$$E = 2s^2 2p^5 \quad G = 4d^{10} 5s^2 5p^5 \quad J = 2s^2 2p^2$$

$$L = 5d^{10} 6s^2 6p^5 \quad M = 2s^2 2p^4$$

a. Identify the block location for each element. Then, determine which elements are in the same period and which are in the same group.

b. Which element would you expect to have the highest electron affinity? Which would you expect to form a 1– ion? Which should have the highest electronegativity?

c. Compare the ionic radius of the typical ion formed by the element G with the radius of the atom from which the ion was formed.

d. Which element(s) contain seven valence electrons?

extension

Go to **go.hrw.com** for more practice problems that ask you to predict periodic properties.

Keyword: HC6PERX

Periodic Properties of the *d*- and *f*-Block Elements

The properties of the *d*-block elements (which are all metals) vary less and with less regularity than those of the main-group elements. This trend is indicated by the curves in **Figures 14** and **16,** which flatten where the *d*-block elements fall in the middle of Periods 4–6.

Recall that atoms of the *d*-block elements contain from zero to two electrons in the *s* orbital of their highest occupied energy level and one to ten electrons in the *d* sublevel of the next-lower energy level. Therefore, electrons in both the *ns* sublevel and the $(n - 1)d$ sublevel are available to interact with their surroundings. As a result, electrons in the incompletely filled *d* sublevels are responsible for many characteristic properties of the *d*-block elements.

Atomic Radii

The atomic radii of the *d*-block elements generally decrease across the periods. However, this decrease is less than that for the main-group elements because the electrons added to the $(n - 1)d$ sublevel shield the outer electrons from the nucleus. Also, note in **Figure 14** that the radii dip to a low and then increase slightly across each of the four periods that contain *d*-block elements. As the number of electrons in the *d* sublevel increases, the radii increase because of repulsion among the electrons.

In the sixth period, the *f*-block elements fall between lanthanum (Group 3) and hafnium (Group 4). Because of the increase in atomic number that occurs from lanthanum to hafnium, the atomic radius of hafnium is actually slightly less than that of zirconium, Zr, the element immediately above it. The radii of elements following hafnium in the sixth period vary with increasing atomic number in the usual manner.