The Periodic Law

- When arranged by increasing atomic number, the chemical elements display a regular and repeating pattern of chemical and physical properties.

- Atoms with similar properties appear in groups or families (vertical columns)

- They are similar because they all have the same number of valence (outer shell) electrons

The Octet Rule

- The "goal" of most atoms is to have an octet or group of 8 electrons in their valence energy level.
- They may accomplish this by either giving electrons away or taking them.

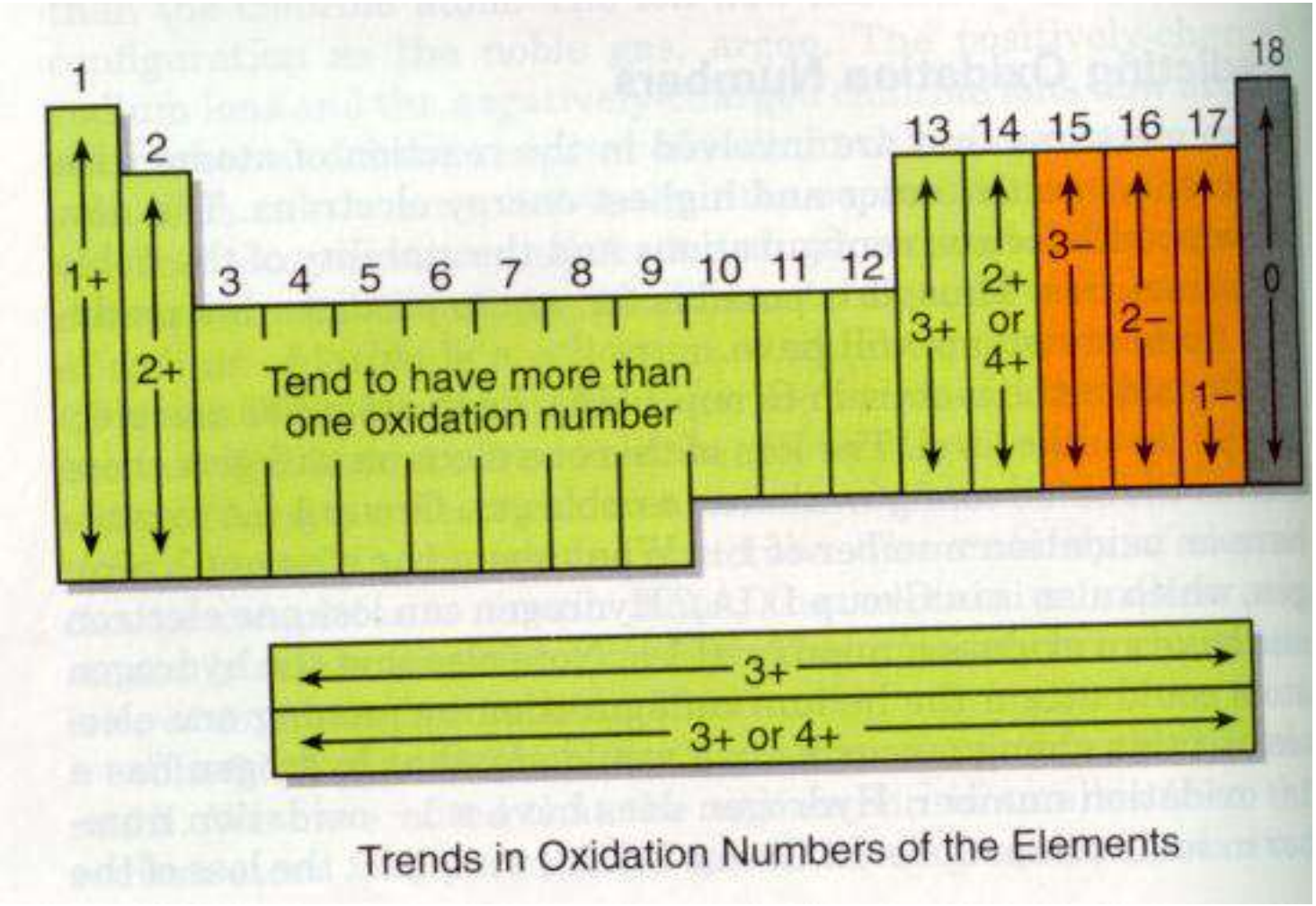
- Atoms that have gained or lost electrons are called ions.

