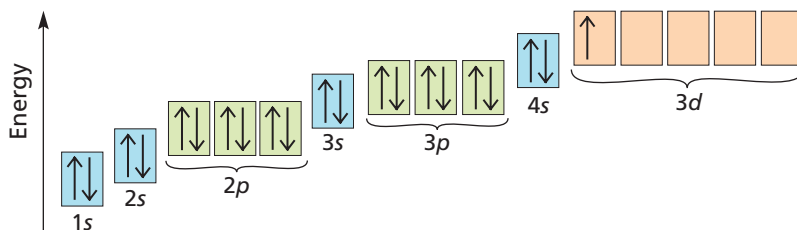


FIGURE 9 The diagram shows the electron configuration of scandium, Sc, the Group 3 element of the fourth period. In general, the $(n - 1)d$ sublevel in Groups 3–12 is occupied by electrons after the ns sublevel is filled.



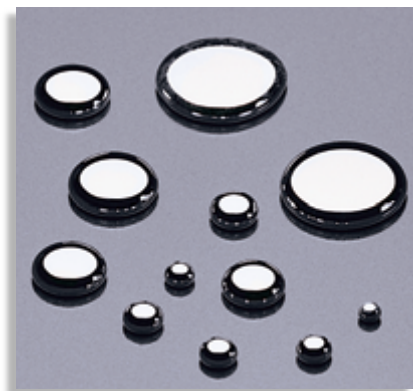
The d -Block Elements: Groups 3–12

For energy level n , there are n possible sublevels, so the d sublevel first appears when $n = 3$. This $3d$ sublevel is slightly higher in energy than the $4s$ sublevel, so these are filled in the order $4s3d$ (see **Figure 9**). This order of filling is also seen for higher values of n . Each d sublevel consists of five orbitals with a maximum of two electrons each, or up to 10 electrons possible in each d sublevel. In addition to the two ns electrons of Group 2, atoms of the Group 3 elements each have one electron in the d sublevel of the $(n - 1)$ energy level. The group configuration for Group 3 is therefore $(n - 1)d^1ns^2$. Atoms of the Group 12 elements have 10 electrons in the d sublevel plus two electrons in the ns sublevel. The group configuration for Group 12 is $(n - 1)d^{10}ns^2$.

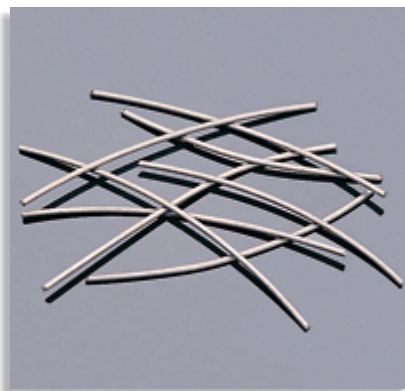
As you read in Chapter 4, some deviations from orderly d sublevel filling occur in Groups 4–11. As a result, elements in these d -block groups, unlike those in s -block and p -block groups, do not necessarily have identical outer electron configurations. For example, in Group 10, nickel, Ni, has the electron configuration $[\text{Ar}]3d^84s^2$. Palladium, Pd, has the configuration $[\text{Kr}]4d^{10}5s^0$. And platinum, Pt, has the configuration $[\text{Xe}]4f^{14}5d^96s^1$. Notice, however, that in each case the sum of the outer s and d electrons is equal to the group number.

*The d -block elements are metals with typical metallic properties and are often referred to as **transition elements**.* They are good conductors of electricity and have a high luster. They are typically less reactive than the alkali metals and the alkaline-earth metals. Some are so unreactive that they do not easily form compounds, existing in nature as free elements. Palladium, platinum, and gold are among the least reactive of all the elements. Some d -block elements are shown in **Figure 10**.

FIGURE 10 Mercury, tungsten, and vanadium are transition elements. Locate them in the d block of the periodic table on pages 140–141.



Mercury



Tungsten



Vanadium