

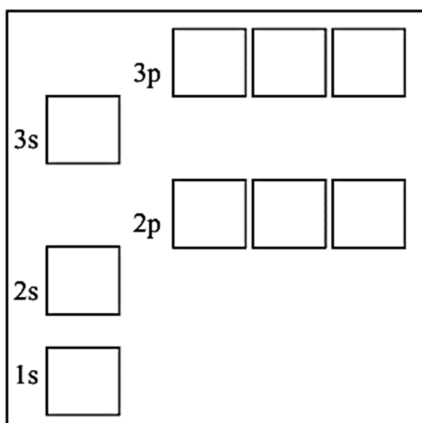
Orbital Diagram Rules:

1. **The Aufbau Principle:** Under normal condition, each electron occupies the _____

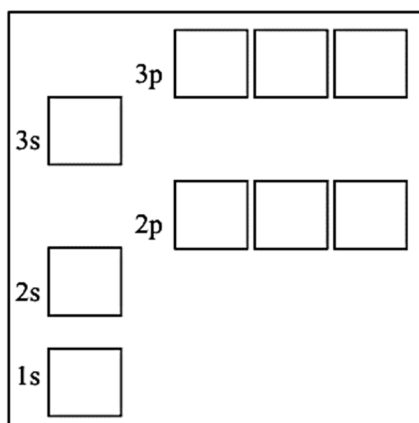
2. **The Pauli Exclusion Principle:** a maximum of _____ can occupy an orbital space, but only if they have _____

3. **Hund's Rule:** to minimize repulsion between electrons, _____

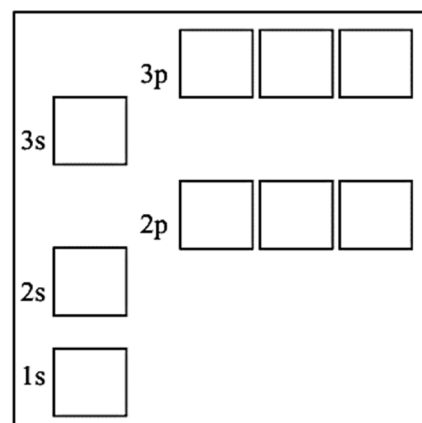
Practice: Draw in the orbital diagram and write the electron configuration for the following neutral atoms in the ground state



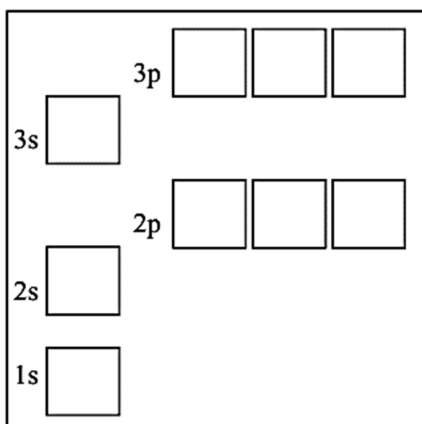
Magnesium 1s 2s 2p 3s



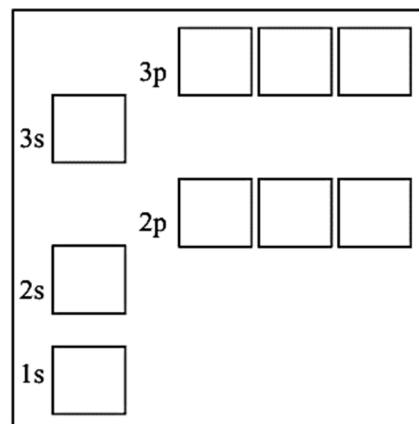
Silicon 1s 2s 2p 3s 3p



Sulfur 1s 2s 2p 3s 3p

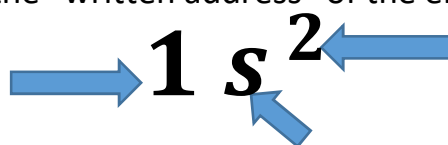


Lithium



Nitrogen

Electron Configurations are the “written address” of the electrons. There are 3 parts to the electron configuration:

