

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Block: \_\_\_\_\_

**Chemical Reactions:**

Lesson 1 – Atomic Theory & Periodic Table

Atom: The smallest particle of an element that retains the properties of that element.

Subatomic particles: particles that make up atoms (3)

Proton: - Has a positive charge

- Symbol:  $p^+$  or  $\oplus$
- Found inside the nucleus

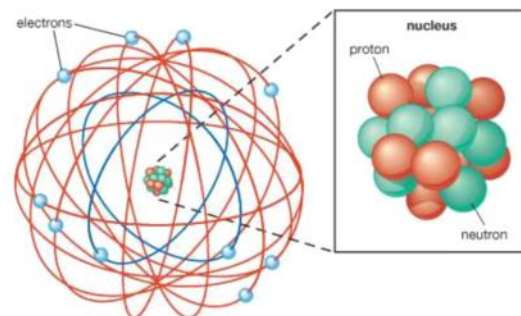
Neutron: - Has no charge

- Symbol:  $n$  or  $\circ$
- Found inside nucleus

Electron: - Has a negative charge

- Symbol:  $e^-$  or  $\ominus$
- found outside nucleus

# protons = # electrons  
For Atoms



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Atomic Number: the # of protons in the nucleus (# of electrons)

Atomic Mass: the average mass of an atom. Measured in AMU

AMU (Atomic Mass Unit): 1 proton = 1 AMU

1 neutron = 1 AMU

1 electron = So small, we say 0 AMU

Ex. Aluminum

atomic #	13	3+
Symbol	Al	
Name	Aluminum	
atomic mass	26.9	

ion charge

Ex. How many neutrons does Aluminum have?

