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Angular Momentum and Spin Pretest

University of Colorado

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In the following questions, we will use quantum states made up of the hydrogen energy eigenstates:

$$\psi_{nlm}(r, \theta, \phi) = R_{nl}(r)Y_l^m(\theta, \phi)$$

The energy of one of these states is:

$$E_n = \frac{E_1}{n^2}$$

where E_1 is the energy of the ground state (-13.6 eV). For simplicity, we will leave out the coordinates and use:

$$\psi_{nlm} = R_{nl}Y_l^m$$

Q1:

Consider the electron in a hydrogen atom to initially be in the state:

$$\Psi(t=0) = \sqrt{\frac{1}{3}}R_{10}Y_0^0 + \sqrt{\frac{1}{3}}R_{21}Y_1^1 + \sqrt{\frac{1}{3}}R_{32}Y_2^1$$

- a) What is the probability of measuring the energy of this state and obtaining E_2 ?

Required.

Select one...

- b) Explain your answer.

Required.

Q2:

Consider the electron in a hydrogen atom to be in the same initial state.

- a) What is the probability of measuring the \hat{L}_z of this state and

obtaining \hbar ?

Required.

b) Explain your answer.

Required.

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Submit responses

Questions or Comments?

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