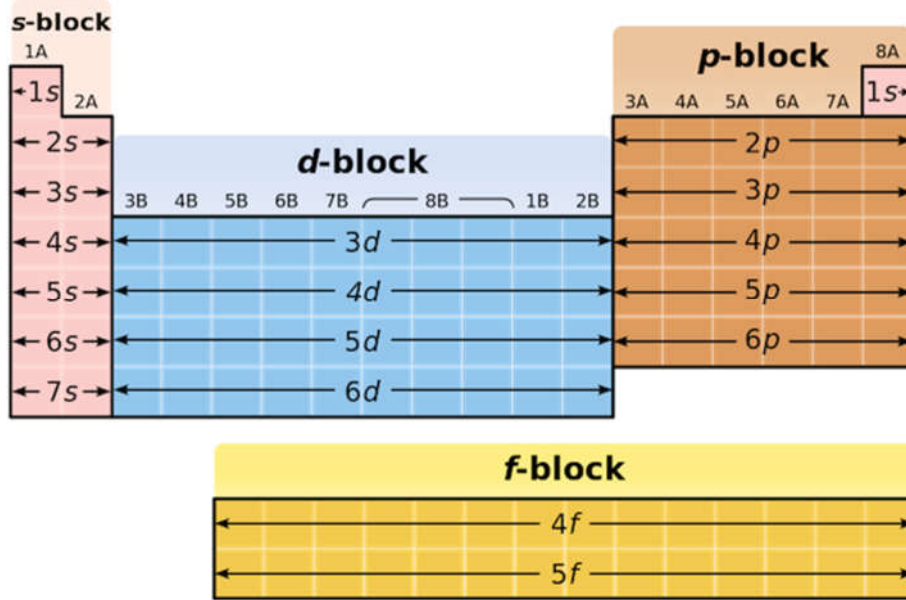


The Periodic Table gives you information regarding which orbitals are being filled:

****Note: The electron configuration for Helium is $1s^2$**

Determining the Electron Configuration Using the Periodic Table

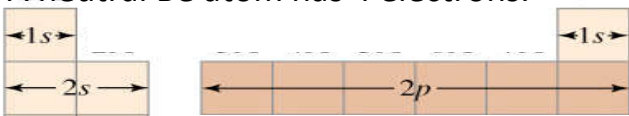
1. Determine the # of electrons in your atom
2. Go row by row and block by block on the Periodic Table until you reach the element or the # of electrons desired.



Ex 1: Beryllium

Be: atomic number = 4.

A neutral Be atom has 4 electrons.



1.00794 H 1 Hydrogen							4.00260 He 2 Helium
6.941 Li 3 Lithium	9.01218 Be 4 Beryllium	10.81 B 5 Boron	12.0111 C 6 Carbon	14.0067 N 7 Nitrogen	15.9994 O 8 Oxygen	18.998403 F 9 Fluorine	20.179 Ne 10 Neon

The entire 1s block must be filled, so Be has 2 electrons in the 1s orbital.

The entire 2s block must be filled, so Be also has 2 electrons in the 2s orbital.

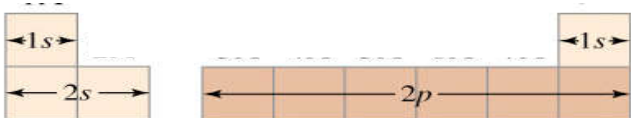
The full electron configuration for Be would be written as $1s^2 2s^2$

The subscripts (2 and 2) add up to 4, which is the total number of electrons.

Ex 2: Oxygen

O: atomic number = 8.

A neutral O atom has 8 electrons.



1.00794 H 1 Hydrogen							4.00260 He 2 Helium
6.941 Li 3 Lithium	9.01218 Be 4 Beryllium	10.81 B 5 Boron	12.0111 C 6 Carbon	14.0067 N 7 Nitrogen	15.9994 O 8 Oxygen	18.998403 F 9 Fluorine	20.179 Ne 10 Neon

The entire 1s block must be filled, so O has 2 electrons in the 1s orbital.