Ions

When an atom gains an electron, it becomes negatively charged (more electrons than protons) and is called an **anion.**

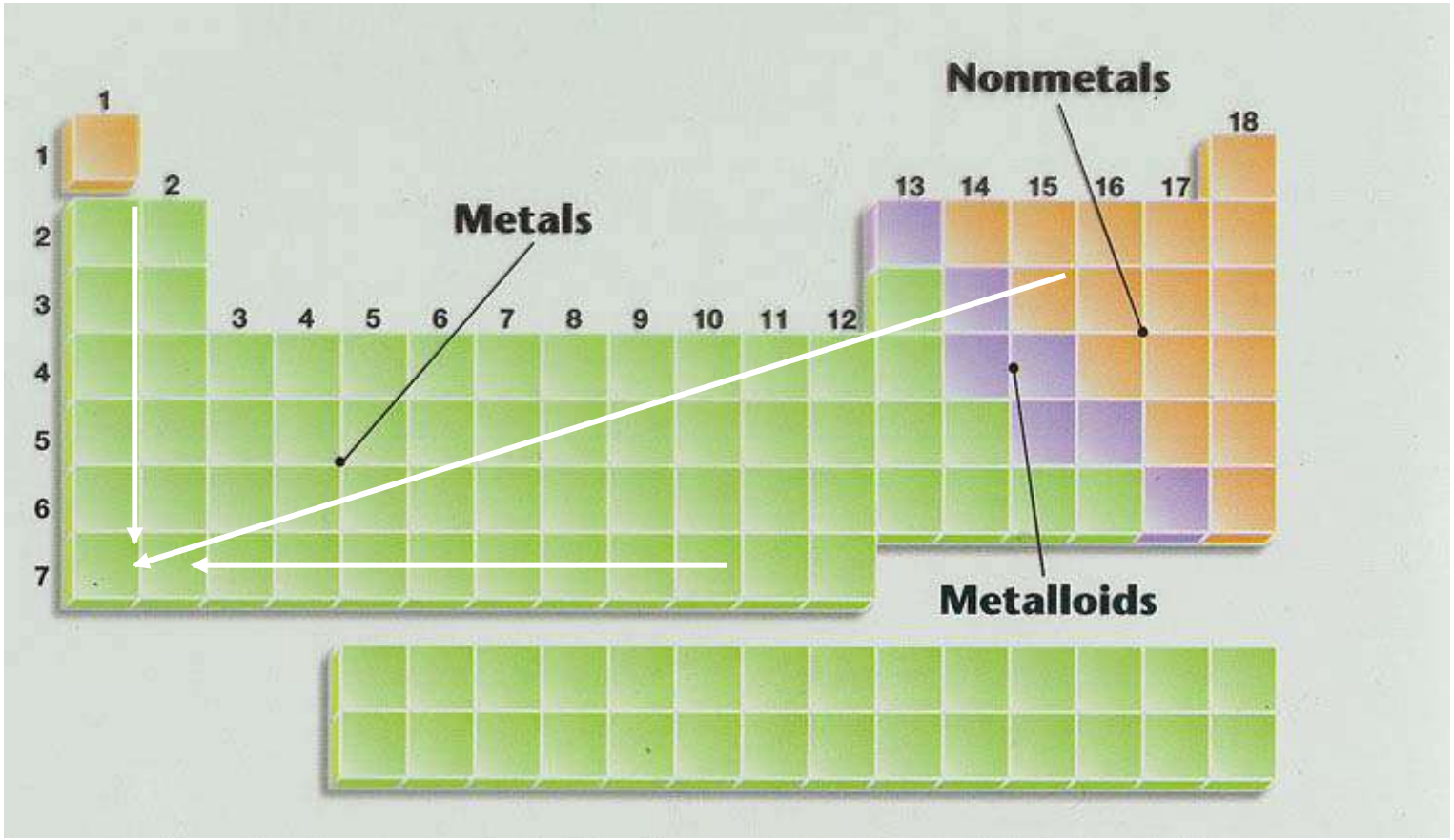
When atoms lose electrons they become positively charged **cations**.

