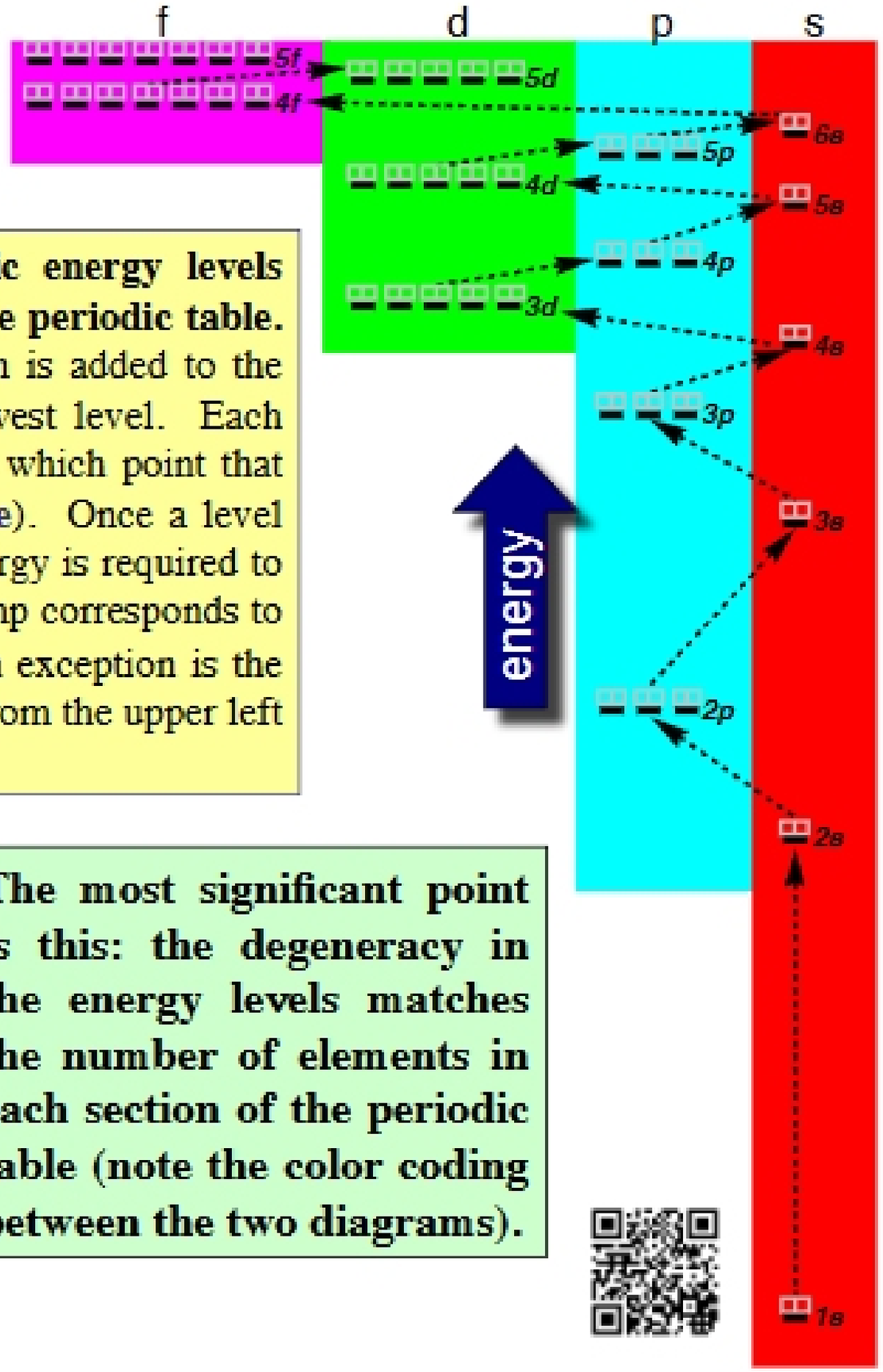
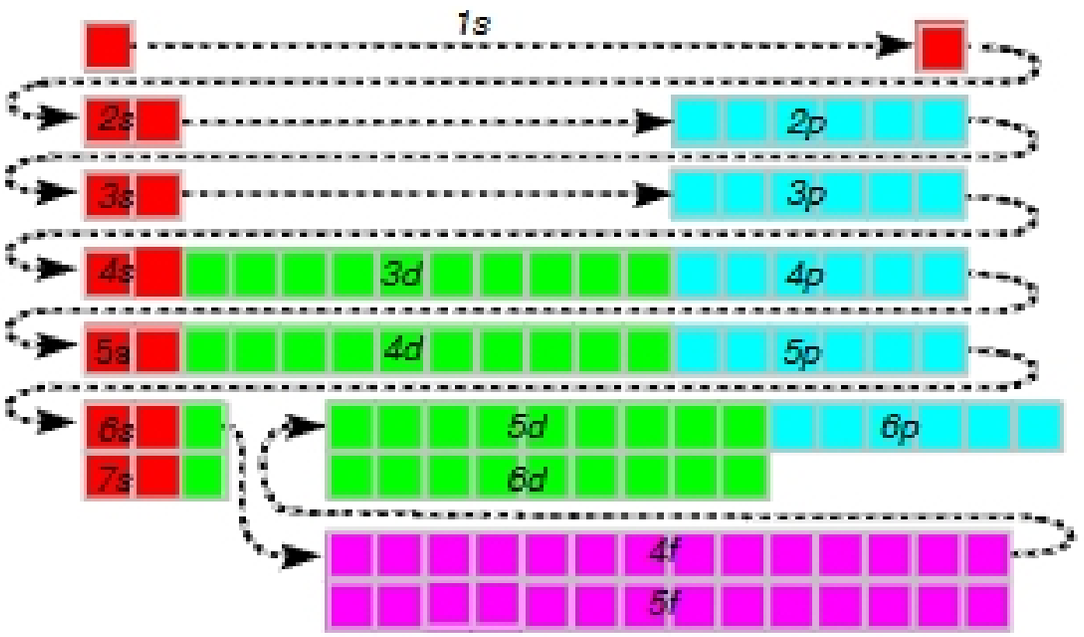
Electron Configuration and the Periodic Table

