

Question 1

Consider the hydrogen atom in any state for which the magnitude of the angular momentum is $L = \hbar\sqrt{20}$.

The z component of the momentum, L_z is measured. What is the largest value that this measurement can give?

1. $L_z = \hbar$
2. $L_z = 2\hbar$
3. $L_z = 4\hbar$
4. $L_z = 5\hbar$
5. $L_z = \sqrt{20}\hbar$

Question 2

For $l = 2$ and $m_l = 0$, the angular factor of the wavefunction is

$$\sqrt{\frac{5}{16\pi}} \left(3 \cos^2 \theta - 1 \right) .$$

Let p_z be the probability with which the particle is found along the z axis and p_{xy} the probability with which it is found anywhere in the xy -plane.

Which of the following is true?

1. $p_z = \frac{1}{4} p_{xy}$
2. $p_z = \frac{1}{2} p_{xy}$
3. $p_z = p_{xy}$
4. $p_z = 2p_{xy}$
5. $p_z = 4p_{xy}$