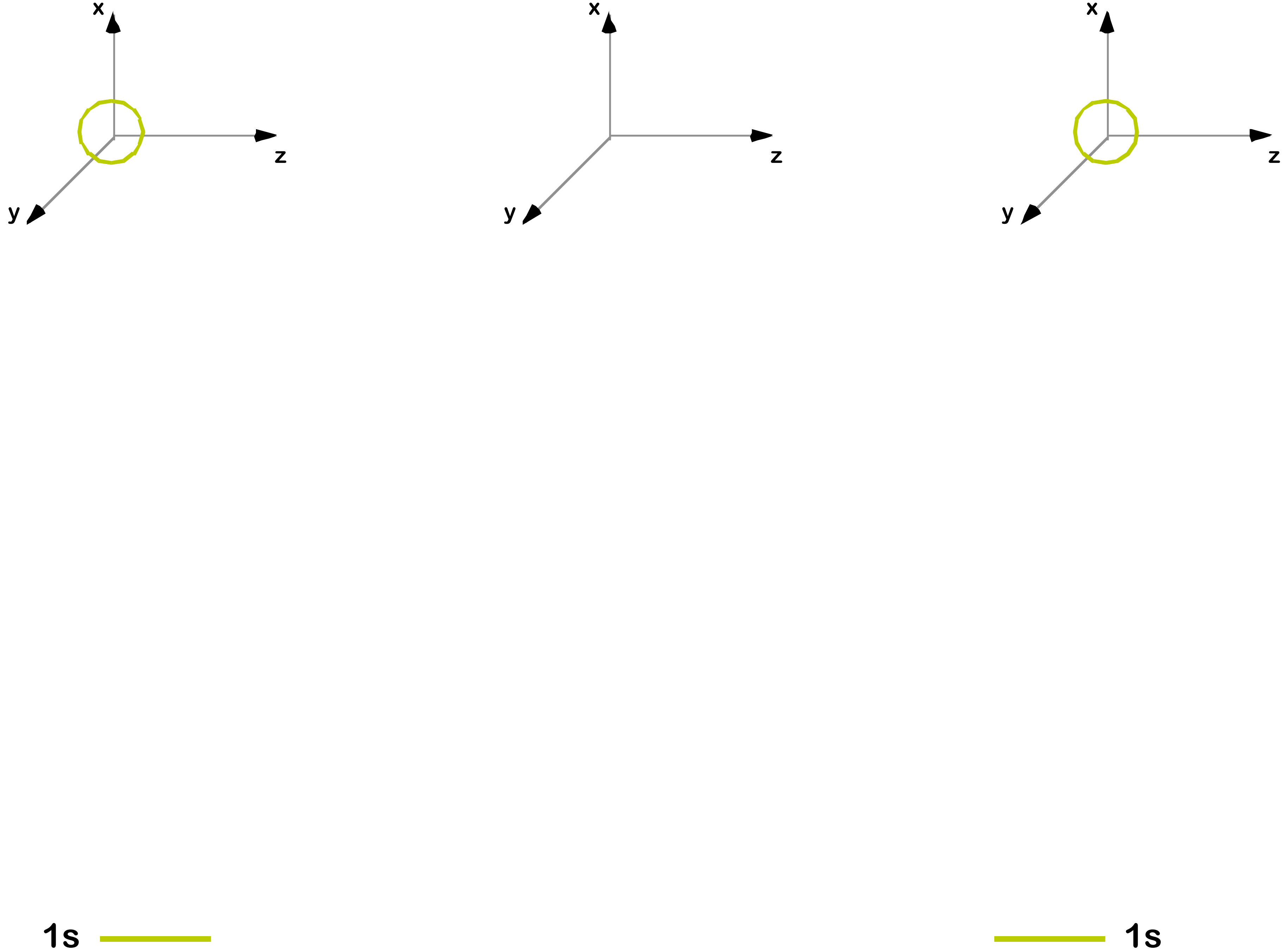
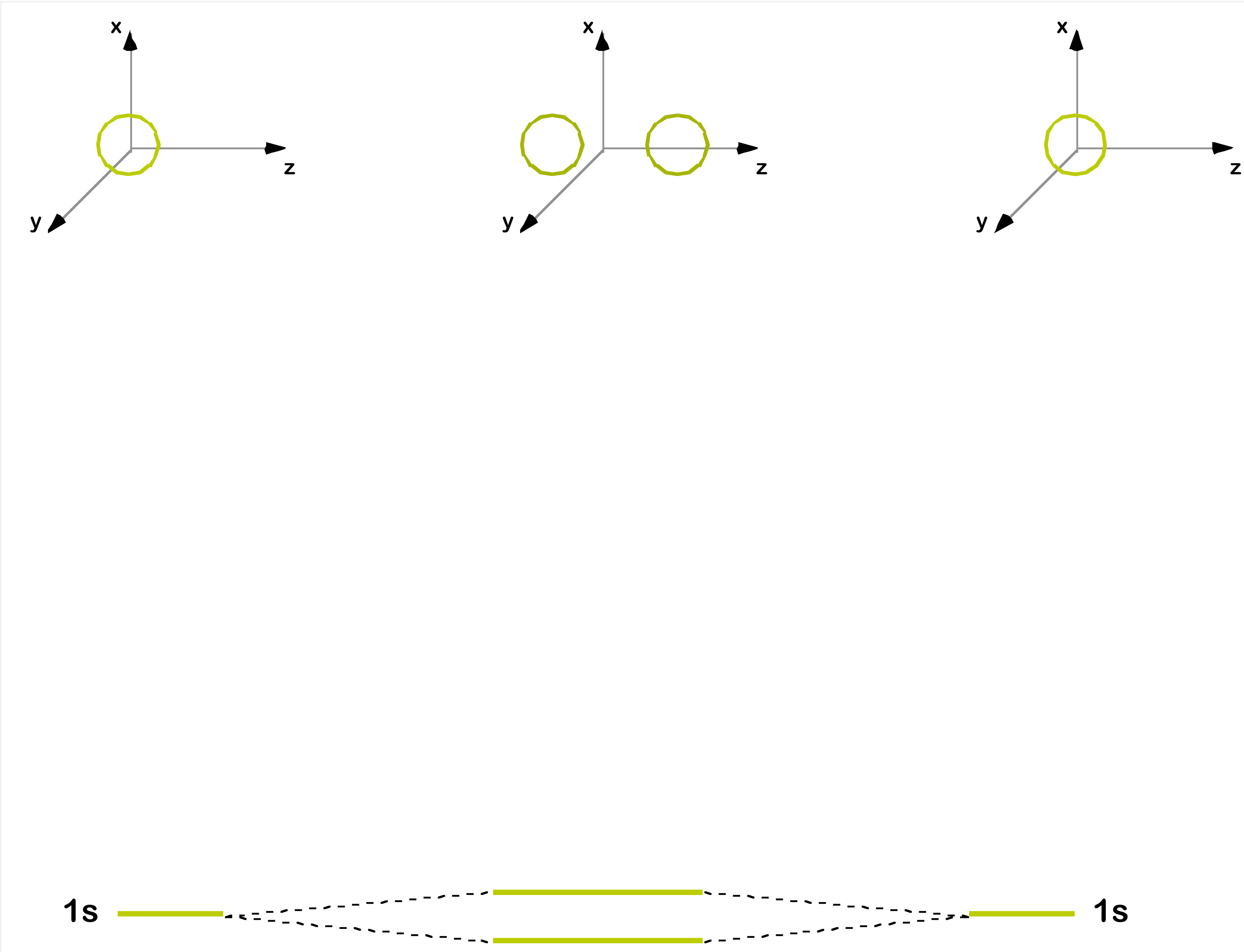
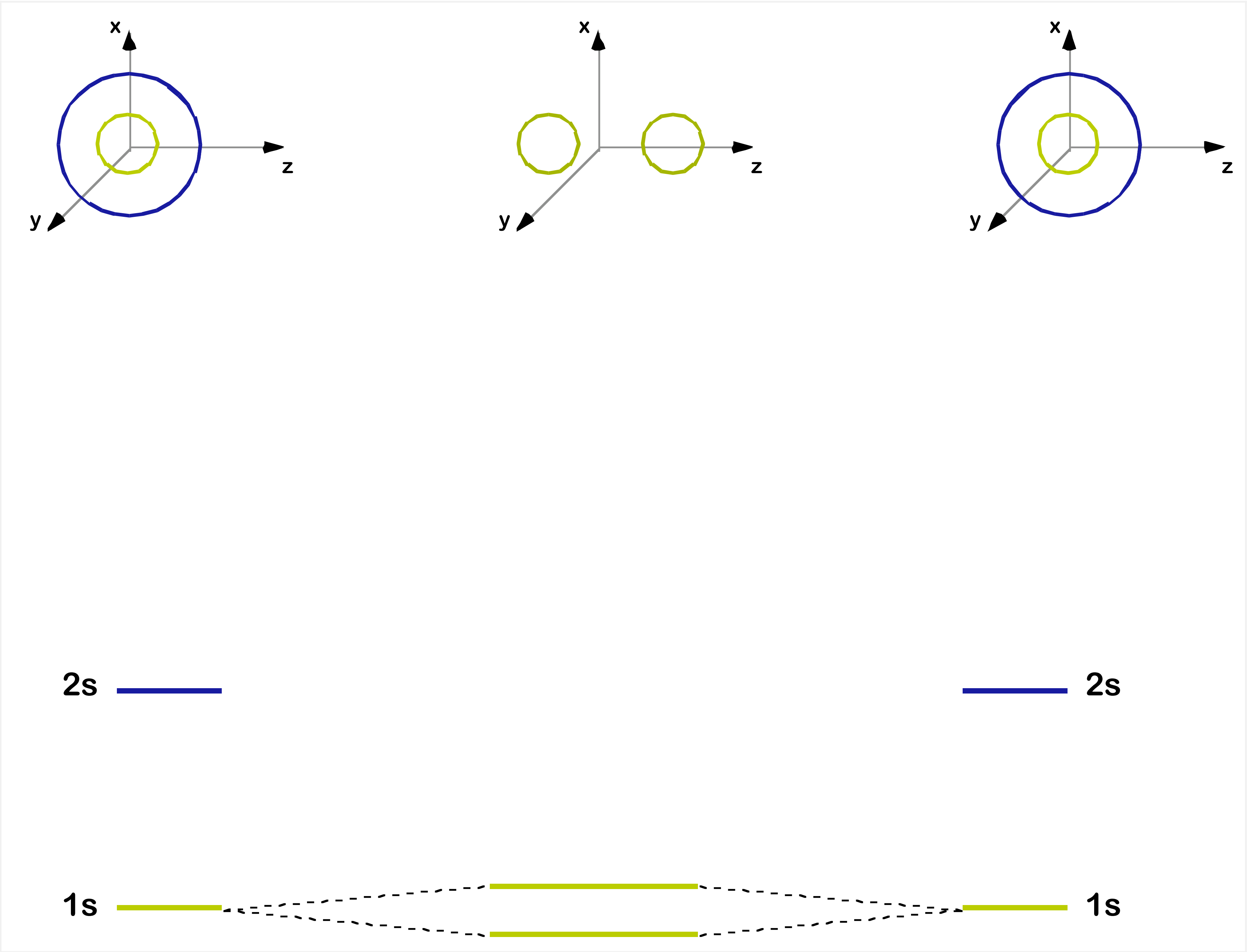