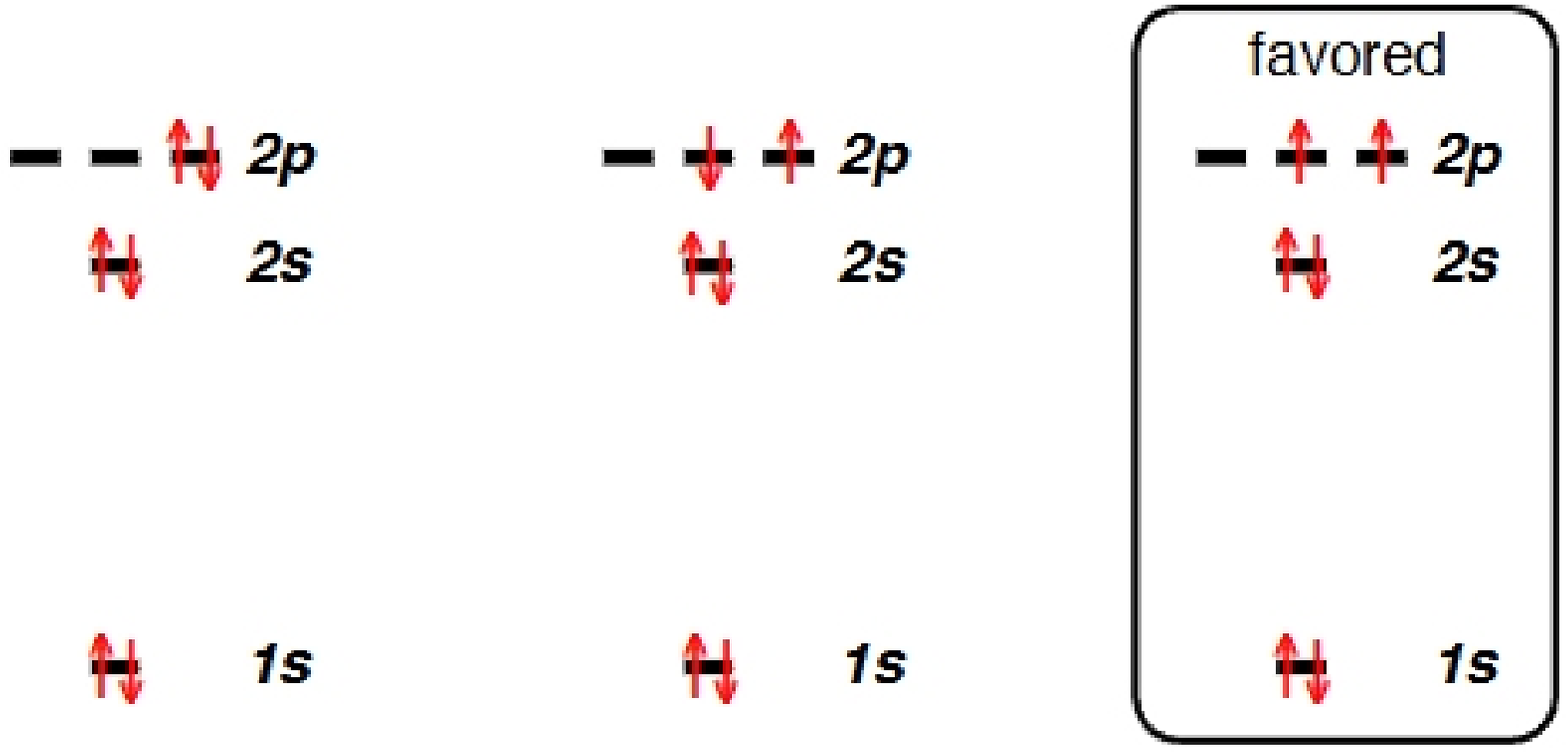


These diagrams show how the order of atomic energy levels corresponds to the arrangement of elements in the periodic table. With each increment in atomic number one electron is added to the energy diagram. Electrons are added from the lowest level. Each level can accommodate at most an **electron pair** at which point that level is considered "full" (**Pauli exclusion principle**). Once a level (or a set of degenerate levels) is filled, a jump in energy is required to reach the energy of the next available level. This jump corresponds to movement to a new section of the periodic table (an exception is the filling of the 1s level, in which case there is a jump from the upper left corner to the upper right corner).



The most significant point is this: the degeneracy in the energy levels matches the number of elements in each section of the periodic table (note the color coding between the two diagrams).

Hund's Rule



Three possible electron configurations for carbon are shown. Carbon is an atom with six electrons. After filling the *1s* and *2s* levels, the remaining two electrons must be distributed between three degenerate levels. Hund's rule tells how to do this. The most stable configuration is found by adding electrons to empty, degenerate levels in a way that creates the largest magnetic moment (spin aligned configuration).

Table of Electron Configurations for the 1st 18 Elements

Element	Ground state configuration	Valence electrons
H	$1s^1$	H·
He	$1s^2$	He:
Li	$1s^2 2s^1$	Li·
Be	$1s^2 2s^2$	·Be·
B	$1s^2 2s^2 2p^1$	·Ḃ·
C	$1s^2 2s^2 2p^2$	·Ċ·
N	$1s^2 2s^2 2p^3$	·N̈·
O	$1s^2 2s^2 2p^4$	:Ö·
F	$1s^2 2s^2 2p^5$	:F̈·
Ne	$1s^2 2s^2 2p^6$	:Ne:
Na	$1s^2 2s^2 2p^6 3s^1$	Na·
Mg	$1s^2 2s^2 2p^6 3s^2$	·Mg·
Al	$1s^2 2s^2 2p^6 3s^2 3p^1$	·Al·
Si	$1s^2 2s^2 2p^6 3s^2 3p^2$	·Si·
P	$1s^2 2s^2 2p^6 3s^2 3p^3$	·P̈·
S	$1s^2 2s^2 2p^6 3s^2 3p^4$	·S̈·
Cl	$1s^2 2s^2 2p^6 3s^2 3p^5$	:C̈l·
Ar	$1s^2 2s^2 2p^6 3s^2 3p^6$	:Ar: