

# Metals , Nonmetals and Valence Electrons

The Bottom Line  
Grade W/S 13 & 14  
Homework 2  
Valence Electrons  
Groups and Families

# The Bottom Line

**FACE IT,** Nobody owes you a living,  
What you achieve or fail to achieve in your  
lifetime,  
is directly related to what you do or fail to do.  
No one chooses their parents or childhood,  
but you can choose your own direction.  
Everyone has problems and obstacles to  
overcome,  
but that, too, is relative to each individual.

**NOTHING IS CARVED IN STONE,**

you can change anything in your life,

if you want to badly enough,

Excuses are for losers;

Those who take responsibility for their actions

are the real winners in life.

Winners meet life's challenges head on,

knowing there are no guarantees,

and give it all they've got.

And never think it's too late or too early to begin.

Time plays no favorites

and will pass whether you act or not.

**TAKE CONTROL OF YOUR LIFE.**

Dare to dream and take risks...

Compete.

If you aren't willing to work for your  
goals,

don't expect others to.

---Believe in Yourself---

# Grade Homework

- Worksheet 13 & 14

# Homework 2

**Word/Term:** Valence Electrons

**Drawing:**

**Describe in own words:**

**Textbook Definition:**

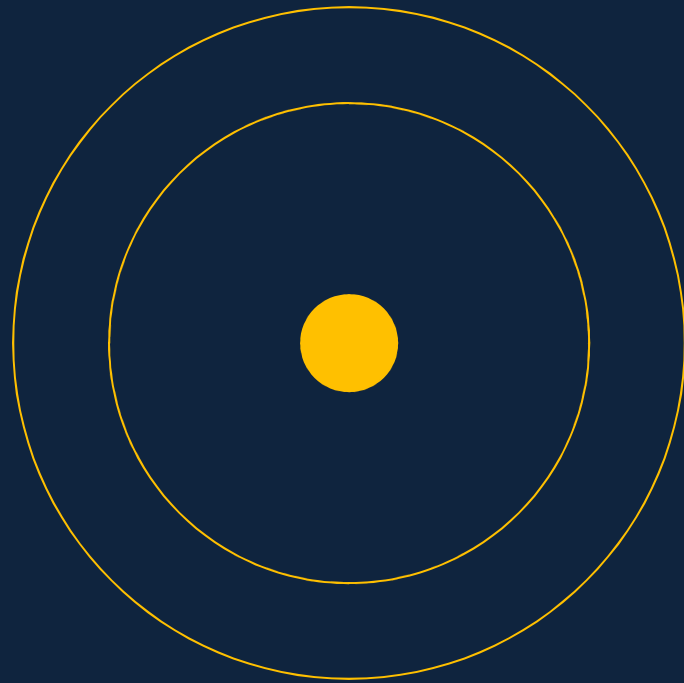
Rate my Understanding: 1 2 3 4

**How I remember it:**

**Reflections:**

# Valence Electrons

- All of the electrons in the Outer Shell of the Atom



<sup>6</sup>  
C



# Octet Rule

- Atoms are more stable that have a full shell of electrons
- For most atoms, 8 valence electrons is full
  - Octet = 8
- Hydrogen and Helium are exceptions
- Atoms "want" to have 8 electron in their outer shell
  - All other elements will lose, gain or share to reach 8 electrons

- *Elements with the same valence electrons have similar reactivity, so they tend to react the same*

# Periods, Groups and Valence Electrons

	<b>1</b>		<b>Valence Electrons</b>							<b>8</b>
	1A	<b>2</b>		<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>		18A
→ 1	1 H									2 He
		2A ← Groups		Groups → 13A	14A	15A	16A	17A		
Electron Levels (Periods)										
→ 2	3 Li	4 Be		5 B	6 C	7 N	8 O	9 F	10 Ne	
			<i>Divides metals and non-metals</i>							<b>Exception: Helium only has 2 valence electrons!</b>
→ 3	11 Na	12 Mg		13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
→ 4	19 K	20 Ca	<b>Transition Metals</b> (valence electrons vary)	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
	<b>1</b>	<b>2</b>		<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	

# Metals and Non-Metals

**Valence Electrons**

1 ←      2      3      4      5      6      7      8

1A      2A      ← Groups      Groups →      13A      14A      15A      16A      17A      18A

Electron Levels (Periods)

→ 1      1      H      2      He

→ 2      3      Li      4      Be      5      B      6      C      7      N      8      O      9      F      10      Ne

→ 3      11      Na      12      Mg      13      Al      14      Si      15      P      16      S      17      Cl      18      Ar

4      19      K      20      Ca      Transition Metals (valence electrons vary)      31      Ga      32      Ge      33      As      34      Se      35      Br      36      Kr

←      1      2      3      4      5      6      7      8

←      **Metals**      **Non-metals** →

*Exception: Helium only has 2 valence electrons!*

*Divides metals and non-metals*

# Location of Metals and Non-Metals

- Metals are located on the left side of the Periodic Table
- Non-Metals are located on the right side of the Periodic Table
- Metals and Non-Metals have different properties and bond differently, making different kinds of compounds

# Metal or Non-Metal?

- Calcium (Ca)?
- Bromine (Br)?
- Silicon (Si)?

# Metalloids

- Have characteristics of Metals and Non-Metals
  - Boron
  - Silicon
  - Germanium
  - Arsenic
  - Antimony

H																	He																														
Li	Be											B	C	N	O	F	Ne																														
Na	Mg											Al	Si	P	S	Cl	Ar																														
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																														
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																														
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																														
Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt																																							
<table border="1"> <tbody> <tr> <td>La</td> <td>Ce</td> <td>Pr</td> <td>Nd</td> <td>Pm</td> <td>Sm</td> <td>Eu</td> <td>Gd</td> <td>Tb</td> <td>Dy</td> <td>Ho</td> <td>Er</td> <td>Tm</td> <td>Yb</td> <td>Lu</td> </tr> <tr> <td>Ac</td> <td>Th</td> <td>Pa</td> <td>U</td> <td>Np</td> <td>Pu</td> <td>Am</td> <td>Cm</td> <td>Bk</td> <td>Cf</td> <td>Es</td> <td>Fm</td> <td>Md</td> <td>No</td> <td>Lr</td> </tr> </tbody> </table>																		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu																																	
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr																																	

- **Periods or Rows**

- The Horizontal Rows

- Tells you the number of Energy Levels around the Nucleus



H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt									
			La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
			Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

- **Groups or Families**
  - The vertical columns
  - Tells you how the elements will react with other elements

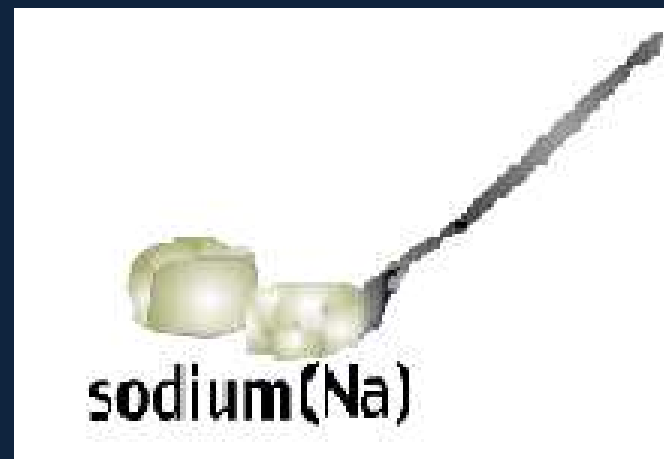
# Hydrogen

- The hydrogen square sits atop Family AI, but it is not a member of that family. Hydrogen is in a class of its own.
- It's a gas at room temperature.
- It has one proton and one electron in its one and only energy level.
- Hydrogen only needs 2 electrons to fill up its valence shell.

# Alkali Metals

- The alkali family is found in the first column of the periodic table.
- Atoms of the alkali metals have a single electron in their outermost level, in other words, 1 valence electron.
- They are shiny, have the consistency of clay, and are easily cut with a knife.

Periodic Table of the Elements

# Alkali Metals



- They are the most reactive metals.
- They react violently with water.
- Alkali metals are never found as free elements in nature. They are always bonded with another element.

# Alkaline Earth Metals

- They are never found uncombined in nature.
- They have two valence electrons.
- Alkaline earth metals include magnesium and calcium, among others.

Periodic Table  
of the Elements

The image shows a simplified periodic table of elements. The title "Periodic Table of the Elements" is centered at the top. The table is a grid of cells representing elements. The first two columns on the left are highlighted in blue, representing the alkaline earth metals. The rest of the table is gray. The table is arranged in four rows. The first row has 2 cells in the blue column and 1 cell in the gray column. The second row has 2 cells in the blue column and 10 cells in the gray column. The third row has 2 cells in the blue column and 10 cells in the gray column. The fourth row has 2 cells in the blue column and 10 cells in the gray column. Below the main table is a separate row of 10 gray cells, representing the lanthanide and actinide series.

# Transition Metals

- Transition Elements include those elements in the B families.
- These are the metals you are probably most familiar: copper, tin, zinc, iron, nickel, gold, and silver.
- They are good conductors of heat and electricity.

Periodic Table of the Elements

The diagram shows a simplified periodic table with a grid of 18 columns and 7 rows. The central d-block (columns 3-10) and the bottom f-block (rows 6-7, columns 3-10) are shaded blue. The remaining cells, including the s-block (columns 1-2), p-block (columns 11-18), and the rest of the grid, are shaded grey.

# Transition Metals



- The compounds of transition metals are usually brightly colored and are often used to color paints.
- Transition elements have 1 or 2 valence electrons, which they lose when they form bonds with other atoms. Some transition elements can lose electrons in their next-to-outermost level.

# Rare Earth Elements

Periodic Table of the Elements

The diagram shows a simplified periodic table with a highlighted section for rare earth elements. The highlighted section consists of two rows of 14 elements each, located between the lanthanoid and actinoid series. The rest of the periodic table is shown in a simplified grid format.