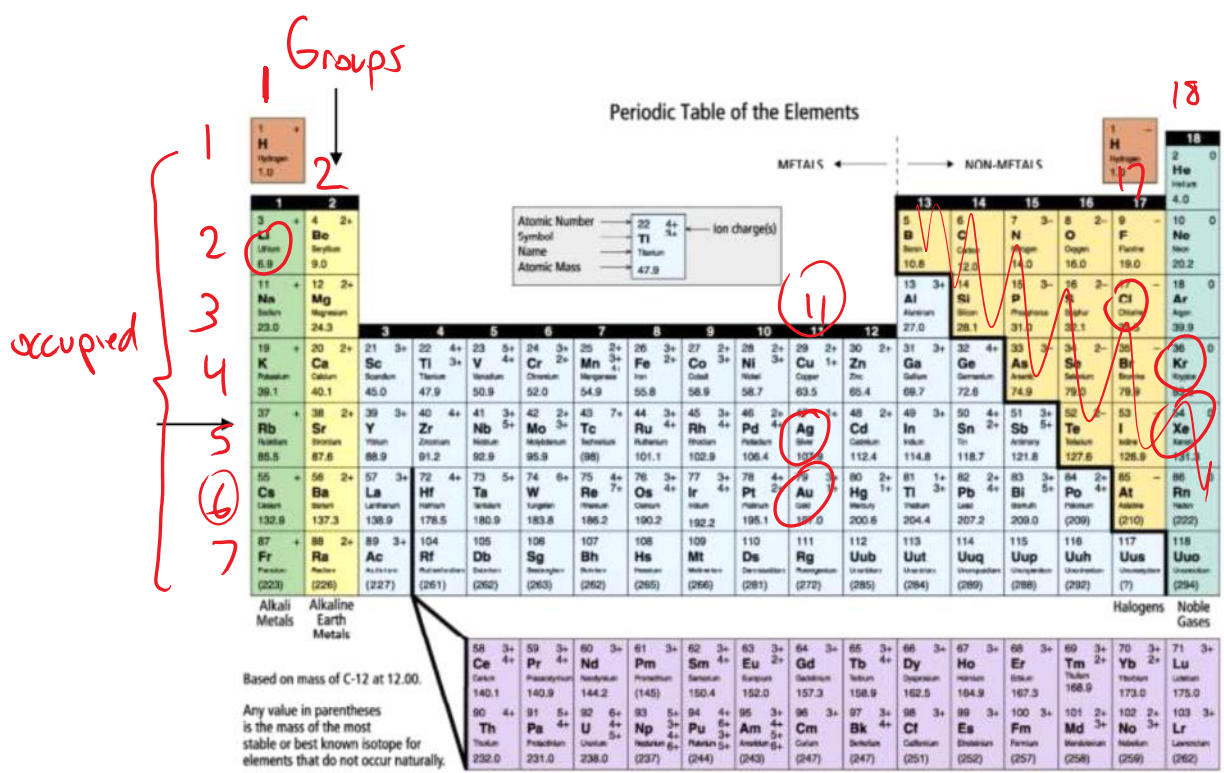
$$26.9 - 13 = 13.9$$

$$\Rightarrow 14 \text{ neutrons}$$

To find neutrons!  
Atomic Mass – Atomic Number

Mass Number: Rounded atomic mass  
Ex Aluminum mass number = 27

When Rounding:  
.5 or more round up  
.4 or less round down



Period: a row in the periodic table

Group/Family: a column in the periodic table

Elements in the same chemical group or family have similar chemical properties.

- Alkali Metals: Group 1 (not H), very reactive metals
  - Alkaline Earth Metals: Group 2, somewhat reactive
  - Halogens: Group 17, very reactive non-metals
  - Nobel Gases: Group 18, unreactive gaseous non-metals
- neutrons = atomic mass - atomic number

Examples:

Name	Symbol	Atomic Number	Atomic Mass	Protons	Neutrons	Electrons	Period	Group	Metal or Non-metal
Lithium	Li	3	6.9	3	4	3	2	1	Metal
Silver	Ag	47	107.9	47	61	47	5	11	metal
Chlorine	Cl	17	35.5	17	19	17	3	17	Non metal
Krypton	Kr	36	83.8	36	48	36	4	18	non-metal
Xenon	Xe	54	131.3	54	77	54	5	18	
Gold	Au	79	197	79	118	79	6	11	metal

197 - 79

Name: \_\_\_\_\_

Date: \_\_\_\_\_

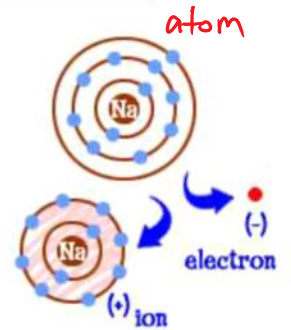
Block: \_\_\_\_\_

### Chemical Reactions:

#### Lesson 2 – Atoms vs Ions & Bohr Models

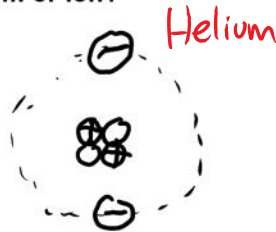
Valence electrons: are the  $e^-$  on the outermost energy level / shell of an atom

Atoms	Ions
<u># protons = # electrons</u>	<u># protons <math>\neq</math> # electrons</u>



Atom or Ion?

Ex.



Atom or Ion

Net charge:

$$\begin{array}{r} 2p^+ \\ -2e^- \\ \hline 0 \end{array} \text{ zero charge } \therefore \text{ ATOM}$$

therefore

Ex.



Atom or Ion

Net charge:

$$\begin{array}{r} +3p^+ \\ -2e^- \\ \hline 1+ \end{array}$$

Positively charged ion = "Cation"

Ex.



Atom or Ion

Net charge:

$$\begin{array}{r} +8p^+ \\ -10e^- \\ \hline 2- \end{array}$$

Negatively charged ion = "Anion"

## Bohr Model

Ex. Magnesium Atom

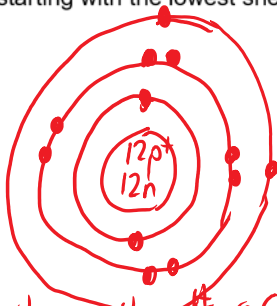
Step 1: Find element on periodic table.