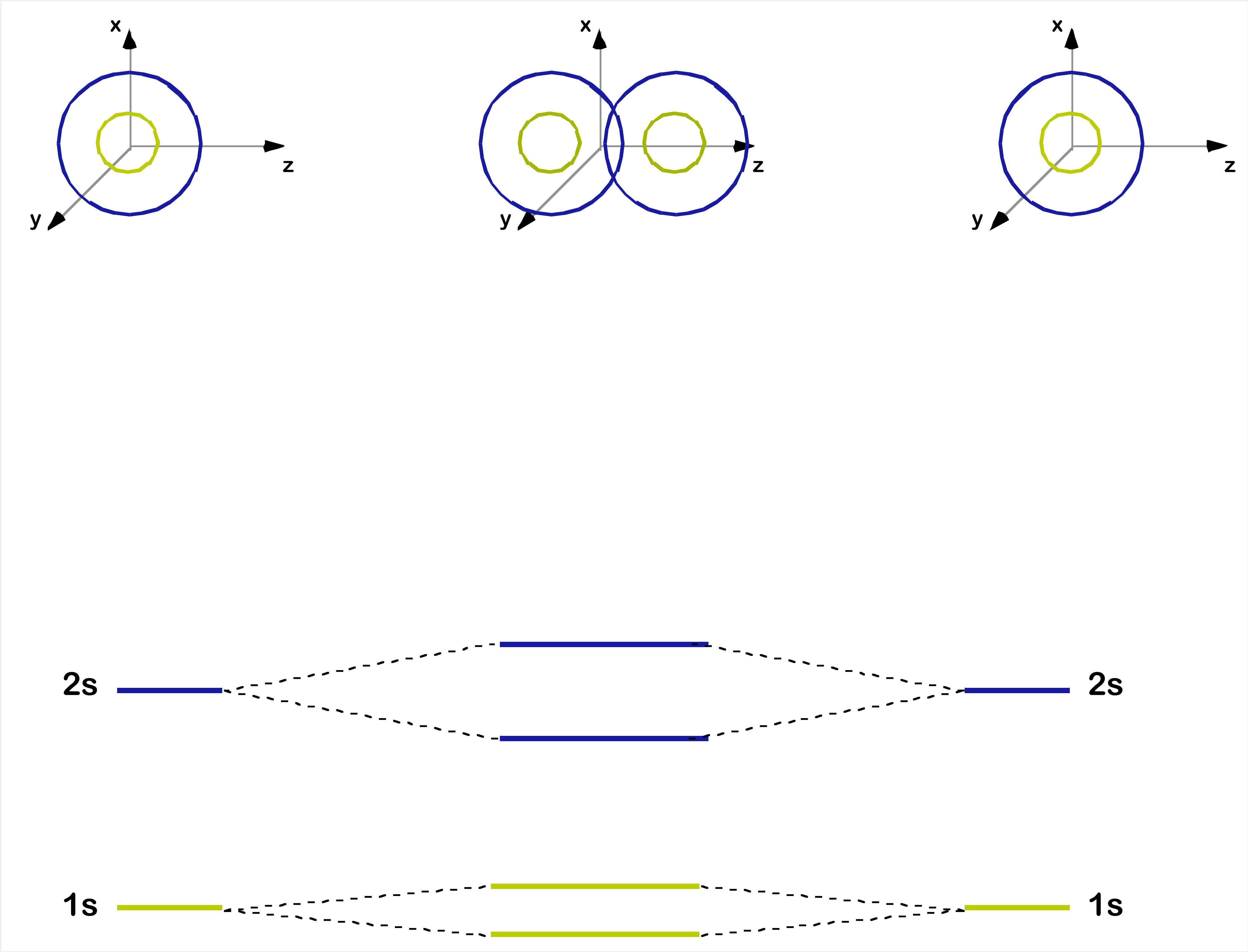
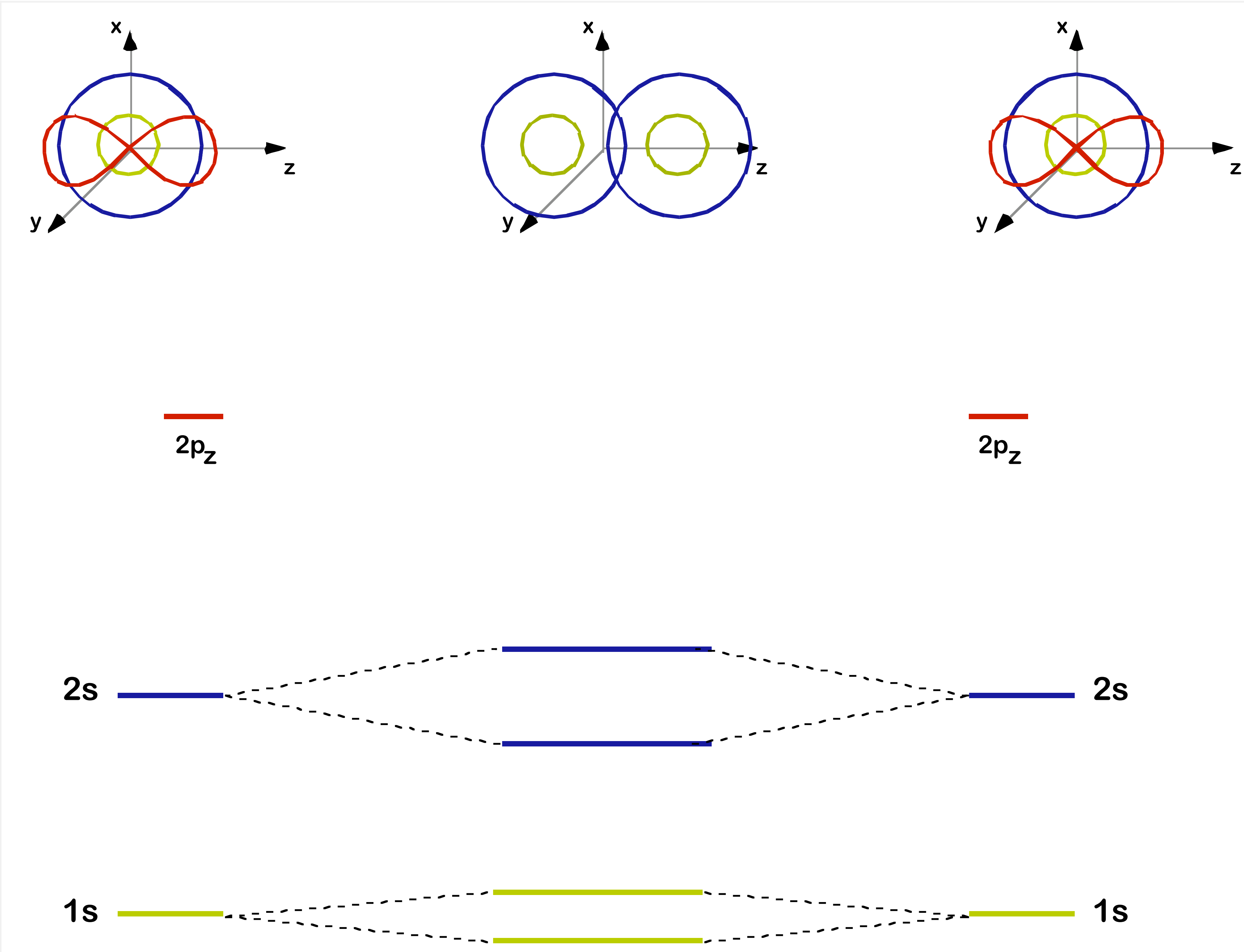

