

Phys 402: Applications of Quantum Mechanics

Lecture on variational method: Example II

Consider a hydrogen molecule ion or two protons with one electron. When two protons are close by, a strong repulsion keeps them apart. But when they are far apart, the electron orbiting around these two protons leads to an effective attraction between two protons. Here you can use the simple delta-potential model to study and understand the effect of electrons on protons, the effect of *gluing*.

1) Calculate the normalization factor of the proposed electronic wave function.

2) Calculate the potential energy.

3) What is the kinetic energy ?

4) What is the energy as a function of the distance between two "protons"?