.0	-0.002 271 9
5.0	2.950 728
10.0	10.650 295

- (ii) p. 5, right column, last line: the expression “ $n = 70\ 100$ ” should be replaced by “ $n = 70-100$.”
- (iii) p. 6, left column, first line: “ $\varepsilon_{70\ 100}$ ” should be replaced by “ ε_{70-100} .”
- (iv) p. 6, left column, second line of the second paragraph: “factorially a large” should be replaced by “factorially at large n .”
- (v) p. 7, right column, the line after Eq. (4.25): remove “the Riccati equation.”
- (vi) p. 18: “tothe” should be replaced by “to the.”
- (vii) p. 19, Table VII, fourth column: replace “ n ” by “ k .”
- (viii) p. 19, Appendix C, first line: “ $1p_0$ ” should be replaced by “ $2p_0$.”

None of the final results presented in our paper, either of a numerical or mathematical nature, is affected by the above corrections, omissions, and additions. Physical conclusions remain unchanged.