CH301H – Principles of Chemistry I: Honors
Fall 2011, Unique 51040

Quiz 3

For an atom in which \( n = 3 \) and \( l = 1 \), answer the following questions:

a) Determine the allowed values of \( m \) and \( m_s \).

b) Determine the number of radial nodes, angular nodes, and the total number of nodes.

c) Using a combination of words, pictures, or equations, describe the probability of finding an electron a certain distance from the nucleus.

d) Using a combination of words, pictures, or equations, describe the probability of finding an electron at certain angle with respect to the nucleus.

e) If there are 6 electrons in the \( n = 3 \) orbital, is this atom paramagnetic or diamagnetic?

f) What is this atom?

\( m = -1, 0, 1 \) : \( m_s = \pm \frac{1}{2} \)

b) \( \text{angular nodes} = l = 1 \)

\( \text{radial nodes} = n-l-1 = 1 \)

\( \text{total nodes} = 2 \)

c) Radial node implies that there are two places we could find the electron, with lower probability closer to the nucleus and higher probability further away:

\[ P \]

\[ \uparrow \text{node} \quad r \]
d) Angular node \( \Rightarrow \) orbital, node is a plane

- Putting c + d together, orbital looks something like:

\[
\begin{array}{l}
E \quad \text{angular node} \\
\text{radial node}
\end{array}
\]

c) \(6e^- \quad \frac{7L}{3S} \quad \frac{7L}{1} \quad \frac{7L}{1} \quad \frac{3p}{3p}
\]

2 unpaired \( \Rightarrow \) paramagnetic

f) The atom with \(4e^-\) in a 3p orbital is \(\boxed{5}\).