



PHYS 3317: Two-Particle systems

Hand in at beginning of next lecture

Problem 1. For each of the following problems, write a two-particle wavefunction $\psi(r_e, R_p)$ for an electron and proton which models each independent situation:

1.1. The electron and proton are tightly bound to one-another, but their center of mass is undetermined.

Solution 1.1.

1.2. The electron is localized near r_1 and the proton is localized near r_2 .

Solution 1.2.



1.3. The electron and proton are both delocalized, but whenever the electron is in the half-space where $x_e > 0$, the proton is in the space with $X_p < 0$. Conversely if the electron position has $x_e < 0$, then the proton's position has $X_p > 0$. You may find it useful to use the Heaviside function $\theta(x)$, which is zero for negative x and 1 for positive x .

Solution 1.3.