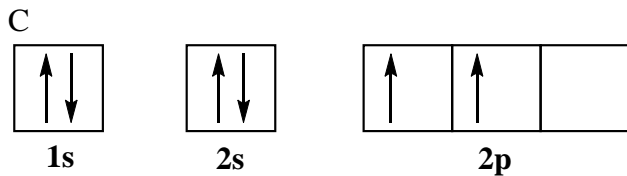


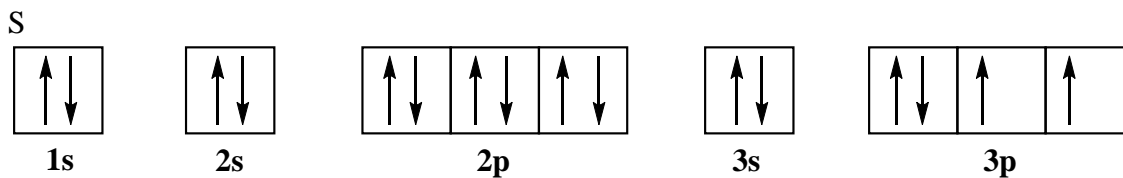
## Answers to Exercise 5.1 Drawing Orbital Occupancy Diagrams

1.

(a)

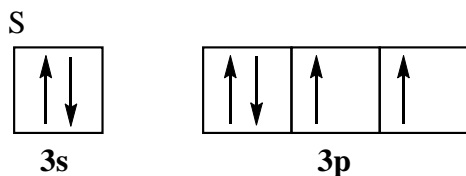


(b)

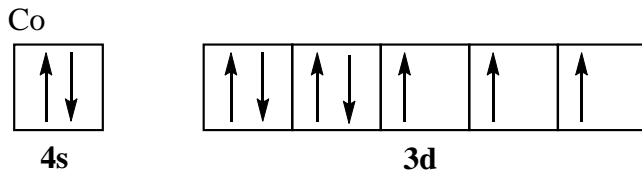


2.

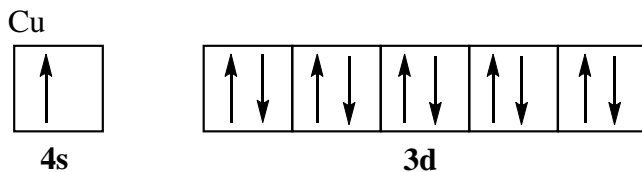
(a)



(b)



(c)



*Cu and Cr are the two elements in period 4 who do not follow the usual order (“aufbau order”) for adding electrons. In both cases, the atom has lower energy if there is only one electron in the 4s orbital (leaving it half full). For Cu, the 3d subshell is therefore full. For Cr, the 3d subshell is half full. If you have not yet discussed this in class, you will. There are no exceptions to the aufbau order in periods 1, 2 or 3.*

3.

(a) All the 3d electrons have  $n = 3$ .

(b) All the 4s electrons have  $n = 4$ .

(c) All the 4s electrons have  $l = 0$ .

(d) All the 3d electrons have  $l = 2$ .

(e) The only valid  $m_l$  value for the electrons in the 4s orbital is 0.

The five orbitals in the 3d subshell must each have a different value for  $m_l$ . The five different values must be -2, -1, 0, +1 and +2, but it does not matter which box is assigned which number.

(f) The electrons with the same value for  $m_s$  have the same spin. This is represented by the direction in which the arrow is pointing. So, the electrons with the same value for  $m_s$  are shown as arrows pointing in the same direction.