x
z
y
x
z
y
x
z
y
1s
1s

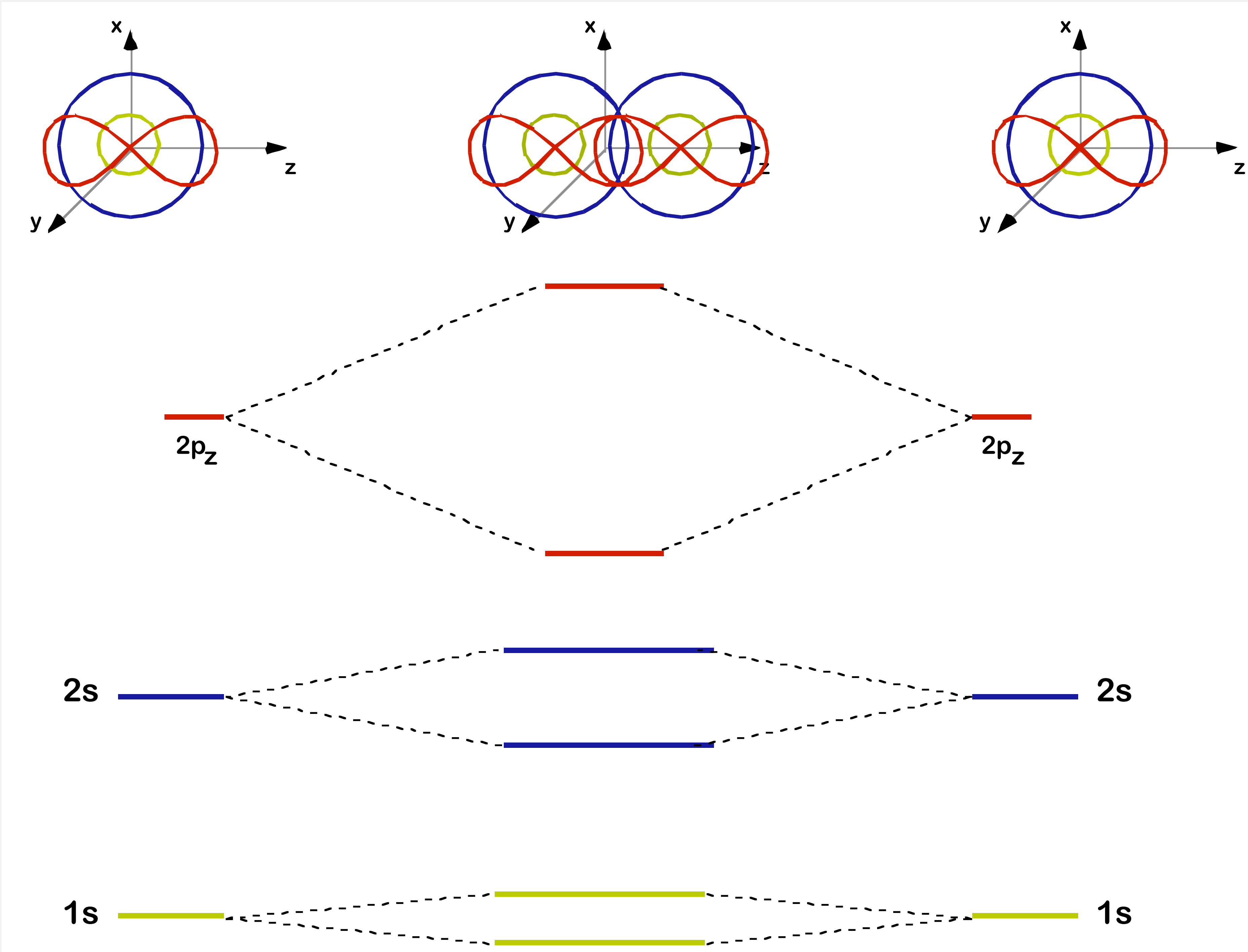

x
z
y
x
z
y
x
z
y
1s
1s

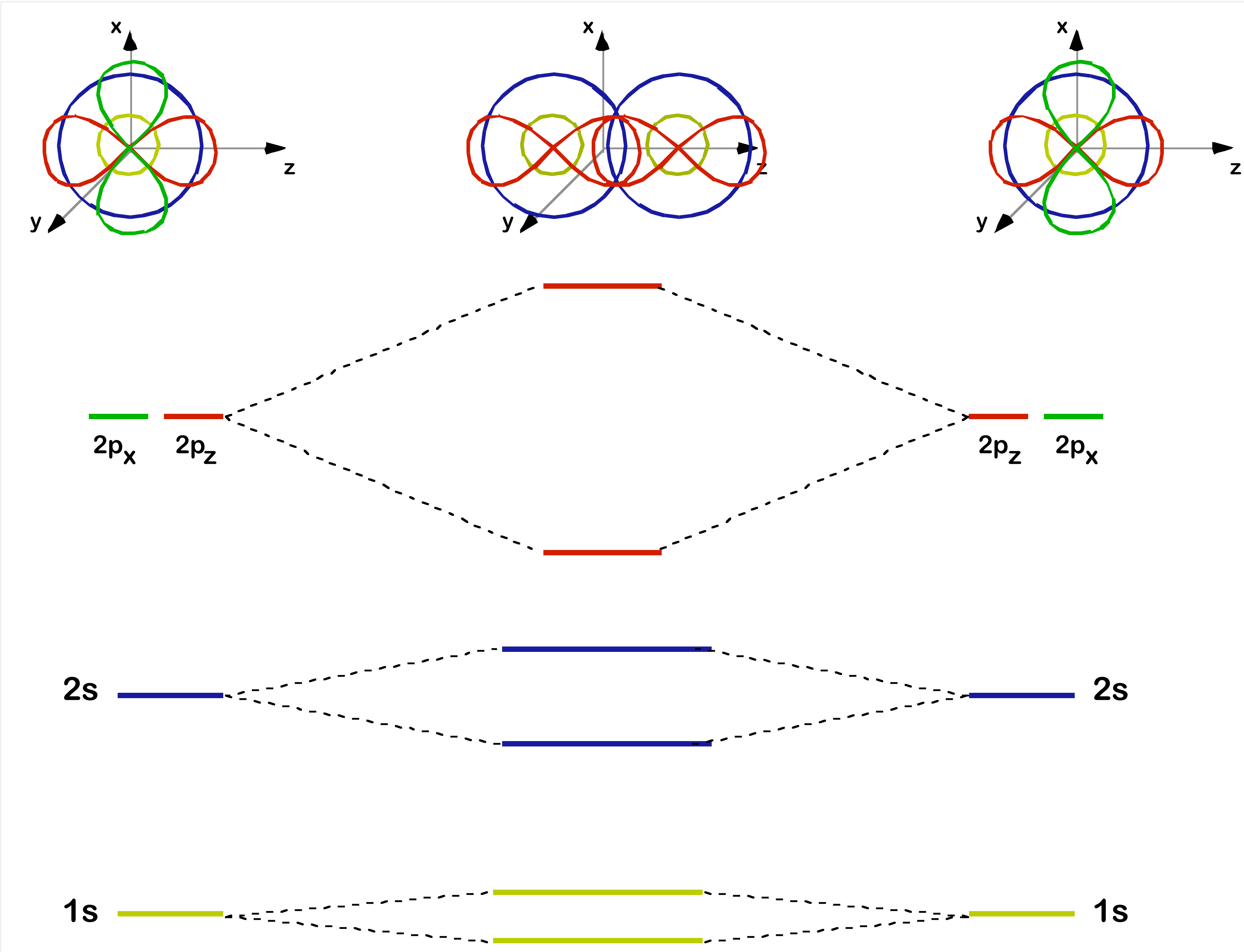

x
y
z
x
y
z
x
y
z
2s
2s
1s
1s


x
y
z
x
y
z
x
y
z
2s
2s
1s
1s

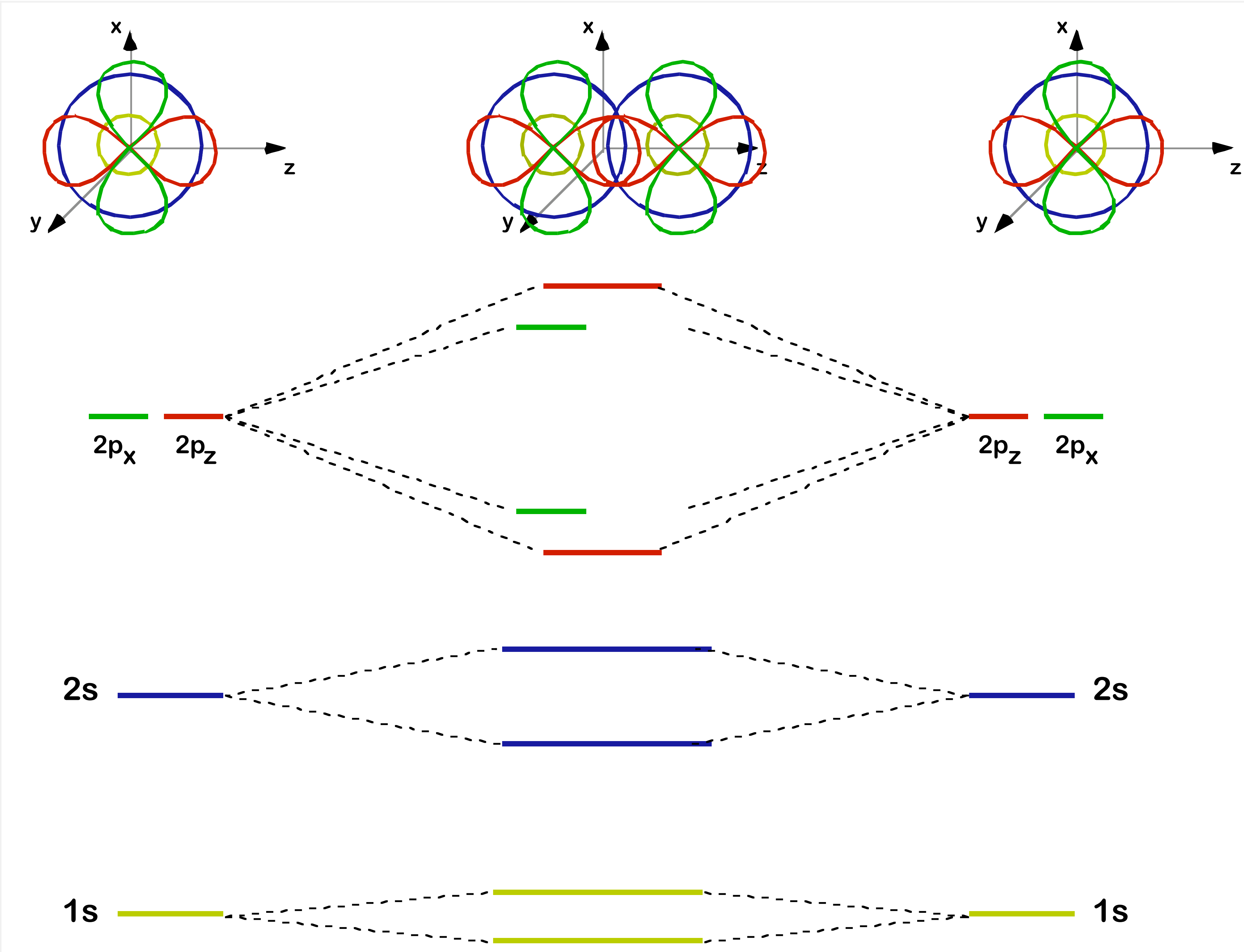


