6.1 CLASSIFICATION OF THE ELEMENTS

Dimitri Mendeleev (1869) arranged elements in a table in order of increasing mass. He put elements with similar properties in the same column.

Organization of the Periodic Table

- A horizontal row is called a _________.
- A vertical column is called a _________.
- Elements in the same group exhibit similar properties.
- Main Group Elements: ____ Group
- Transition Metals: _____ Group

Some Group Names to Memorize

- Group IA: _____________
- Group IIA: _______________
- Group VIIA: ___________
- Group VIIIA: _____________
- B Groups: Transition _________

The noble gas in the third row is ____

The halogen in the fourth row is ____
Ion Formation

- Atoms gain or lose electrons in order to combine and make compounds.
- When an atom has lost or gained electrons it is now called ________
- An ion has unequal numbers of protons and electrons unlike an atom
- Remember atoms are ___________

Metals lose electrons

- Losing negative electrons makes the atom less negative or more positive
- The atom becomes a _________ ion
- Cation is a + ion
- Metals like to _______ electrons and become ___________ !!!

Example Sodium Na

- Sodium atom likes to lose one electron
- Sodium atom has ___ protons, ___ electrons
- Sodium ion has ___ protons, ___ electrons
- Thus Na ion has a charge of +1 because there is one more proton than electron
  – Your Turn
- Do the exact same thing with Calcium atom which likes to lose two electrons

NonMetals gain electrons

- Gaining negative electrons makes the atom more negative or less positive
- The atom becomes a ___________ ion
- Anion is a ( - ) ion
- Nonmetals like to _______ electrons and become ___________ !!!

Example Oxygen O

- Oxygen atoms like to gain 2 electrons
- Oxygen atoms have ___ protons, ___ electrons
- Oxygen ions have ___ protons, ___ electrons
- Thus oxygen ion has a –2 charge because there is 2 more electrons than protons
  – YOUR TURN
- Do the exact same thing for fluorine F atom which likes to gain 1 electron

Ionic Compound

- We saw that Na becomes Na⁺¹ and F becomes F⁻¹
- Opposites attract so Na⁺ and F⁻ like each other. Oh la la!
- So they bond and make compound _______
Metals lose electrons and become positively charged ions = cations

<table>
<thead>
<tr>
<th>Group</th>
<th>Group IA metals</th>
<th>Group IIA metals</th>
<th>Group IIIA metals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge</td>
<td>Li⁺</td>
<td>Mg²⁺</td>
<td>Al³⁺</td>
</tr>
<tr>
<td>Example</td>
<td>Li⁺</td>
<td>Mg²⁺</td>
<td>Al³⁺</td>
</tr>
</tbody>
</table>

Nonmetals gain electrons and become negatively charged ions = anions

<table>
<thead>
<tr>
<th>Group</th>
<th>Group VA nonmetals</th>
<th>Group VIA nonmetals</th>
<th>Group VIIA nonmetals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge</td>
<td>N³⁻</td>
<td>O²⁻</td>
<td>F⁻</td>
</tr>
<tr>
<td>Example</td>
<td>N³⁻</td>
<td>O²⁻</td>
<td>F⁻</td>
</tr>
</tbody>
</table>

What charged ion do they make?

Cl: ___
Ca: ___
P: ___
Na: ___
O: ___
Al: ___

What charge will the following atoms have when they become ions?

- K
- Mg
- B
- S
- N
- I
- Ba
- In

Putting ions together to make ionic compounds

Ions come together to make neutral compounds. This means they must add up to zero. So a +1 ion wants a -1 ion with it. A +2 ion wants a _____ ion with it. A +3 ion wants a _____ ion with it.

Ionic Compounds

NaCl is an ionic compound. Why did one Na and one Cl bond together?
Ionic Compounds

• CaCl₂ is an ionic compound. Why did one Ca and two Cl's bond together?

Write your own formulas

• Na and O make
• Na and F make
• K and S make
• Mg and Cl make
• Mg and S make
• K and N make