

Answer on Question #67991 - Physics – Quantum Mechanic

Question:

Consider the 1s state of hydrogen, calculate the probability of finding the electron in the region given below:  $0 < r \leq 0.5a_0$

Solution:

A problem in integration of

$$\frac{4}{a_0^3} \int_0^{a_0/2} e^{-\frac{2r}{a_0}} r^2 dr$$

$$\int_0^{a_0/2} e^{-\frac{2r}{a_0}} r^2 dr = -\frac{a_0}{2} e^{-\frac{2r}{a_0}} \left[ r^2 + a_0 r + \frac{a_0}{2} \right]$$

$$\text{Thus } \frac{4}{a_0^3} \int_0^{a_0/2} e^{-\frac{2r}{a_0}} r^2 dr = -\frac{2}{a_0^2} e^{-\frac{2r}{a_0}} \left[ r^2 + a_0 r + \frac{a_0}{2} \right]_0^{a_0/2}$$

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