x
z
y
x
z
y
x
z
y
2pz
2pz
2s
2s
1s
1s

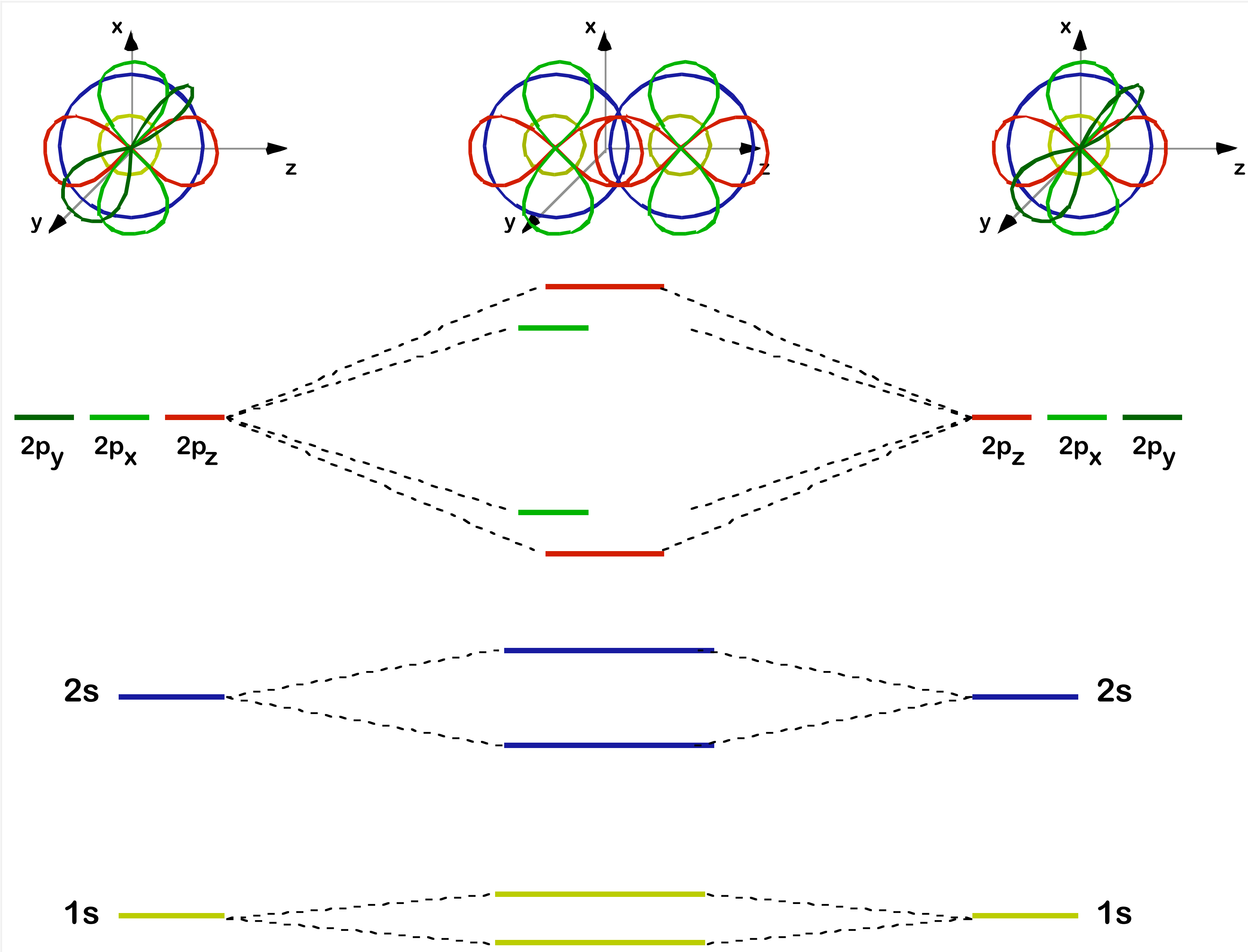

x
y
z
x
y
z
x
y
z
2p$_z$
2p$_z$
2s
2s
1s
1s

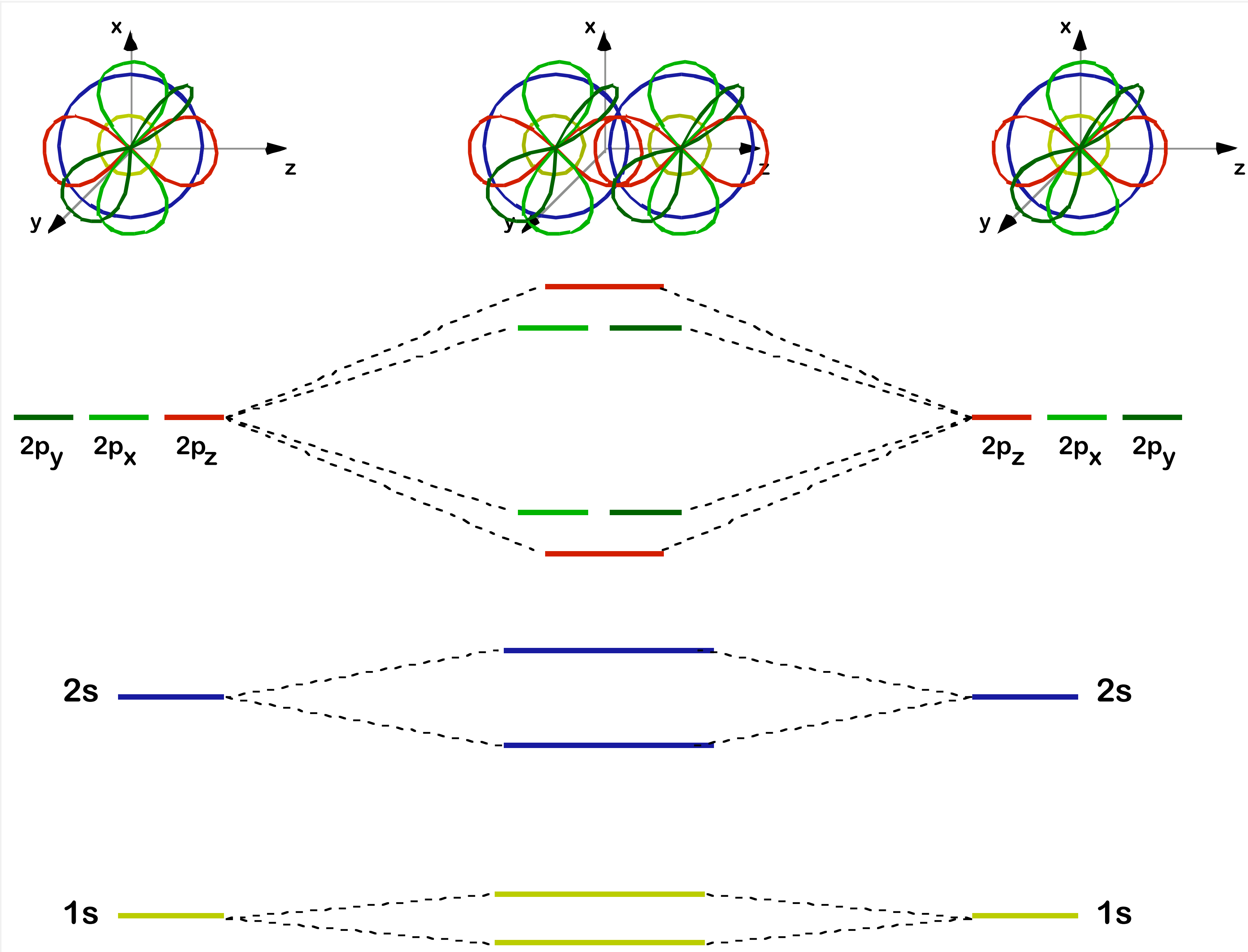


x
y
z
x
y
z
x
y
z
$2p_x$
$2p_z$
$2p_z$
$2p_x$
2s
2s
1s
1s

