

## THE PERIODIC TABLE

The periodic table was developed by **Dmitri Mendeleev**. Mendeleev arranged the elements by their increasing atomic masses. Although many elements had not been discovered yet Mendeleev had the fore thought to leave spaces for elements that seemed to be missing based on the expected properties of the space. **Henry Moseley** followed after Mendeleev and explained that the periodic table should be arranged in order by increasing atomic number. Moseley proposed the **Modern Periodic Law**, which states that the chemical and physical properties of elements are periodic functions of their atomic numbers.

The periodic table lists basic information about the elements, such as the name of the element, the element's symbol, its atomic number and its average atomic weight. Some tables give additional information like common ion states or common oxidation states.

6	Atomic Number
C	Element Symbol
Carbon	Element Name
12.011	Average Atomic Weight

Our current periodic table is divided into columns called **groups**, and rows called **periods**. Do you remember what a group has in common? Do you remember what a period tells you about the element? Groups all have the same number of valence electrons. Periods all have the same number of energy levels. There are additional names given to most groups that express characteristics about the group:

- Group IA is also known as **Alkali metals**. The metals of this group are soft metals that react vigorously with water.
- Group IIA = **Alkaline earth metals**. The metals of this group are also reactive but less than the alkali metals.
- Group B = **Transition elements**. The metals of this group have an incomplete filling of their energy levels.
- Sixth period = **Lanthanoids**. The metals of this group are similar to the transition elements, having incomplete filling of their energy levels.
- Seventh period = **Actinoids**. The metals of this group also have incomplete filling of their energy levels.
- Group VIIA = **Halogens**. Reactive non-metals.
- Group VIIIA = **Noble Gases**. The noble gases are inert gases, and generally do not react with other elements.

Modern periodic tables contain other useful information as well. Most tables have elements marked to show whether it is a metal, semi-metal or a non-metal, and markings to show what state the element is found in at room temperature.

- Metals** –
1. They have a characteristic luster or shine.
  2. They are generally good conductors of heat and electricity.
  3. They are solid at room temperature, except mercury.
  4. They are malleable and ductile.

- Non-metals** –
1. They do not exhibit characteristics of metals.
  2. Most are gases, except bromine.
  3. When in their solid state most are hard and brittle.

- Semi-metals or metalloids** -
1. They have both metallic and non-metallic properties.
  2. They are good semi-conductors; poor conductors at room temperature, but relatively good at higher temperatures.

**Practice: Complete the following tasks using the periodic table provided.**

1. Outline all the metals with a dark color (perhaps dark blue, green or purple)
2. Outline all the semi-metals in a different dark color.
3. Outline all the non-metals in a light color.
4. Color in the blocks that are solids, color lightly so that you do not obscure the information on the table. (using a light color is usually helpful)
5. Color in the blocks that are liquids, use a color much different than the one you used for the metals.
6. Color in the blocks that are gases, and once again please use a different color.
7. Create a legend at the top of your periodic table.

