1. Hydogen Atom - Final Fall 1997

2. Protons on Glass - Prelim III Spring 1997

Week Beginning October 30, 1997, 4:00 - 5:18

Week Beginning November 23, 4:00 - 5:18

1. Reading: Assimilations from Young and Freedman

Homework

Handout November 15 1997

Physics 214 Fall 99 - Problem Set 14
SOLUTION: The probability of finding a particle in the volume between \( r \) and \( r + dr \) is given by the volume integral:

\[
\rho = \frac{\mu_0}{4\pi} \frac{d^3 r}{r^3}
\]

We wish to compute the probability of finding a particle in the volume corresponding to a given configuration of particles such that one particle is in the configuration given by the wavefunction \( \psi_1 \) and the other is in the configuration given by the wavefunction \( \psi_2 \).

Now consider the situation that we have two identical non-interacting particles. The Schrödinger equation is given by

\[
\frac{\hbar^2}{2m} \left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2} \right) \psi = i\hbar \frac{\partial \psi}{\partial t}
\]

To find the eigenvalues, express your answer(s) in terms of \( \mu_0 \). Hence determine the radius at which the electron is least likely to be

\[
\frac{\partial^2}{\partial r^2} + \frac{1}{r} \frac{\partial}{\partial r} \left( r \frac{\partial}{\partial r} \right) \psi = i\hbar \frac{\partial \psi}{\partial t}
\]

The solutions to the radial Schrödinger equation are given by

\[
\psi(r) = \frac{\rho \mu_0}{r} \left( \frac{\mu_0}{\pi} \right)^{3/2} \frac{\mu_0}{\pi} \left( \frac{\mu_0}{\pi} \right)^{1/2} \pi^{1/2} r^2 e^{-\frac{\mu_0 r^2}{\pi}}
\]

Thus, the solutions are

\[
\frac{\rho \mu_0}{r} \left( \frac{\mu_0}{\pi} \right)^{3/2} \frac{\mu_0}{\pi} \left( \frac{\mu_0}{\pi} \right)^{1/2} \pi^{1/2} r^2 e^{-\frac{\mu_0 r^2}{\pi}}
\]

This then implies

\[
0 = \left( \frac{\rho \mu_0}{r} \left( \frac{\mu_0}{\pi} \right)^{3/2} \frac{\mu_0}{\pi} \left( \frac{\mu_0}{\pi} \right)^{1/2} \pi^{1/2} r^2 e^{-\frac{\mu_0 r^2}{\pi}} \right) \text{ for } \infty = r \Rightarrow 0 = (\phi)^\mu
\]

Thus, the minimum for \( \infty \) is zero. Hence the minimum occurs when \( 0 = (\phi)^\mu \).

\[
\frac{\rho \mu_0}{r} \left( \frac{\mu_0}{\pi} \right)^{3/2} \frac{\mu_0}{\pi} \left( \frac{\mu_0}{\pi} \right)^{1/2} \pi^{1/2} r^2 e^{-\frac{\mu_0 r^2}{\pi}}
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Thus, the solutions are

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Hence determine the radius at which the electron is least likely to be

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Thus, the solutions are

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\]
\[ \frac{a_{xy}}{a_{xy}} - \epsilon \left( \frac{b_{xy}}{b_{xy}} - 1 \right) a_{xy} = - \frac{b_{xy}}{b_{xy}} - \epsilon \left( \frac{a_{xy}}{a_{xy}} - 1 \right) a_{xy} = \epsilon (a_{xy}) = (a_{xy})_x \]

Hence
\[ (a_{xy})_x = (a_{xy})_y \]

SOLUTION: Bons are described by anti-symmetric wavefunction. 

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