The Angular Momentum Operators in Spherical Coordinates

$$\hat{L}_x = -i\hbar\left(-\sin\phi\frac{\partial}{\partial\theta} - \cot\theta\cos\phi\frac{\partial}{\partial\phi}\right)$$

$$\hat{L}_y = -i\hbar\left(\cos\phi\frac{\partial}{\partial\theta} - \cot\theta\sin\phi\frac{\partial}{\partial\phi}\right)$$

$$\hat{L}_z = -i\hbar\frac{\partial}{\partial\phi}$$

Donald A. McQuarrie and John D. Simon, *Physical Chemistry*: *A Molecular Approach*; University Science Books: Sausalito, CA; 1997

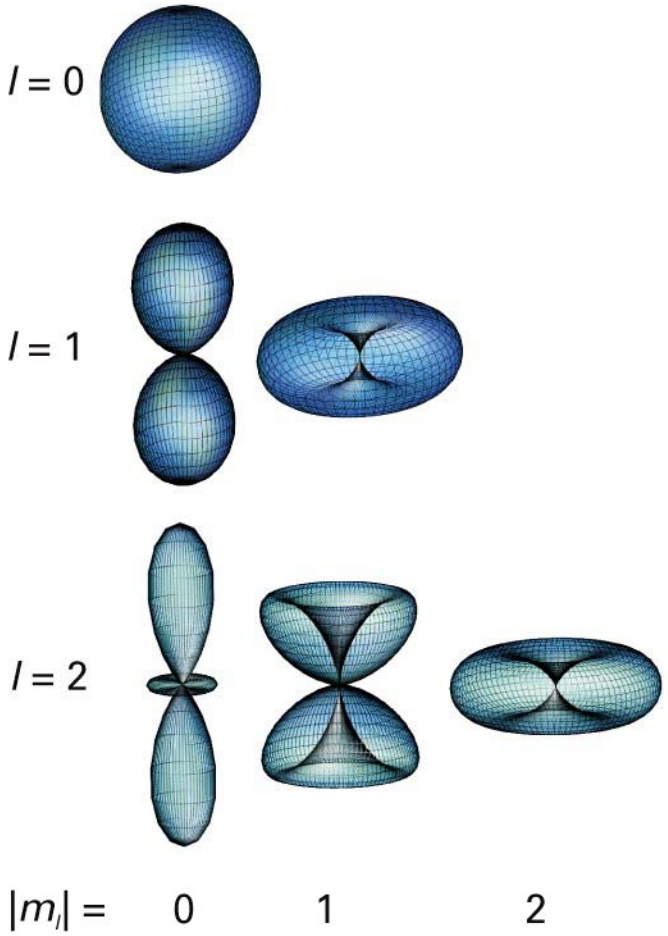

Fig. 9.37 A more complete representation of the wavefunctions for $l = 0$, 1, 2, and 3. The distance of a point on the surface from the origin is proportional to the square modulus of the amplitude of the wavefunction at that point.