Electron Arrangement

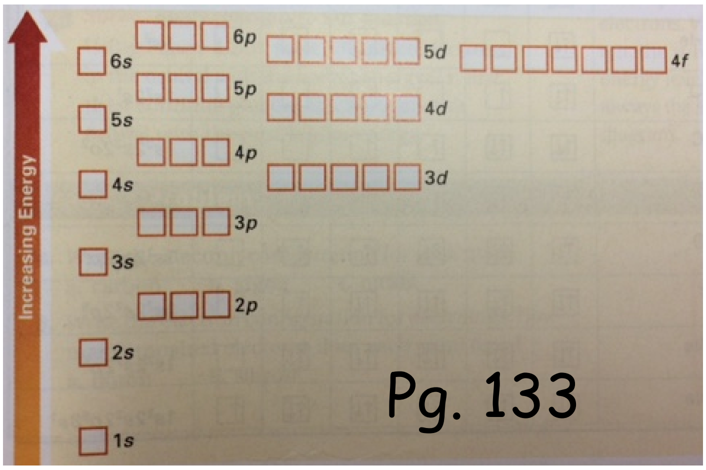
In an atom, electrons and the nucleus interact to make the most stable arrangement possible.

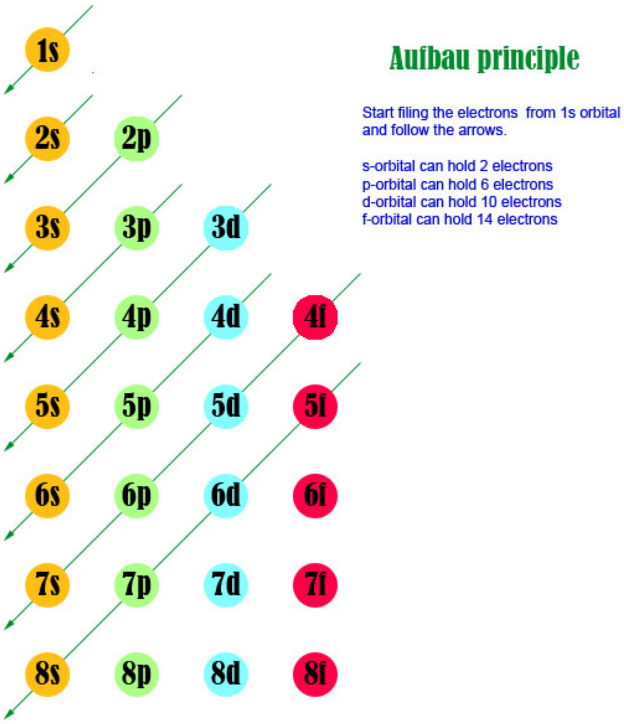
The ways electrons are arranged in various orbitals are called **electron configuration**

There are 3 rules to help find the electron configuration in atoms.

Rule 1: Aufbau Principle

Electrons occupy the orbitals of lowest energy first.



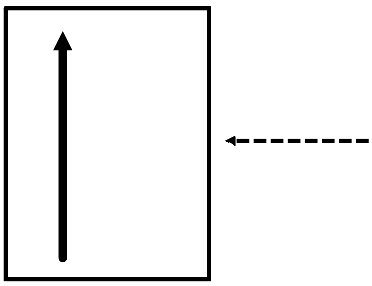


Although the s sublevel is the lowest sublevel, it does not follow a simple pattern. Looking back on the diagram, notice how 4s actually has less energy than 3d.

Rule 2: Pauli Exclusion Principle

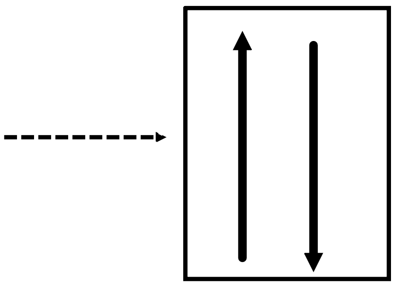
An atomic orbital may describe at most 2 electrons.

To occupy the same orbital, 2 electrons must have opposite *spins*. Spin is a quantum mechanical property of electrons.



A vertical arrow indicates an electron

An orbital containing paired electrons



Rule 3: Hund's Rule

Electrons occupy orbitals of the same energy in a way that makes the number of electrons with the same spin direction as large as possible.

Table 5.3

Electron Configurations for Some Selected Elements

Element	Orbital filling 1s	2s	$2p_x$	$2p_y$	$2p_z$	3s	Electron configuration
H	↑						$1s^1$
He	↑↓						$1s^2$
Li	↑↓	↑					$1s^22s^1$
C	↑↓	↑↓	↑	↑			$1s^22s^22p^2$
N	↑↓	↑↓	↑	↑	↑		$1s^22s^22p^3$
O	↑↓	↑↓	↑↓	↑	↑		$1s^22s^22p^4$
F	↑↓	↑↓	↑↓	↑↓	↑		$1s^22s^22p^5$
Ne	↑↓	↑↓	↑↓	↑↓	↑↓		$1s^22s^22p^6$
Na	↑↓	↑↓	↑↓	↑↓	↑↓	↑	$1s^22s^22p^63s^1$

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A convenient method for showing electron configuration of an atom involves writing the energy level and the symbol for every sublevel occupied by an electron.

This is done by using superscripts to indicate the number of electrons occupying that sublevel.

For hydrogen, which has 1 electron in a 1s orbital, the configuration is $1s^1$

For heliums 2 electrons in the s orbital, we have $1s^2$

As the atoms become more complex, the electron configuration also becomes more complex.

For example, potassium (K) would be

$$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$$

Orbitals and Electron Configuration Worksheet 1 and 2