SAMPLE PROBLEM B

For more help, go to the Math Tutor at the end of this chapter.

An element has the electron configuration [Kr]$4d^5 5s^1$. Without looking at the periodic table, identify the period, block, and group in which this element is located. Then, consult the periodic table to identify this element and the others in its group.

SOLUTION

The number of the highest occupied energy level is 5, so the element is in the fifth period. There are five electrons in the *d* sublevel, which means that it is incompletely filled. The *d* sublevel can hold 10 electrons. Therefore, the element is in the *d* block. For *d*-block elements, the number of electrons in the *ns* sublevel (1) plus the number of electrons in the $(n - 1)d$ sublevel (5) equals the group number, 6. This Group 6 element is molybdenum. The others in Group 6 are chromium, tungsten, and seaborgium.

PRACTICE

Answers in Appendix E

1. Without looking at the periodic table, identify the period, block, and group in which the element that has the electron configuration [Ar]$3d^8 4s^2$ is located.
2. Without looking at the periodic table, write the outer electron configuration for the Group 12 element in the fifth period.

extension

Go to **go.hrw.com** for more practice problems that ask you to use the electron configurations of elements to locate those elements in the periodic table.

Keyword: HC6PERX

The *p*-Block Elements: Groups 13–18

The *p*-block elements consist of all the elements of Groups 13–18 except helium. Electrons add to a *p* sublevel only after the *s* sublevel in the same energy level is filled. Therefore, atoms of all *p*-block elements contain two electrons in the *ns* sublevel. *The p-block elements together with the s-block elements are called the* **main-group elements.** For Group 13 elements, the added electron enters the *np* sublevel, giving a group configuration of ns^2np^1. Atoms of Group 14 elements contain two electrons in the *p* sublevel, giving ns^2np^2 for the group configuration. This pattern continues in Groups 15–18. In Group 18, the stable noble-gas configuration of ns^2np^6 is reached. The relationships among group numbers and electron configurations for all the groups are summarized in **Table 2.**

For atoms of *p*-block elements, the total number of electrons in the highest occupied level is equal to the group number minus 10. For example, bromine is in Group 17. It has $17 - 10 = 7$ electrons in its highest energy level. Because atoms of *p*-block elements contain two electrons in the *ns* sublevel, we know that bromine has five electrons in its outer *p* sublevel. The electron configuration of bromine is [Ar]$3d^{10}4s^2 4p^5$.

The properties of elements of the *p* block vary greatly. At its right-hand end, the *p* block includes all of the *nonmetal*s except hydrogen and helium. All six of the *metalloids* (boron, silicon, germanium, arsenic,