Step 2: Determine: Number of protons = 12  
 Number of neutrons =  $\text{mass \#} - \text{atomic \#} = 12$

Step 3: Determine: Number of electrons = 12

Step 4: Draw nucleus.

Step 5: Add electrons starting with the lowest shells



Electrons Per Shell

1<sup>st</sup> shell = 2 electrons

2<sup>nd</sup> shell = 8 electrons

3<sup>rd</sup> shell = 8 electrons

4<sup>th</sup> shell = 18 electrons

Ions: Occurs when the # of Protons  $\neq$  # of electrons.  
 They are formed when a metal LOSES one or more  $e^-$   
 or when a non-metal GAINS one or more  $e^-$

Ex. Magnesium Ion

Step 1: Find element on periodic table.

Step 2: Determine: Number of protons = 12  
 Number of neutrons = 12

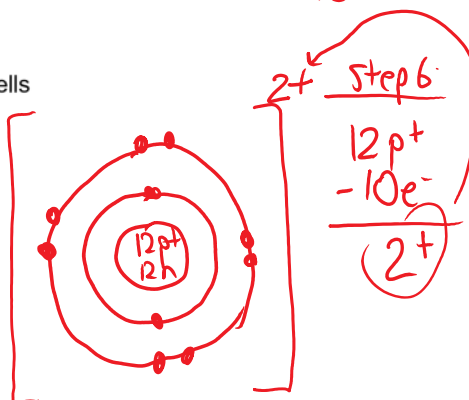
Step 3: Determine: Number of electrons =  $10e^-$   $\rightarrow$  Started 12  $\leftarrow$  from group 2  

$$\begin{array}{r} 12 \\ - 2 \\ \hline 10e^- \end{array}$$

Step 4: Draw nucleus.

Step 5: Add electrons starting with the lowest shells

\*Step 6: Determine charge.



On the periodic table the period shows how many shells an element has. The group can help you find the number of valence electrons.

**Chemical Reactions:**  
Lesson 3 – Ionic Compounds

**Periodic Table Hacks**

# of occupied shells

1  
2  
3  
4  
5  
6  
7

Periodic Table of the Elements

Atomic Number: 22, Symbol: Ti, Name: Titanium, Atomic Mass: 47.9, Ion charge(s): 3+

Na

11p  
12n

3 4 5 6 7

1 2

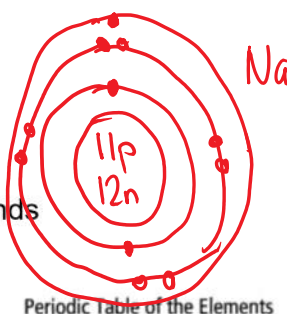
1 2

3 4 5 6 7

Alkali Metals Alkaline Earth Metals Halogens Noble Gases

Based on mass of C-12 at 12.00.

Any value in parentheses is the mass of the most stable or best known isotope for elements that do not occur naturally.



Name: \_\_\_\_\_

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Cation: formed when a metal atom LOSES electrons and becomes a Positive ion

Anion: Formed when a non-metal atom GAINS e<sup>-</sup> and becomes a negative ion.

Ionic Bond: occurs between a metal and non-metal, when e<sup>-</sup> are transferred

Covalent Bond: formed between 2 non-metals that share e<sup>-</sup>

**Cation or Anion**

Ex. Magnesium Ion

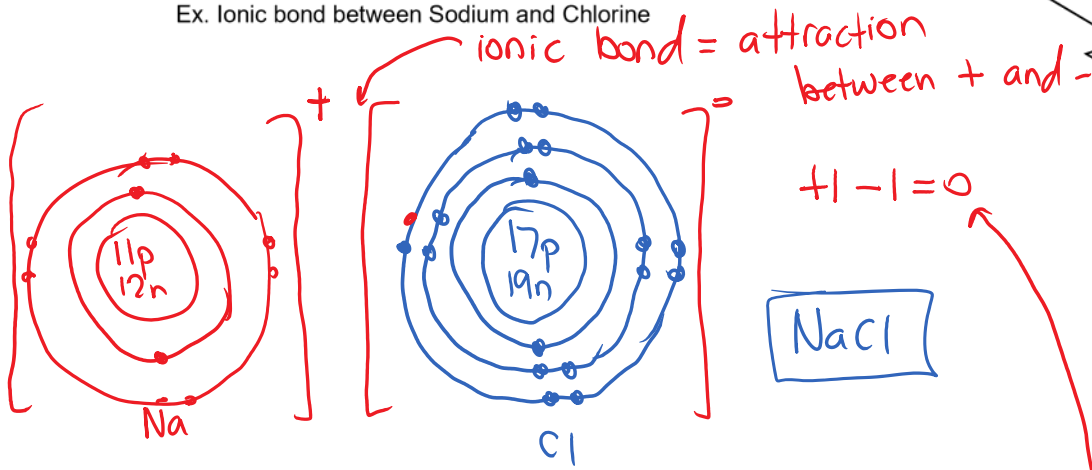
$$\begin{array}{r} 12e \\ -10e \\ \hline +2 \end{array} \quad \text{Mg}^{2+} \quad \text{Cation}$$

Ex. Sulfur Ion

$$\begin{array}{r} 16e \\ -18e \\ \hline -2 \end{array} \quad \text{S}^{2-} \quad \text{Anion}$$

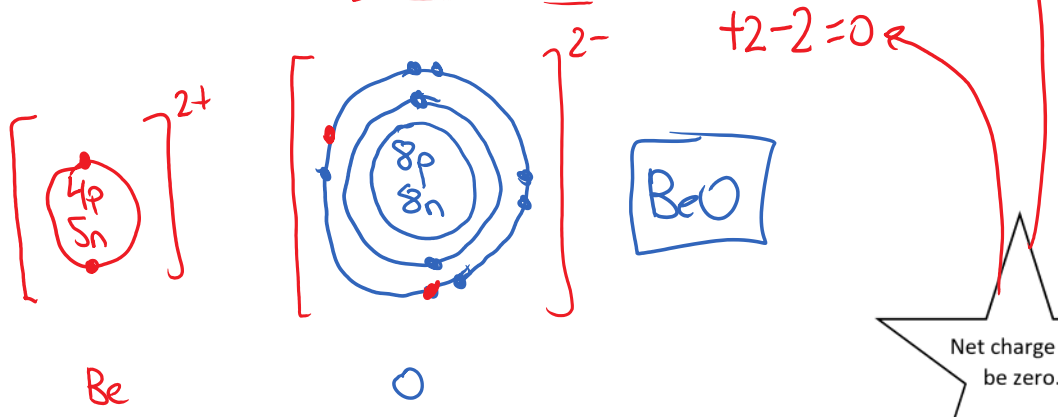
# Ionic Bonds ~~11/11/20~~

Ex. Ionic bond between Sodium and Chlorine

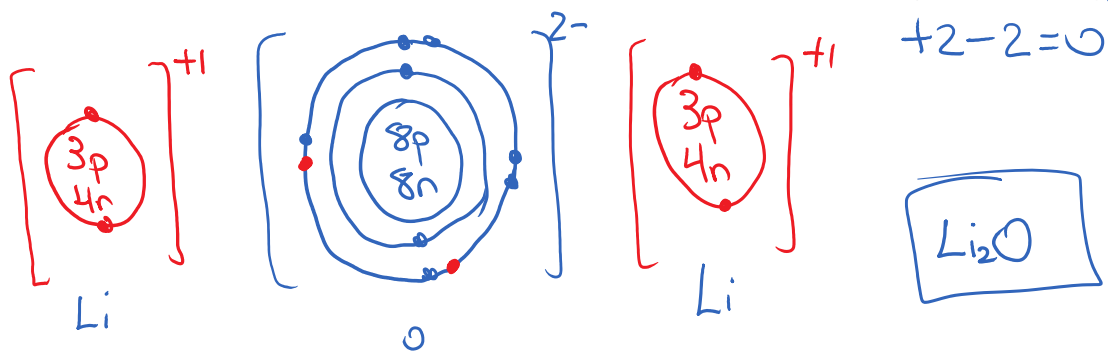


An ion's shells will always be full

Ex. Ionic bond between Beryllium and Oxygen



Ex. Ionic bond between Lithium and Oxygen



Net charge will be zero.

ASSIGNMENT: Drawing Bohr Diagrams of Ionic Compounds

Chemical Reactions  
Lesson 4: **Covalent Compounds**

Date: \_\_\_\_\_

Review:

Ionic Compounds are formed between \_\_\_\_\_ IONS and \_\_\_\_\_ IONS.

The metal ion is \_\_\_\_\_ charged, and called a \_\_\_\_\_. Eg. aluminum ion  $\text{Al}^{3+}$

The nonmetal ion is \_\_\_\_\_ charged, and called an \_\_\_\_\_. Eg. Fluorine ion  $\text{F}^{1-}$

The oppositely charged ions are ATTRACTED to each other, and this force of attraction is what holds them tightly together = IONIC BOND

New:

**Covalent Bonding** text p. 121

Covalent compounds are made up of atoms of two or more \_\_\_\_\_  
\_\_\_\_\_ joined together by covalent bonds.

UNLIKE in Ionic Bonding, \_\_\_\_\_

A covalent bond is a strong connection between atoms when they share electrons.  
The sharing of electrons results in \_\_\_\_\_

Examples of Covalent Bonding:

a) WATER                   $\text{H}_2\text{O}$                   Bohr model                  Common Model

b) Carbon Dioxide  $\text{CO}_2$

c) Carbon Monoxide CO

Most Covalent compounds exist as \_\_\_\_\_. A molecule is the smallest independent unit of a covalent compound.

Two or more atoms of the \_\_\_\_\_ that are joined covalently are also molecules. These elements include \_\_\_\_\_. You will see that these elements make up an "upside down hockey stick" plus a 'puck' on the periodic table!

**Video: Covalent Bonding**

**Activity:**

Draw *Bohr Diagrams* showing each of the following Covalent Molecules. Use the internet to help you if needed.

a) CH<sub>4</sub> Methane Gas

b) NH<sub>3</sub> Ammonia

c) O<sub>2</sub> Oxygen Gas hint: double bonding

d) N<sub>2</sub> Nitrogen Gas hint: triple bonding



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**Chemical Reactions:**  
Lesson 5 -Lewis Diagrams

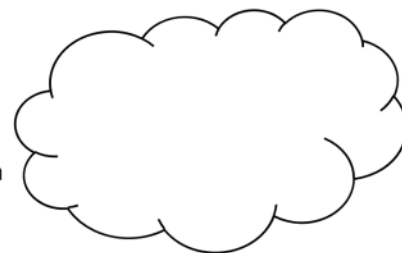
Lewis Diagrams: \_\_\_\_\_

<b>Bohr Diagram</b>	<b>Magnesium</b>	<b>Lewis Dot Structure</b>
	Atom	
	Ion	

**Lewis Dot Structure**

Ex. Oxygen Atom

Ex. Oxygen Ion



Ex. Negative Hydrogen Ion

Ex. Positive Hydrogen Ion

Ex. Aluminum Atom

Ex. Aluminum Ion

**A: Lewis Diagram for IONIC COMPOUNDS**

a) Draw a Lewis Diagram for Lithium Chloride.

Step 1:

Step 2:

b) Draw a Lewis Diagram for Calcium Iodide.

Step 1:

Step 2:

**B: Lewis Diagrams for COVALENT COMPOUNDS**

a) Draw a Lewis Diagram of an Oxygen Molecule  $O_2$

Step 1:

Step 2:

c) Draw a Lewis Diagram of the molecule formed when Fluorine bonds with Chlorine (FCl)

Step 1:

Step 2:

<b>Ionic Bonds</b>	<b>Covalent Bonds</b>
Metal and non-metal	Non-metal and non-metal
Use ions	Use atoms
Gaining or losing electrons	Sharing electrons