

3. Electron Configuration

EQ: How do I draw electron configurations?

A. Order of Filling Orbitals (3 ways)

1. Chart

2. Diagram (Arrows)

6d	_____	_____	_____	_____	_____	_____	_____
5f	_____	_____	_____	_____	_____	_____	_____
7s	_____	_____	_____	_____	_____	_____	_____
6p	_____	_____	_____	_____	_____	_____	_____
5d	_____	_____	_____	_____	_____	_____	_____
4f	_____	_____	_____	_____	_____	_____	_____
6s	_____	_____	_____	_____	_____	_____	_____
5p	_____	_____	_____	_____	_____	_____	_____
4d	_____	_____	_____	_____	_____	_____	_____
5s	_____	_____	_____	_____	_____	_____	_____
4p	_____	_____	_____	_____	_____	_____	_____
3d	_____	_____	_____	_____	_____	_____	_____
4s	_____	_____	_____	_____	_____	_____	_____
3p	_____	_____	_____	_____	_____	_____	_____
3s	_____	_____	_____	_____	_____	_____	_____
2p	_____	_____	_____	_____	_____	_____	_____
2s	_____	_____	_____	_____	_____	_____	_____
1s	_____	_____	_____	_____	_____	_____	_____

3. Periodic Table

1s ¹																		1s ²
2s ¹	2s ²												2p ¹	2p ²	2p ³	2p ⁴	2p ⁵	2p ⁶
3s ¹	3s ²												3p ¹	3p ²	3p ³	3p ⁴	3p ⁵	3p ⁶
4s ¹	4s ²	3d ¹	3d ²	3d ³	3d ⁴	3d ⁵	3d ⁶	3d ⁷	3d ⁸	3d ⁹	3d ¹⁰	4p ¹	4p ²	4p ³	4p ⁴	4p ⁵	4p ⁶	
5s ¹	5s ²	4d ¹	4d ²	4d ³	4d ⁴	4d ⁵	4d ⁶	4d ⁷	4d ⁸	4d ⁹	4d ¹⁰	5p ¹	5p ²	5p ³	5p ⁴	5p ⁵	5p ⁶	
6s ¹	6s ²	5d ¹	5d ²	5d ³	5d ⁴	5d ⁵	5d ⁶	5d ⁷	5d ⁸	5d ⁹	5d ¹⁰	6p ¹	6p ²	6p ³	6p ⁴	6p ⁵	6p ⁶	
7s ¹	7s ²	6d ¹	6d ²	6d ³	6d ⁴	6d ⁵	6d ⁶	6d ⁷	6d ⁸	6d ⁹								

4f ¹	4f ²	4f ³	4f ⁴	4f ⁵	4f ⁶	4f ⁷	4f ⁸	4f ⁹	4f ¹⁰	4f ¹¹	4f ¹²	4f ¹³	4f ¹⁴
5f ¹	5f ²	5f ³	5f ⁴	5f ⁵	5f ⁶	5f ⁷	5f ⁸	5f ⁹	5f ¹⁰	5f ¹¹	5f ¹²	5f ¹³	5f ¹⁴