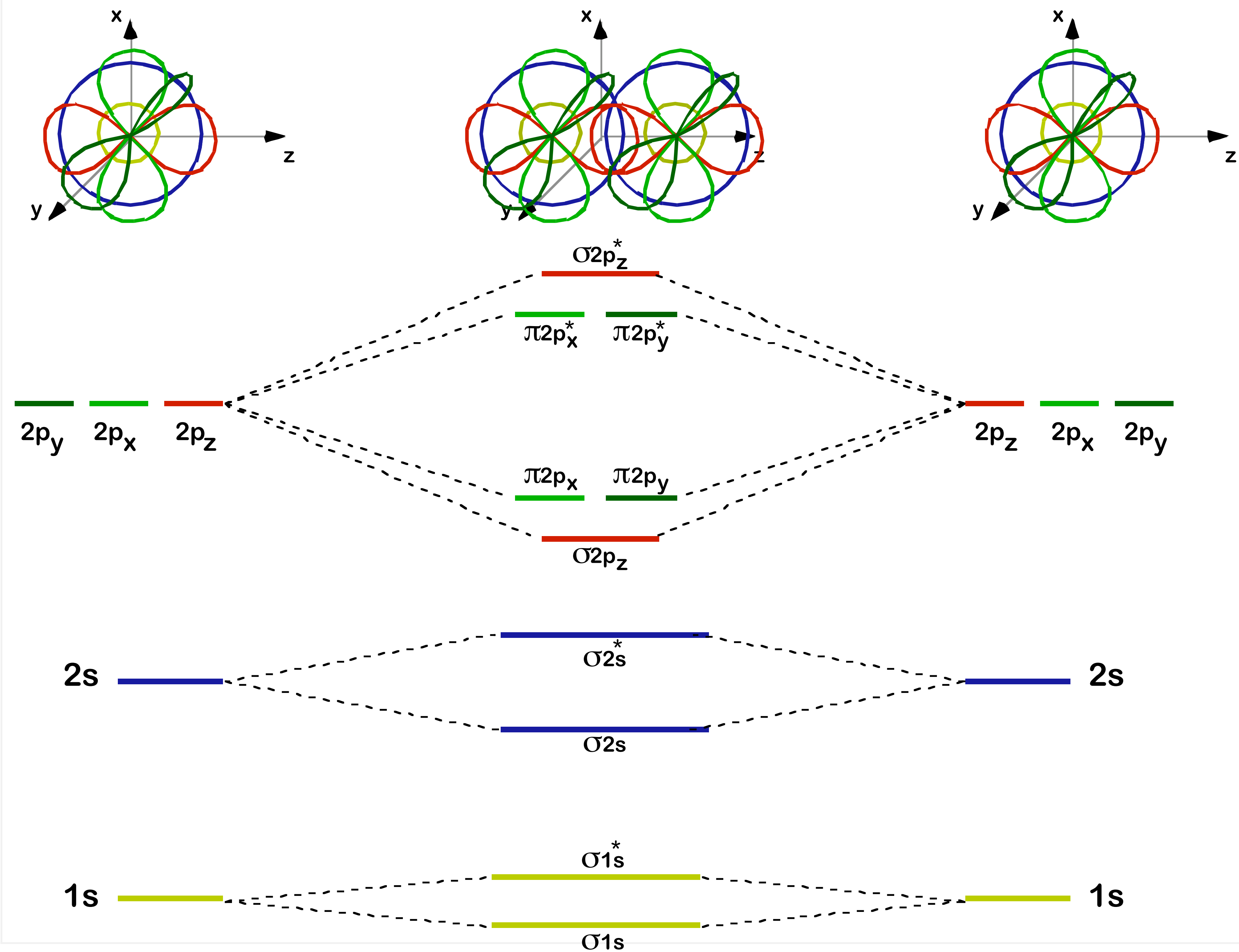


x
y
z
2px
2pz
2s
1s


x
z
y
2p_y
2p_x
2p_z
2s
1s



x
y
z
2p_y
2p_x
2p_z
2s
1s



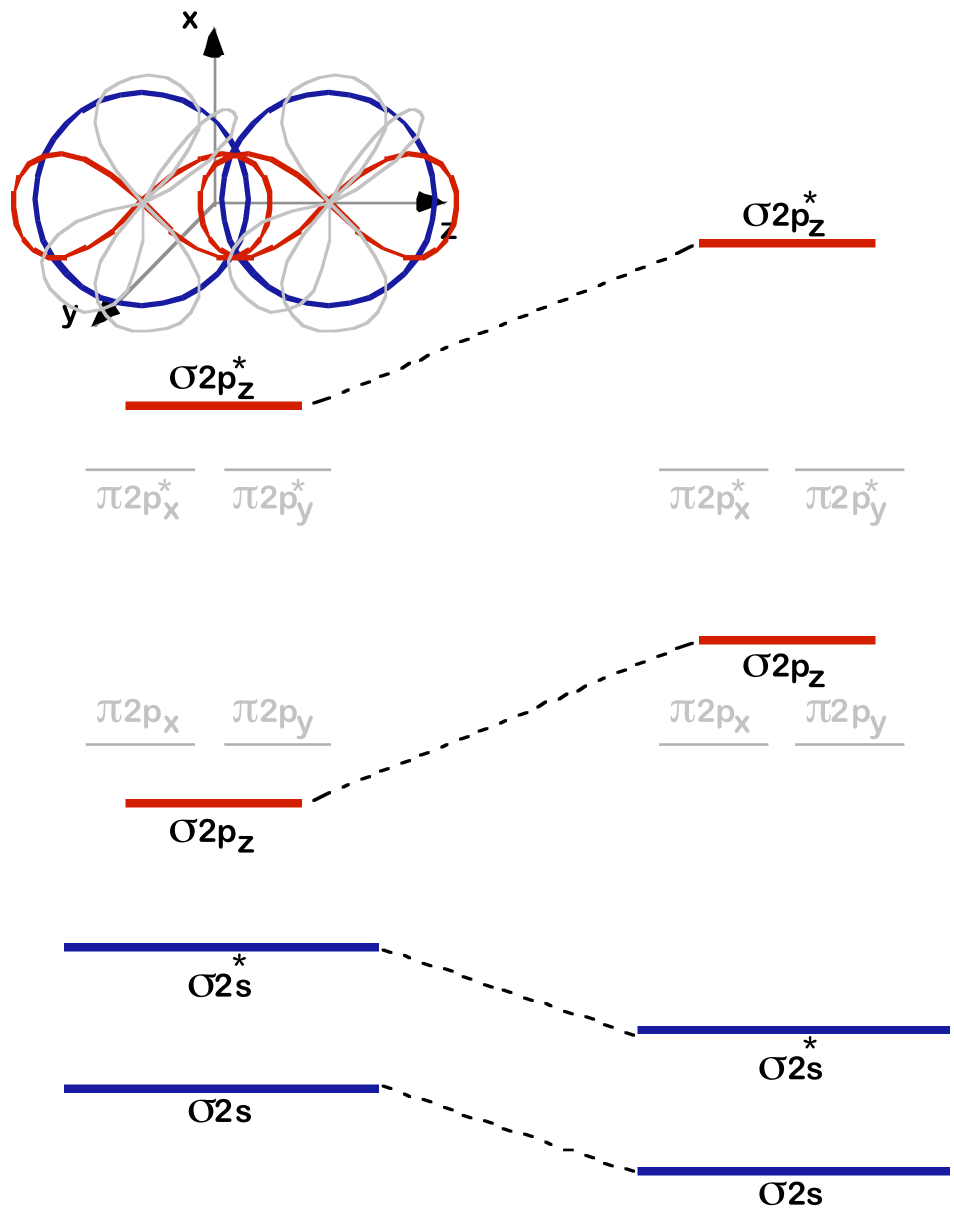
x
z
y
σ2p*z
π2p*x
π2p*y
2py
2px
2pz
π2px
π2py
σ2pz
2s
σ2s*
σ2s
1s
σ1s*
σ1s