# Periodic Table of the Elements

IA		IIA		IIIB		IVB		VB		VIB		VIIB		VIIIB		IIB		IIIA		IVA		VA		VIA		VIIA		VIIIA																																										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																																			
<b>H</b> 1.008	<b>He</b> 4.003	<b>Li</b> 6.941	<b>Be</b> 9.012	<b>B</b> 10.81	<b>C</b> 12.01	<b>N</b> 14.01	<b>O</b> 16.00	<b>F</b> 19.00	<b>Ne</b> 20.18	<b>Na</b> 23.00	<b>Mg</b> 24.30	<b>Al</b> 26.98	<b>Si</b> 28.09	<b>P</b> 30.97	<b>S</b> 32.07	<b>Cl</b> 35.45	<b>Ar</b> 39.95	<b>K</b> 39.10	<b>Ca</b> 40.08	<b>Sc</b> 44.96	<b>Ti</b> 47.88	<b>V</b> 50.94	<b>Cr</b> 52.00	<b>Mn</b> 54.94	<b>Fe</b> 55.85	<b>Co</b> 58.93	<b>Ni</b> 58.69	<b>Cu</b> 63.55	<b>Zn</b> 65.38	<b>Ga</b> 69.72	<b>Ge</b> 72.59	<b>As</b> 74.92	<b>Se</b> 78.96	<b>Br</b> 79.90	<b>Kr</b> 83.80	<b>Rb</b> 85.47	<b>Sr</b> 87.62	<b>Y</b> 88.91	<b>Zr</b> 91.22	<b>Nb</b> 92.91	<b>Mo</b> 95.94	<b>Tc</b> (98)	<b>Ru</b> 101.1	<b>Rh</b> 102.9	<b>Pd</b> 106.4	<b>Ag</b> 107.9	<b>Cd</b> 112.4	<b>In</b> 114.8	<b>Sn</b> 118.7	<b>Sb</b> 121.8	<b>Te</b> 127.6	<b>I</b> 126.9	<b>Xe</b> 131.3	<b>Cs</b> 132.9	<b>Ba</b> 137.3	<b>Lu</b> 175.0	<b>Hf</b> 178.5	<b>Ta</b> 180.9	<b>W</b> 183.8	<b>Re</b> 186.2	<b>Os</b> 190.2	<b>Pt</b> 195.1	<b>Au</b> 197.0	<b>Hg</b> 200.6	<b>Tl</b> 204.4	<b>Pb</b> 207.2	<b>Bi</b> 209.0	<b>Po</b> (209)	<b>At</b> (210)	<b>Rn</b> (222)
<b>Fr</b> (223)	<b>Ra</b> 226.0	<b>Ac</b> 227.0	<b>Th</b> 232.0	<b>Pa</b> 231.0	<b>U</b> 238.0	<b>Np</b> 237.0	<b>Pu</b> (244)	<b>Am</b> (243)	<b>Cm</b> (247)	<b>Bk</b> (247)	<b>Cf</b> (251)	<b>Es</b> (252)	<b>Fm</b> (257)	<b>Md</b> (258)	<b>No</b> (259)	<b>Lr</b> (260)	<b>Rf</b> (261)	<b>Db</b> (262)	<b>Sg</b> (263)	<b>Bh</b> (262)	<b>Hs</b> (265)	<b>Mt</b> (266)	<b>Ir</b> 192.2	<b>Pt</b> 195.1	<b>Au</b> 197.0	<b>Hg</b> 200.6	<b>Tl</b> 204.4	<b>Pb</b> 207.2	<b>Bi</b> 209.0	<b>Po</b> (209)	<b>At</b> (210)	<b>Rn</b> (222)	<b>La</b> 138.9	<b>Ce</b> 140.9	<b>Pr</b> 140.9	<b>Nd</b> 144.2	<b>Pm</b> (145)	<b>Sm</b> 150.4	<b>Eu</b> 152.0	<b>Gd</b> 157.2	<b>Tb</b> 158.9	<b>Dy</b> 162.5	<b>Ho</b> 164.9	<b>Er</b> 167.3	<b>Tm</b> 168.9	<b>Yb</b> 173.0	<b>Lu</b> 175.0	<b>Hf</b> 178.5	<b>Ta</b> 180.9	<b>W</b> 183.8	<b>Re</b> 186.2	<b>Os</b> 190.2	<b>Pt</b> 195.1	<b>Au</b> 197.0	<b>Hg</b> 200.6	<b>Tl</b> 204.4	<b>Pb</b> 207.2	<b>Bi</b> 209.0	<b>Po</b> (209)	<b>At</b> (210)	<b>Rn</b> (222)									

<b>La</b> 138.9	<b>Ce</b> 140.9	<b>Pr</b> 140.9	<b>Nd</b> 144.2	<b>Pm</b> (145)	<b>Sm</b> 150.4	<b>Eu</b> 152.0	<b>Gd</b> 157.2	<b>Tb</b> 158.9	<b>Dy</b> 162.5	<b>Ho</b> 164.9	<b>Er</b> 167.3	<b>Tm</b> 168.9	<b>Yb</b> 173.0
<b>Ac</b> 227.0	<b>Th</b> 232.0	<b>Pa</b> 231.0	<b>U</b> 238.0	<b>Np</b> 237.0	<b>Pu</b> (244)	<b>Am</b> (243)	<b>Cm</b> (247)	<b>Bk</b> (247)	<b>Cf</b> (251)	<b>Es</b> (252)	<b>Fm</b> (257)	<b>Md</b> (258)	<b>No</b> (259)





## Electronegativities of the Elements

H 2.1																			He -
Li 1.0	Be 1.5											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0		Ne -	
Na 0.9	Mg 1.2											Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0		Ar -	
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8		Kr -	
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5		Xe -	
Cs 0.7	Ba 0.9	La 1.1	Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.8	Bi 1.9	Po 2.0	At 2.2		Rn -	
Fr 0.7	Ra 0.9	Ac 1.1																	