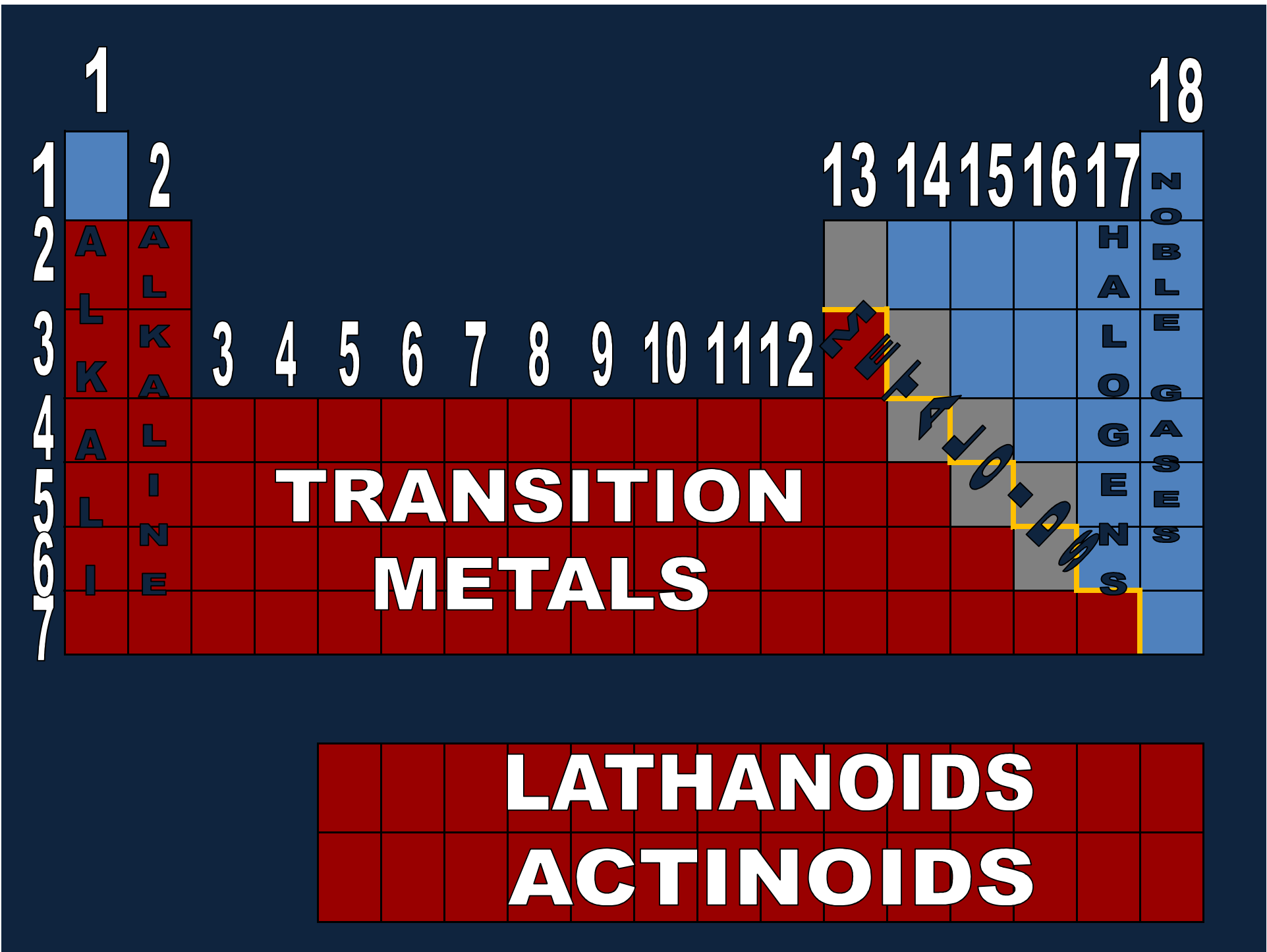
- The thirty rare earth elements are composed of the lanthanoid and actinoid series.
- One element of the lanthanoid series and most of the elements in the actinoid series are called trans-uranium, which means synthetic or man-made.



# Halogens

- Halogens are highly reactive can be found in many minerals and in seawater
- At room temperature and pressure, fluorine and chlorine are gases, bromine is a liquid and iodine and astatine are solids
- Group 17(7) is therefore the only periodic table group exhibiting all three states of matter at room temperature





1

18

1

2

13 14 15 16 17

N

2

A

A

M

L

M

L

H

O

3

L

K

3

4

5

6

7

8

9

10

11

12

M

L

M

L

L

O

4

A

L

TRANSITION

M

L

M

G

A

5

L

I

METALS

M

L

M

E

S

6

I

E

M

L

M

S

S

7

LANTHANOIDS

ACTINOIDS

# Homework

- Periodic Table Worksheet
- Next Class-Build a Periodic Table Lab