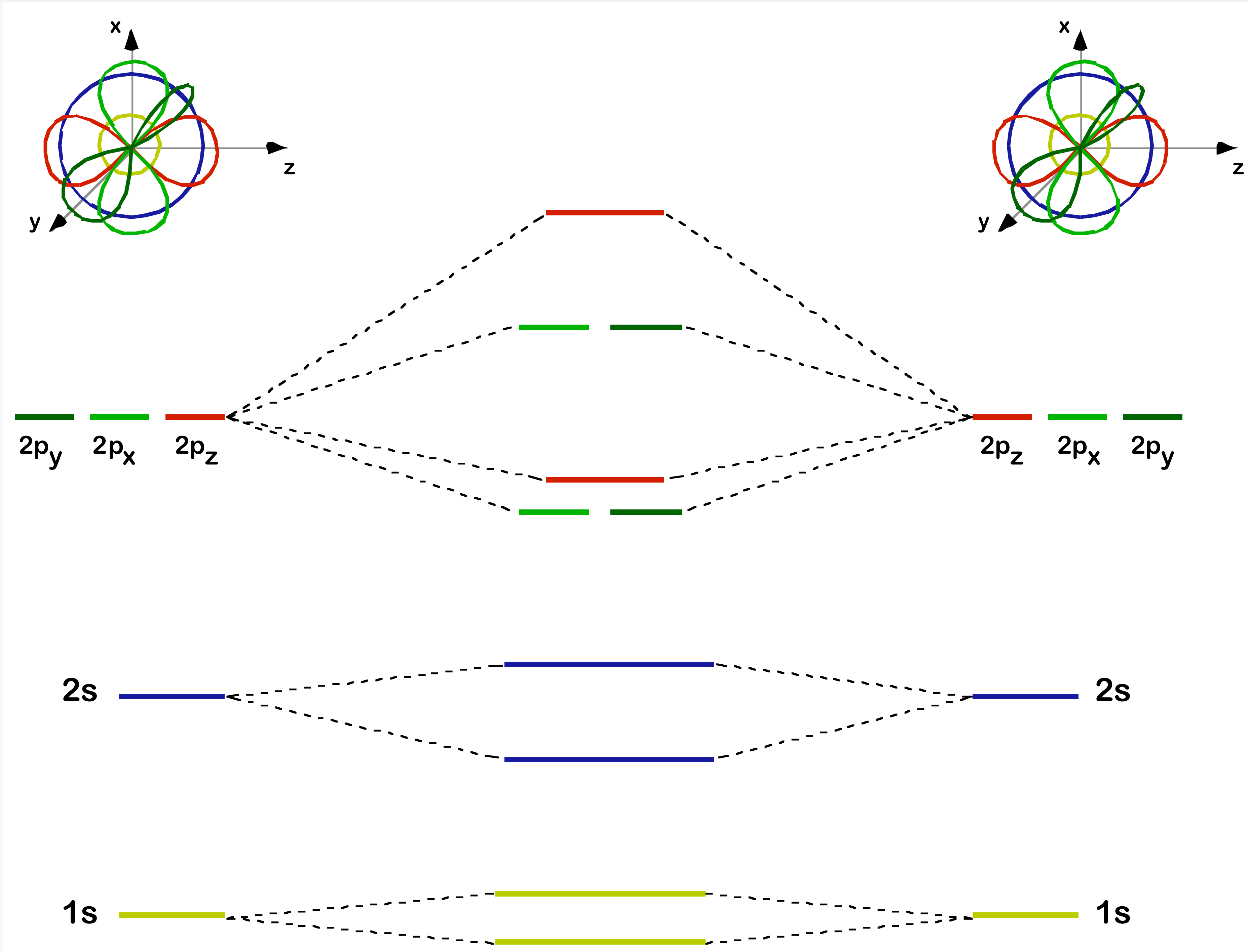
But it's not that simple…

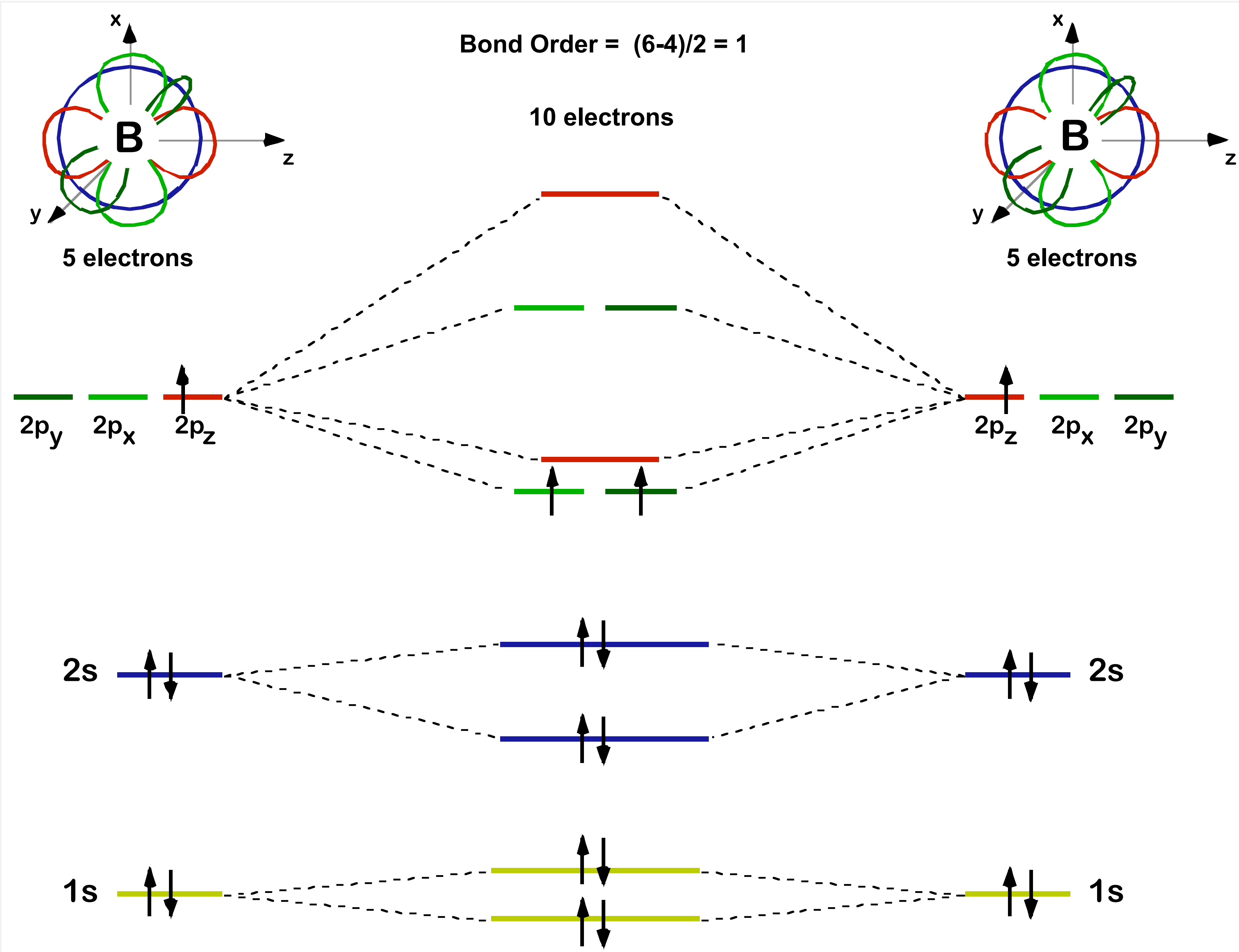
The 2s and 2p orbitals on each atom overlap in space and can be "mixed" to yield new hybrid orbitals. We saw this in Valence Bond Theory.

