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Energy Measurements Pretest

University of Colorado

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Please type your name in the form: Last, First:

Required.

NOTE!! Please type in your CU userid (that's the username you use to log in to CULearn. We do NOT want your password. It probably looks like your last name, perhaps with a few extra characters. Note that it is definitely NOT your numerical (9 digit) student ID!!

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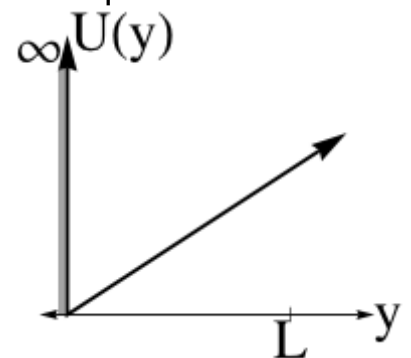
Please type your CU userid:

Required.

Consider a quantum mechanical system with the potential shown at right. The system is prepared so that at $t = 0$ it is in a state described by a wave function identical to that of the ground state of the infinite square well. That is,

$$\Psi(y, 0) = \sqrt{\frac{2}{L}} \sin\left(\frac{\pi y}{L}\right) \quad 0 < y < L$$

$$\Psi(y, 0) = 0 \quad y \leq 0, y \geq L$$



Q1:

a) Does the wave function associated with this state depend on time?

a) DOES the wave function associated with this state depend on time?

Required.

Select one...

b) If so, describe how you would write down its time dependence. If not, explain why not.

Required.

Q2:

a) Does the probability density associated with this state depend on time?

Required.

Select one...

b) If so, describe its time dependence. If not, explain why not.

Required.

Assume that a quantum mechanical harmonic oscillator is prepared so that its initial state is given by:

$$\Psi_i = \Psi(x, 0) = i\sqrt{\frac{1}{3}}\psi_0 - \sqrt{\frac{2}{3}}\psi_1$$

where ψ_0 and ψ_1 are the ground state ($n=0$) and first excited state ($n=1$) which satisfy the time independent Schrödinger equation:

$$\hat{H}\psi_0 = E_0\psi_0$$

and

$$\hat{H}\psi_1 = E_1\psi_1$$

Q3:

a) Consider an energy measurement made on this system. Are there times when the probability of measuring E_1 is zero and the probability of

measuring E_0 is one?

Required.

b) If so, give the first such time. If not, explain why not.

Required.

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Submit responses

Questions or Comments?

Contact the 123 tutorial pretest coordinator at uwttl123@u.washington.edu

