7.56  (a) \( n=6 \Rightarrow \{ l=0, 1, 2, 3, 4, 5 \} \) (i.e. upto \( n-1 \))

(b) \( l=5 \Rightarrow \{ m_l = -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5 \} \)

c) \( l=2 \Rightarrow d \), so subshell label is \( 6d \)

(d) A \( 6d \) orbital can have \( m_l = -2, -1, 0, 1, 2 \); each \( e^- \) can have \( m_s = \frac{1}{2}, \frac{3}{2} \)

7.61  (a) Plot 2-D cross-sections ("boundary surface diagrams")

\[ Y \]
\[ z \]
\[ x \]

\[ 2p_x \]
\[ 2p_y \]
\[ 2p_z \]

We know how to label each orbital by using the rule that "orbital subscript" = 0 gives the equation of the angular node (a plane).

(b) Differences in penetration are clearly shown with radial probability sketches:

\[ 4\pi r^2 \Delta r \left| \psi \right|^2 \equiv RDF \]

This shows that there is a local maximum in the \( 2s \) radial probability closer to the nucleus than the single radial probability in the \( 2p \) radial probability.