### Activity Series of the Elements

<u>Metals</u>	Decreasing Reactivity ▼ Decreasing Reactivity ▼ Decreasing Reactivity ▼	<u>Nonmetals</u>
Lithium		Fluorine
Potassium		Chlorine
Barium		Bromine
Strontium		Iodine
Calcium		
Sodium		
Magnesium		
Aluminum		
Manganese		
Zinc		
Chromium		
Iron		
Cadmium		
Cobalt		
Nickel		
Tin		
Lead		
<b>Hydrogen</b>		
Antimony		
Arsenic		
Bismuth		
Copper		
Mercury		
Silver		
Palladium		
Platinum		
Gold		

### General Rules of Solubility

1. All ammonium, potassium, and sodium compounds are soluble in water.
2. All acetates, chlorates, and nitrates are soluble in water.
3. All chlorides are soluble in water *except* those of silver, mercurous mercury, and lead. (Lead chloride is slightly soluble in cold water and readily soluble in hot water.)
4. All sulfates are soluble in water *except* those of barium and lead. Calcium, strontium, and silver sulfates are only slightly soluble in water.
5. Carbonates, phosphates, oxides, silicates, sulfides, and sulfites are generally insoluble in water *except* those of ammonium, potassium, and sodium.
6. All hydroxides are insoluble in water *except* those of ammonium, potassium, sodium, barium, calcium, and strontium. (Those of barium, calcium, and strontium are only slightly soluble in water.)

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

**Homework: Periodic Table**

Fill in the blanks for the following statements.

1. The periodic table was originally invented by \_\_\_\_\_.
2. This periodic table was arranged in order of increasing \_\_\_\_\_.
3. Mosely rearranged the periodic table based on his \_\_\_\_\_.
4. Elements of Group IA are also called the \_\_\_\_\_.
5. All the elements of the 3<sup>rd</sup> period have \_\_\_\_\_ energy levels.
6. All of the \_\_\_\_\_ have an incomplete filling of their energy levels.
7. The vertical columns of elements are called \_\_\_\_\_, and they all have the same number of \_\_\_\_\_.
8. \_\_\_\_\_ are the most reactive non-metals.
9. The letter in the middle of a periodic block represents the \_\_\_\_\_.
10. \_\_\_\_\_ exhibit characteristics of both metals and non-metals.

Complete the following matching using both the note sheet and your vocabulary.

- |          |   |                         |
|----------|---|-------------------------|
| _____ 1. | The chemical and physical properties of elements are functions of their atomic number.        | a. noble gas            |
| _____ 2. | The electrons in the outer most energy level.   | b. period               |
| _____ 3. | A column of the periodic table containing elements with the same number of valence electrons. | c. periodic law         |
| _____ 4. | Very reactive non-metals, found in Group 7A.  | d. valence electron     |
| _____ 5. | Reactive metals that are found in Group 2A.   | e. halogen              |
| _____ 6. | These elements are inert gases.   | f. alkaline earth metal |
| _____ 7. | A row of elements that contain the same number of energy levels.                              | g. group                |
| _____ 8. | These metals are soft and react vigorously with Water.  | h. alkali metal         |

Choose the best answer for the following questions.

- \_\_\_ 1. Carbon is considered?  
a. metal      b. metalloid      c. non-metal
- \_\_\_ 2. The number listed at the top of a elemental block on the periodic table is the:  
a. atomic mass      c. average atomic weight  
b. atomic number      d. number of electrons
- \_\_\_ 3. How many valence electrons does magnesium have?  
a. 1      b. 2      c. 4      d. 8
- \_\_\_ 4. What family does chlorine belong to?  
a. noble gases      c. alkali metal  
b. transition elements      d. halogens
- \_\_\_ 5. Which of the following is a liquid at room temperature?  
a. mercury      b. lead      c. copper      d. oxygen
- \_\_\_ 6. Which of the following is a metalloid?  
a. zinc      b. silicon      c. calcium      d. helium
- \_\_\_ 7. An element that is hard and brittle at room temperature is most likely a:  
a. metal      b. metalloid      c. non-metal
- \_\_\_ 8. Which of the following scientists is given credit for designing the **modern** periodic table?  
a. Rutherford      c. Mendeleev  
b. Mosely      d. Dalton