TABLE 1 *Orbital Letter Designations According to Values of l*

l	Letter
0	*s*
1	*p*
2	*d*
3	*f*

than or equal to $n - 1$. For example, orbitals for which $n = 2$ can have one of two shapes corresponding to $l = 0$ and $l = 1$. Depending on its value of l, an orbital is assigned a letter, as shown in **Table 1.**

As shown in **Figure 13,** *s* orbitals are spherical, *p* orbitals have dumbbell shapes, and *d* orbitals are more complex. (The *f* orbital shapes are too complex to discuss here.) In the first energy level, $n = 1$, there is only one sublevel possible—an *s* orbital. As mentioned, the second energy level, $n = 2$, has two sublevels—the *s* and *p* orbitals. The third energy level, $n = 3$, has three sublevels—the *s*, *p*, and *d* orbitals. The fourth energy level, $n = 4$, has four sublevels—the *s*, *p*, *d*, and *f* orbitals. In an *n*th main energy level, there are *n* sublevels.

Each atomic orbital is designated by the principal quantum number followed by the letter of the sublevel. For example, the 1*s* sublevel is the *s* orbital in the first main energy level, while the 2*p* sublevel is the set of *p* orbitals in the second main energy level. On the other hand, a 4*d* orbital is part of the *d* sublevel in the fourth main energy level. How would you designate the *p* sublevel in the third main energy level? How many other sublevels are in the same main energy level with this one?

Magnetic Quantum Number

Atomic orbitals can have the same shape but different orientations around the nucleus. *The* **magnetic quantum number,** *symbolized by m, indicates the orientation of an orbital around the nucleus.* Values of *m* are whole numbers, including zero, from $-l$ to $+l$. Because an *s* orbital is spherical and is centered around the nucleus, it has only one possible orientation. This orientation corresponds to a magnetic quantum num-

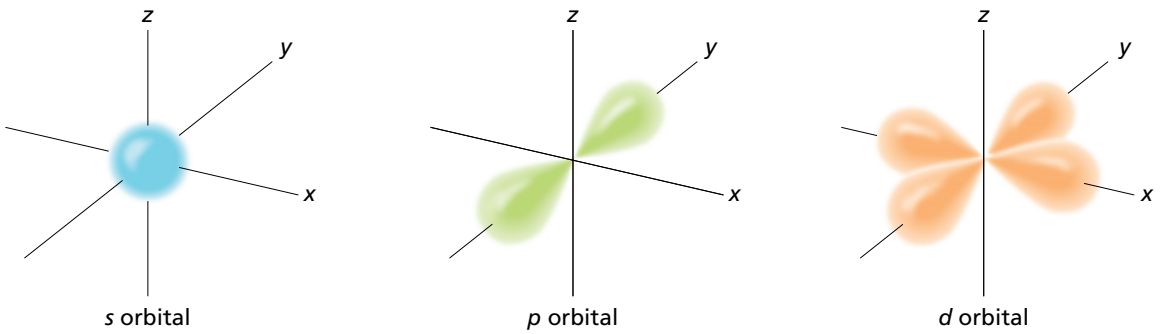

FIGURE 13 The orbitals *s*, *p*, and *d* have different shapes. Each of the orbitals shown occupies a different region of space around the nucleus.