

Time remaining:
0:14:41

This is only a preview of the survey. Responses will not be saved. [Close](#)

Quantum Operator Methods Pretest

University of Colorado

Page 1 of 1

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!!

This script cannot "error check", you have to be sure you type it in correctly! Thanks

Please type your CU userid:

Required.

For the questions below, we will consider measurements on two observables, A and B, in a two-state system. Observable A has an associated operator, \hat{A} . \hat{A} has eigenvalues α_1 and α_2 and eigenfunctions $|a_1\rangle$, and $|a_2\rangle$ respectively. Similarly, observable B has an associated operator, \hat{B} which in turn has eigenvalues β_1 and β_2 and eigenfunctions $|b_1\rangle$, and $|b_2\rangle$ respectively.

We can write the eigenvector, $|b_1\rangle$, in terms of the eigenvectors of \hat{A} :

$$|b_1\rangle = \sqrt{\frac{5}{6}}|a_1\rangle - \sqrt{\frac{1}{6}}|a_2\rangle.$$

Q1:

a) Which choice or choices below represent the eigenvector $|b_2\rangle$ in terms of the eigenfunctions of \hat{A} ?

eigenvectors of A :

$$\text{I: } \sqrt{\frac{5}{6}}|a_1\rangle + \sqrt{\frac{1}{6}}|a_2\rangle$$

$$\text{II: } \sqrt{\frac{1}{6}}|a_1\rangle - \sqrt{\frac{5}{6}}|a_2\rangle$$

$$\text{III: } \sqrt{\frac{1}{6}}|a_1\rangle - i\sqrt{\frac{5}{6}}|a_2\rangle$$

Required.

b) Explain your answer. For each choice you selected as correct, explain how you know. If you stated that none of the choices are correct, give a correct choice. Finally, if a correct choice cannot be determined, state why.

Required.

Q2:

a) We measure A and obtain the value α_1 . If we now measure B , what is the probability that we will obtain β_1 ?

Required.

b) Explain your answer.

Required.

© 2009 Steve Goldhaber and the Physics Education Group
University of Colorado at Boulder

Submit responses

Questions or Comments?

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