Oxidation Numbers: The charge that will occur when an element gains or loses an electron in the predicted way



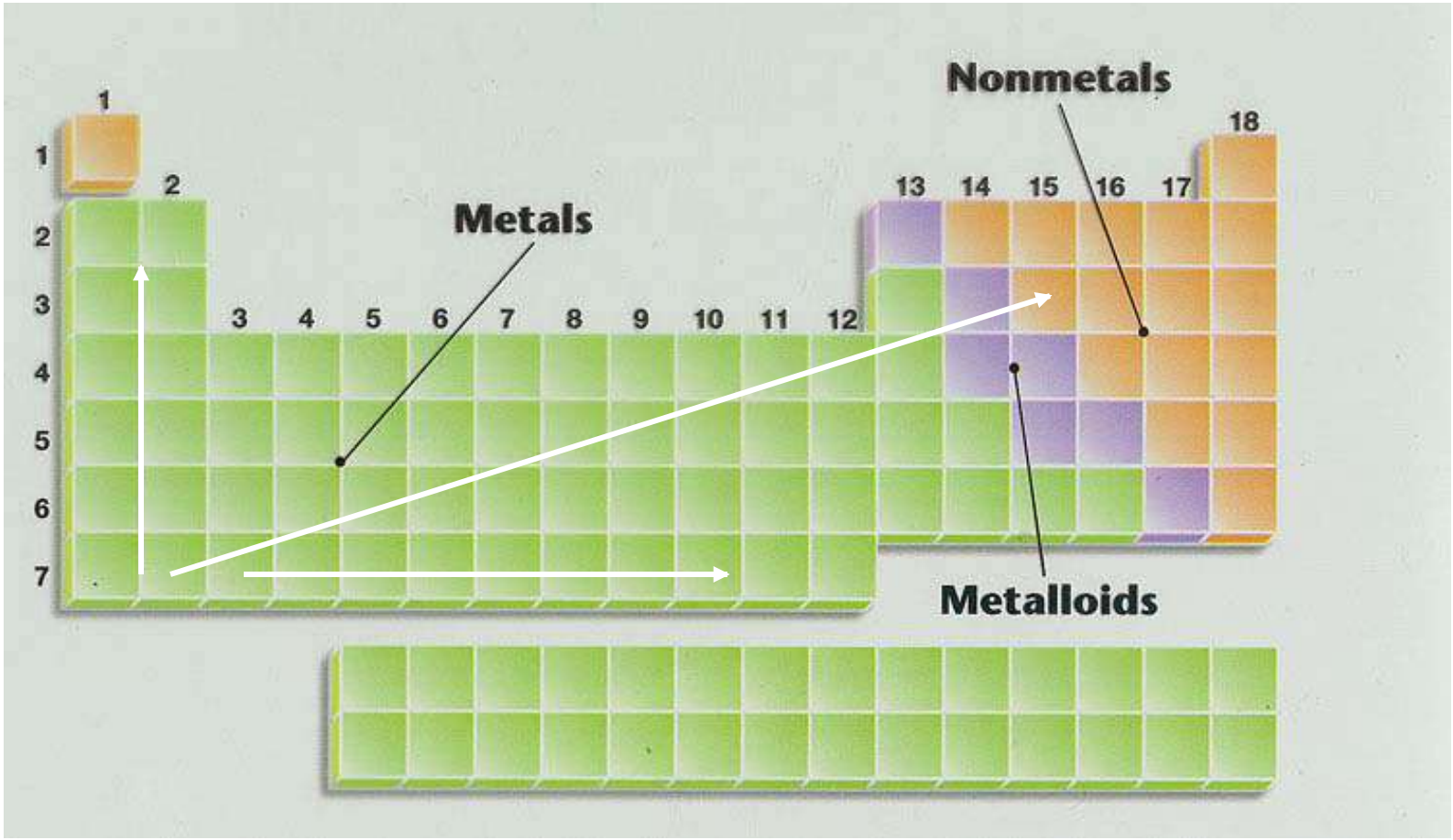
Trends in Oxidation Numbers of the Elements

- Atomic Radius = the distance from the center of the nucleus to the "edge" of the electron cloud.



- Ionization Energy = The energy required to remove an electron from an atom. The larger the atom is, the easier its electrons are to remove.

Ionization energy and atomic radius are inversely proportional.



- Electronegativity = a measure of an atom's attraction for another atom's electrons.

  --Generally, metals give electrons away and have low electronegativities.

  --Nonmetals take electrons from other atoms and have high electronegativities.