The entire 2s block must be filled, so O also has 2 electrons in the 2s orbital.

To get to Oxygen, 4 electrons must be filled in the 2p orbital.

The full electron configuration for O would be written as $1s^2 2s^2 2p^4$

The subscripts (2, 2, and 4) add up to 8, which is the total number of electrons.

Writing Electron Configurations:


Element	# of e ⁻	Long Form Electron Configuration	Noble Gas Abbreviation	# valence e ⁻ 's																
Be		$1s^2 2s^2$ (see example)																		
O		$1s^2 2s^2 2p^4$ (see example)																		
Na		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> <td style="text-align: center; width: 12.5%;"><input type="checkbox"/></td> </tr> <tr> <td style="text-align: center;">1s</td> <td style="text-align: center;">2s</td> <td style="text-align: center;">2p</td> <td style="text-align: center;">3s</td> <td style="text-align: center;">3p</td> <td style="text-align: center;">4s</td> <td style="text-align: center;">3d</td> <td style="text-align: center;">4p</td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1s	2s	2p	3s	3p	4s	3d	4p		
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1s	2s	2p	3s	3p	4s	3d	4p													

Electron configurations can get very long, as you can see in the table above! A shortened form of the electron configuration can be written for most elements. This shortened form is often referred to as the **Noble Gas** abbreviated electron configuration, or the short form.

Valence Electrons

- Electrons in the _____
- The # of valence electrons = the total # electrons in the _____ sublevels (must be of the same energy level)

Noble Gases: Group 18 (rightmost column on periodic table)

- Have _____ = _____
 - All elements want to be a noble gas (so freaking bad).
In other words, all elements want to have a _____
 - Remember: “**8 IS GREAT!**” 
 - Exception to octet rule is _____: it only has _____ valence electrons ($1s^2$)

Obtaining a Noble Gas Electron Configuration

- Elements can _____ or _____ electrons and become **ions** in order to get a noble gas' electron configuration. Depending on the element, sometimes it is “easier to lose electron(s)”, and sometimes it is “easier to gain electron(s)”
- Metals (on the left side of the staircase on the periodic table) tend to _____ electrons to obtain a noble gas electron configuration
- Nonmetals (on the right side of the staircase on the periodic table) tend to _____ electrons to obtain a noble gas electron configuration

Complete the following table for the given ions

Ion	Lose or Gain e's?	# of e's	Long form	# Val e's
Oxygen Ion				
Potassium Ion				
Phosphorous ion				
Chlorine Ion				
Aluminum ion				

Practice

1. Using arrows, show how the following orbitals will fill with electrons for the following elements.

	<i>Electron Configuration</i>	1s	2s	2p			3s	3p			4s	3d		
Mg	$1s^2 2s^2 2p^6 3s^2$													
Cl	$1s^2 2s^2 2p^6 3s^2 3p^5$													
Si	$1s^2 2s^2 2p^6 3s^2 3p^2$													
Ti	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$													

2. In the space below, write the **abbreviated** electron configurations and indicate the number of **valence electrons** for the following elements:

Element	Long Form Electron Configuration	Noble Gas Abbreviated Electron Configuration	# valence electrons
Cobalt			
Tin			
Tellurium			
Cesium			
Palladium			

3. In the space below, write the **long form** electron configurations of the following **ions** and indicate the symbol (w/ charge) for the ion

1) sodium ion _____ symbol: _____

2) calcium ion _____ symbol: _____

3) chlorine ion _____ symbol: _____

4) beryllium ion _____ symbol: _____

5) sulfur ion _____ symbol: _____

4. Why are the following electron configurations **not valid**?

1) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$ _____

2) $1s^2 2s^2 2p^6 3s^3 3d^5$ _____

3) $[\text{Ra}] 7s^2 5f^8$ _____

4) $[\text{Xe}]$ _____