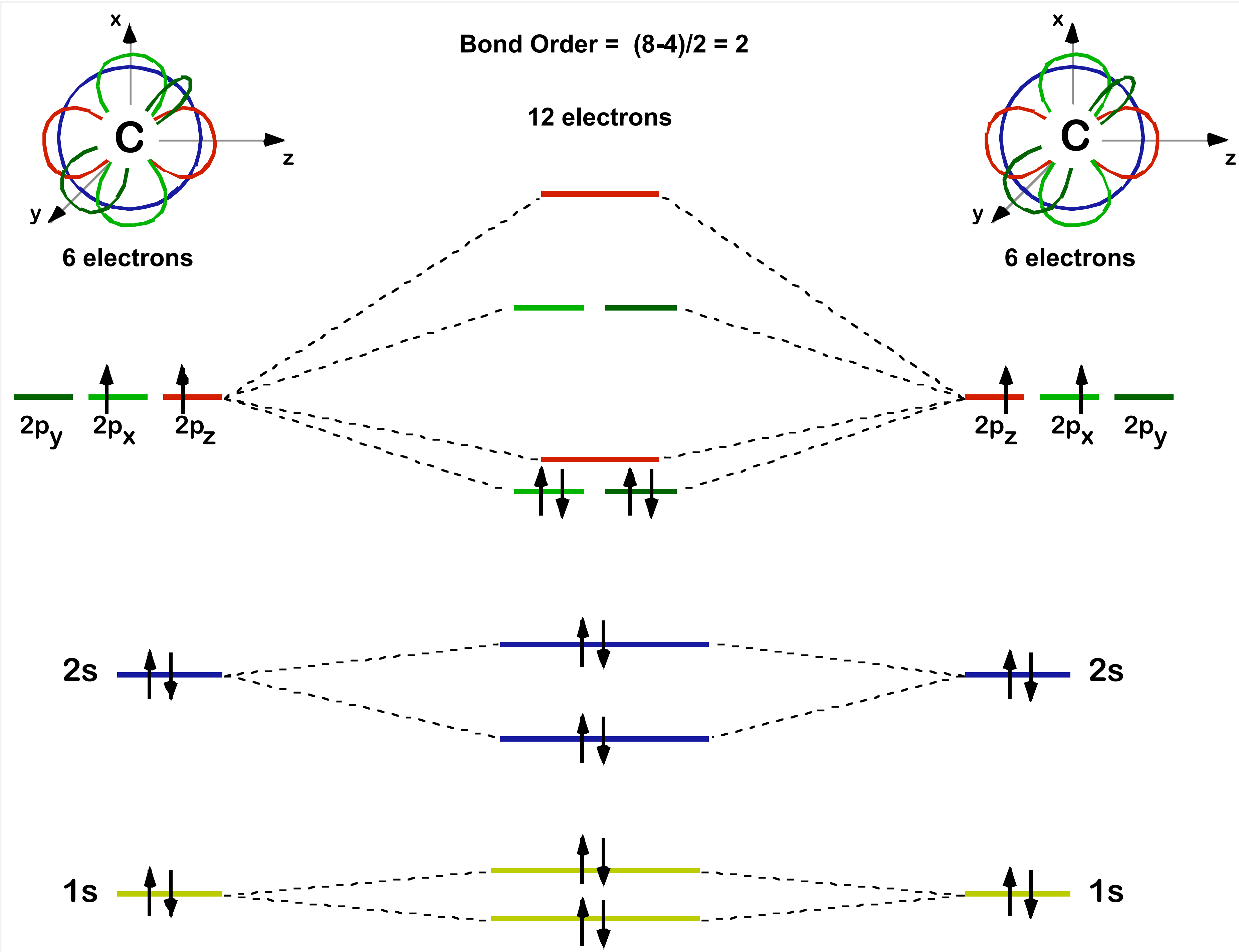
This type of thing happens here as well. In this case, this mixing lowers the energies of the lower energy orbitals and raises the energies of the higher energy orbital, as shown at right.

This leads to the more correct M.O. Theory energy diagrams shown in the textbook.