3. Electron Configuration (cont.)

B. Electron Configurations – The First Eighteen Elements

1-10 with orbital diagrams

<p>1. Hydrogen</p> $1s^1; \frac{\uparrow}{1s}$ <p>) {1,0,0,$\frac{1}{2}$}</p> <p>1</p>	<p>2. Helium</p> $1s^2; \frac{\uparrow\downarrow}{1s}$ <p>) {1,0,0,$-\frac{1}{2}$}</p> <p>2</p>
<p>3. Lithium</p> $1s^2 2s^1; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow}{2s} \right.$ <p>)) {2,0,0,$\frac{1}{2}$}</p> <p>2 1</p>	<p>4. Beryllium</p> $1s^2 2s^2; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow\downarrow}{2s} \right.$ <p>)) {2,0,0,$-\frac{1}{2}$}</p> <p>2 2</p>
<p>5. Boron</p> $1s^2 2s^2 2p^1; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow\downarrow}{2s} \right \frac{\uparrow}{2p}$ <p>)) {2,1,$-\frac{1}{2}$}</p> <p>2 3</p>	<p>6. Carbon</p> $1s^2 2s^2 2p^2; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow\downarrow}{2s} \right \frac{\uparrow}{2p} \frac{\uparrow}{2p}$ <p>)) {2,1,0,$\frac{1}{2}$}</p> <p>2 4</p>
<p>7. Nitrogen</p> $1s^2 2s^2 2p^3; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow\downarrow}{2s} \right \frac{\uparrow}{2p} \frac{\uparrow}{2p} \frac{\uparrow}{2p}$ <p>)) {2,1,1,$\frac{1}{2}$}</p> <p>2 5</p>	<p>8. Oxygen</p> $1s^2 2s^2 2p^4; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow\downarrow}{2s} \right \frac{\uparrow\downarrow}{2p} \frac{\uparrow}{2p} \frac{\uparrow}{2p}$ <p>)) {2,1,-1,$-\frac{1}{2}$}</p> <p>2 6</p>
<p>9. Fluorine</p> $1s^2 2s^2 2p^5; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow\downarrow}{2s} \right \frac{\uparrow\downarrow}{2p} \frac{\uparrow\downarrow}{2p} \frac{\uparrow}{2p}$ <p>)) {2,1,0,$-\frac{1}{2}$}</p> <p>2 7</p>	<p>10. Neon</p> $1s^2 2s^2 2p^6; \frac{\uparrow\downarrow}{1s} \left \frac{\uparrow\downarrow}{2s} \right \frac{\uparrow\downarrow}{2p} \frac{\uparrow\downarrow}{2p} \frac{\uparrow\downarrow}{2p}$ <p>)) {2,1,1,$-\frac{1}{2}$}</p> <p>2 8</p>
<p>Key:</p> <p>e– configuration; orbital configuration</p> <p>Shell configuration; quantum number</p>	

3. Electron Configuration (cont.)

Element	Complete Electron Configuration	Noble Gas Electron Configuration
11. Sodium	$1s^2 2s^2 2p^6 3s^1$	$[\text{Ne}] 3s^1$
12. Magnesium	$1s^2 2s^2 2p^6 3s^2$	$[\text{Ne}] 3s^2$
13. Aluminum	$1s^2 2s^2 2p^6 3s^2 3p^1$	$[\text{Ne}] 3s^2 3p^1$
14. Silicon	$1s^2 2s^2 2p^6 3s^2 3p^2$	$[\text{Ne}] 3s^2 3p^2$
15. Phosphorus	$1s^2 2s^2 2p^6 3s^2 3p^3$	$[\text{Ne}] 3s^2 3p^3$
16. Sulfur	$1s^2 2s^2 2p^6 3s^2 3p^4$	$[\text{Ne}] 3s^2 3p^4$
17. Chlorine	$1s^2 2s^2 2p^6 3s^2 3p^5$	$[\text{Ne}] 3s^2 3p^5$
18. Argon	$1s^2 2s^2 2p^6 3s^2 3p^6$	$[\text{Ne}] 3s^2 3p^6$

C. Noble Gas Configurations

$$\mathbf{2} = 1s^2$$

$$\mathbf{10} = 1s^2 2s^2 2p^6$$

$$\mathbf{18} = 1s^2 2s^2 2p^6 3s^2 3p^6$$

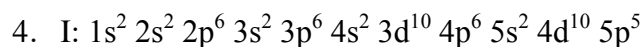
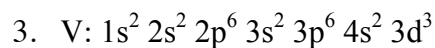
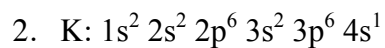
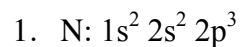
$$\mathbf{36} = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$$

$$\mathbf{54} = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6$$

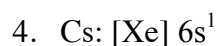
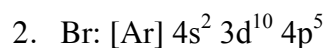
3. Electron Configuration (cont.)

E. Problems – s, p, and d

A. Write the **complete** electron configuration for an atom of the following:



B. Write the **noble gas** electron configuration for an atom of the following:



F. The f Orbitals