

GENERAL CHEMISTRY

STANDARD 4.4

4.4: Describe the differences between main group elements and d-block elements

NON-MAIN GROUP ELEMENTS

- Elements that are located in the d-block of the Periodic Table are called **Transition Metals**
 - Characterized by varying oxidation numbers
 - **Oxidation Number:** An indication of the degree of oxidation, which is a loss of electrons, of an atom in a chemical compound; always positive or negative
 - Oxidation numbers are used to determine how atoms will combine with other atoms to form compounds
 - Atoms by themselves always have an oxidation number of zero
 - However, when atoms combined with each other to form chemical compounds, their oxidation numbers are important to consider when evaluating chemical reactions
 - Remember, the goal of an ion is to have a full outer shell of valence electrons...either zero or eight valence electrons.

OXIDATION NUMBERS

- To determine oxidation numbers:
 - **Elements in Group 1A, 2A, or 3A:** Count the number of valence electrons and introduce a positive charge to account for the loss of these negatively-charged electrons
 - **Elements in Group 5A, 6A, or 7A:** Count the number of valence electrons and subtract that number from eight and introduce a negative charge to account for the gain of these negatively-charged electrons
 - **Elements in Group 8A:** Oxidation number of zero since the outer shell of valence electrons is already full
 - **Elements in Group 4A:** Can be +4 or -4. More often -4.
 - **Transition Metals:** The oxidation number can only be determined in a compound OR if it is given as they can vary for an individual atom.

OXIDATION NUMBER EXAMPLES

- Determine the oxidation numbers of the following atoms when bonding:
 - **Phosphorus**
 - Phosphorus is in Group 5A, so it has 5 valence electrons. $8 - 5 = 3$, and introduce a negative charge for an Oxidation Number of -3.
 - **Bromine**
 - Bromine is in Group 7A, so it has 7 valence electrons. $8 - 7 = 1$, and introduce a negative charge for an Oxidation Number of -1.
 - **Magnesium**
 - Magnesium is in Group 2A, so it has 2 valence electrons. Introduce a positive charge for an oxidation number of +2.