

Quiz #4 (Schrödinger's equation)

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Quantum Mechanics

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Prob. 1

Derive the three-dimensional time-independent Schrödinger equation from the Helmholtz equation for the wave function given as $\nabla^2 \psi(\vec{r}) = -k^2 \psi(\vec{r})$ where k is the wave number.

Prob. 2

Explain the Born interpretation of the quantum mechanical wave function.

Prob. 3

The double slit experiment is often used for investigation of the quantum mechanical nature of physical quantities. Explain how the experimental results change for following changes in the experiment.

(a) The wavelength of photons used in the experiment is increased. The photons have the same wavelength and other conditions are kept the same.

(b) The kinetic energy of electrons used in the experiment is increased. The electrons have the same kinetic energy and other conditions are kept the same.

(c) The experiment is done with only one photon but repeated many times.

(d) A photodetector is placed near one of two slits so that it can be determined which slit a photon passes.