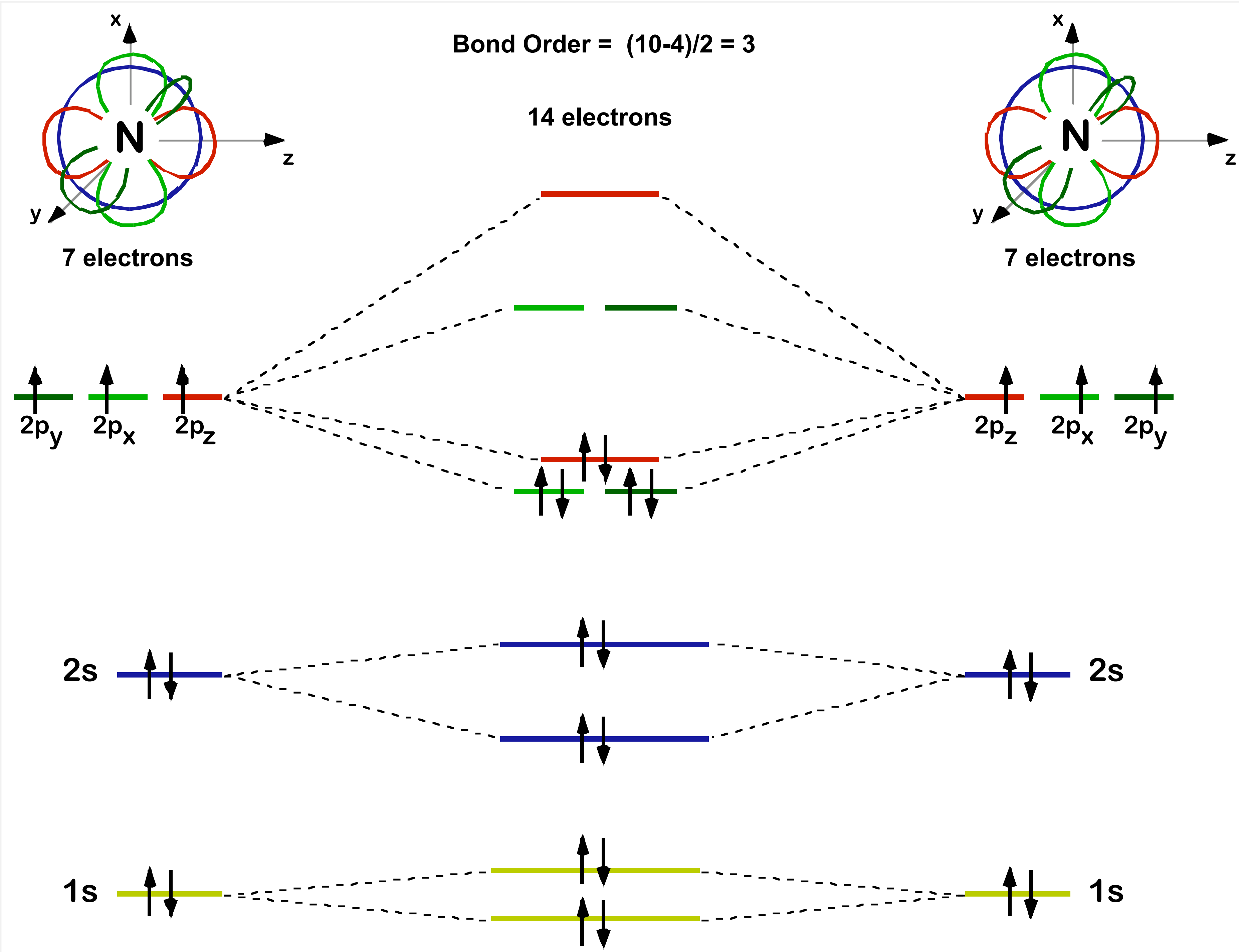


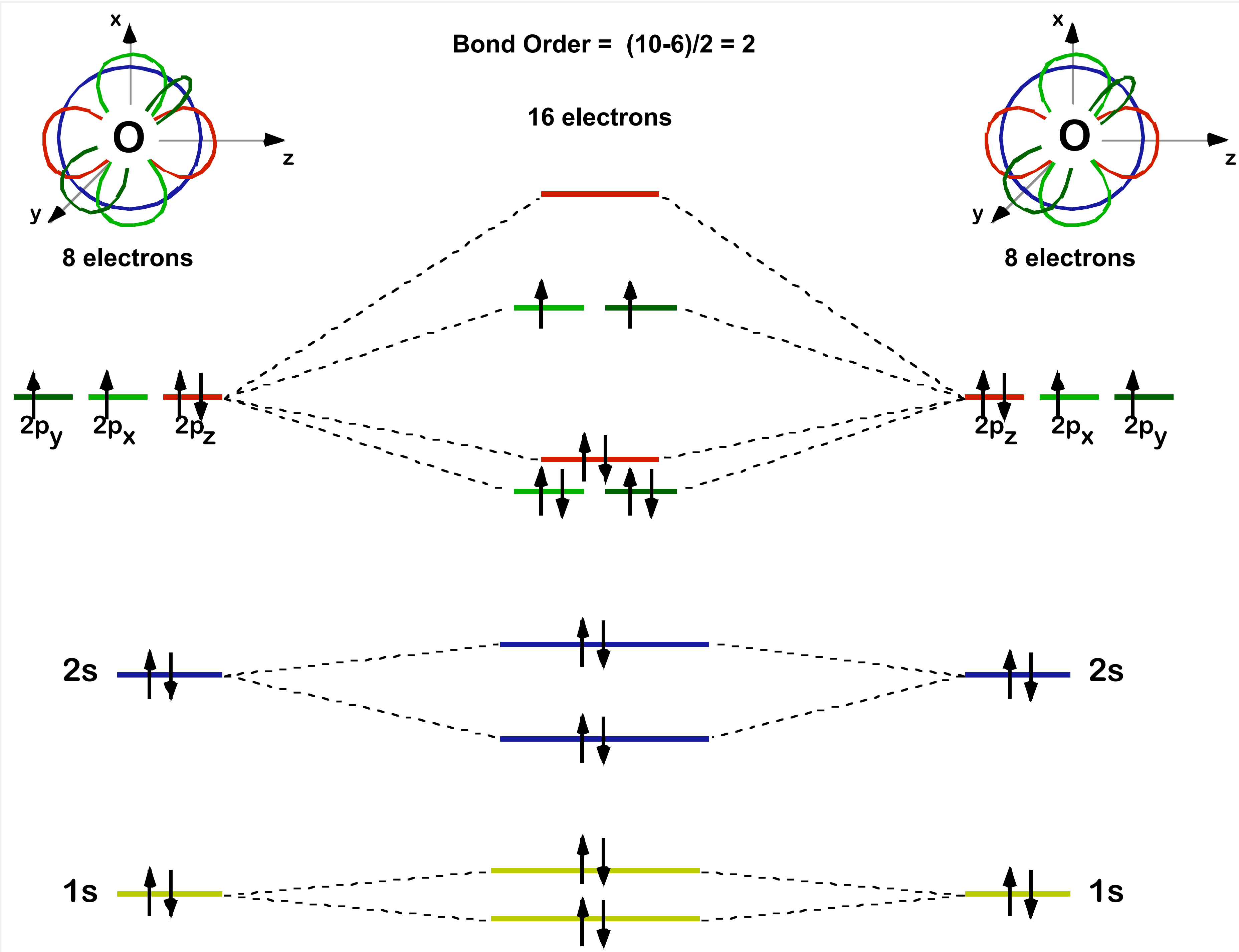

x
z
y
x
z
y
2py
2px
2pz
2pz
2px
2py
2s
2s
1s
1s

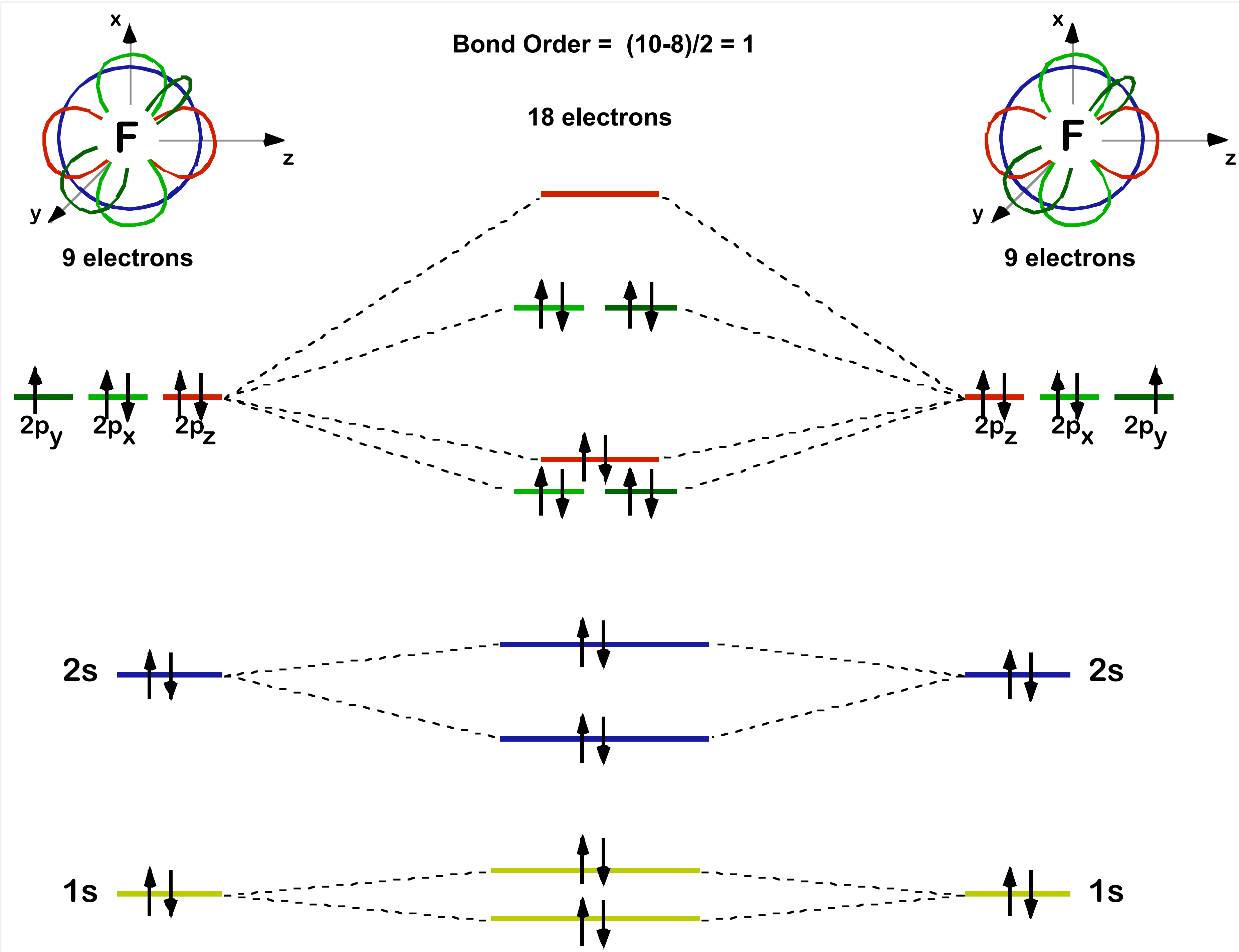

Bond Order = (6-4)/2 = 1
10 electrons
B
x
y
z
5 electrons
B
x
y
z
5 electrons
2py
2px
2pz
2pz
2px
2py
2s
2s
1s
1s

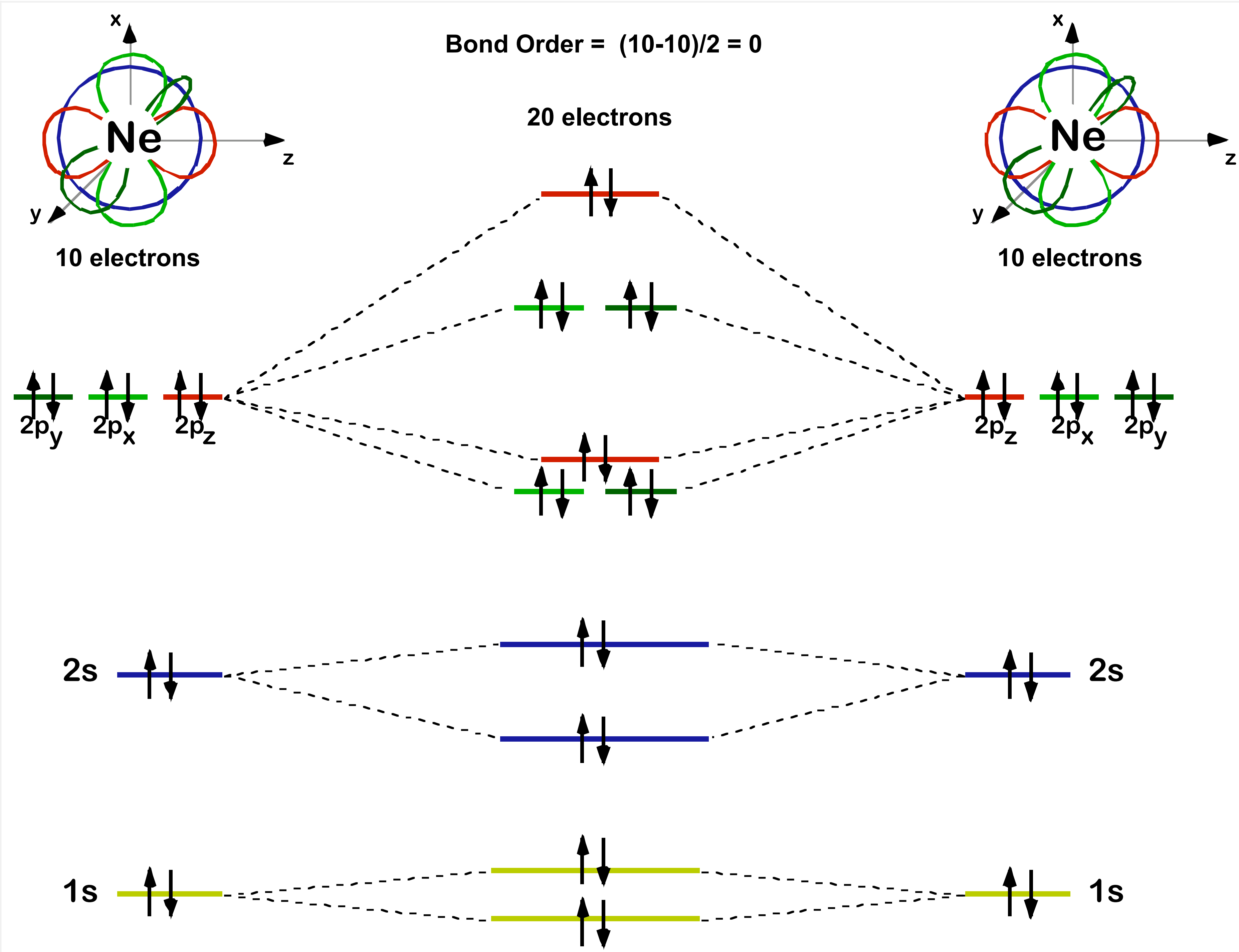


Bond Order = (8-4)/2 = 2
12 electrons
x
y
z
C
6 electrons
x
y
z
C
6 electrons
2p$_y$
2p$_x$
2p$_z$
2p$_z$
2p$_x$
2p$_y$
2s
2s
1s
1s


Bond Order = (10-4)/2 = 3
14 electrons
x
z
y
N
7 electrons
x
z
y
N
7 electrons
2p$_y$
2p$_x$
2p$_z$
2p$_z$
2p$_x$
2p$_y$
2s
2s
1s
1s


Bond Order = (10-6)/2 = 2
16 electrons
x
z
y
O
8 electrons
x
z
y
O
8 electrons
2py
2px
2pz
2pz
2px
2py
2s
2s
1s
1s


Bond Order = (10-8)/2 = 1
18 electrons
x
y
z
F
9 electrons
x
y
z
F
9 electrons
2p$_y$
2p$_x$
2p$_z$
2p$_z$
2p$_x$
2p$_y$
2s
2s
1s
1s


Bond Order = (10-10)/2 = 0
20 electrons
Ne
10 electrons
x
y
z
Ne
10 electrons
x
y
z
2p
y
2p
x
2p
z
2p
z
2p
x
2p
y
2s
2s
1s
1s