

## Ions and Ionization

When atoms lose or gain electrons, they form ions. Ions are charged since the number of protons does not equal the number of electrons.

Atoms form ions to become more stable. By creating a full outer shell, known as their \_\_\_\_\_ shell, they obtain an electron arrangement like those of the \_\_\_\_\_ elements (He, Ne, Ar, Kr)

**METAL** atoms (left side of periodic table) tend to \_\_\_\_\_ electrons to form ions with a \_\_\_\_\_ charge.

**NON-METALS** (right side of periodic table) tend to \_\_\_\_\_ electrons to form ions with a \_\_\_\_\_ charge.

For example, draw the Bohr-Rutherford diagrams for the following atoms and their most stable ion:

ELEMENT	ATOM	ION
Sodium		
Oxygen		
Aluminum		

Note that the charge on any ion can be determined by comparing the number of protons (+) and electrons (-).

### Questions:

Using your periodic table of Bohr Rutherford diagrams, complete the following sentences to determine the charge on the following ions.

1. Sodium will lose 1 electron to form an ion with a charge of +1.
  2. Potassium will \_\_\_\_\_ electron to form an ion with a charge of \_\_\_\_\_.
  3. Chlorine will \_\_\_\_\_ electron to form an ion with a charge of \_\_\_\_\_.
  4. Nitrogen will \_\_\_\_\_ electrons to form an ion with a charge of \_\_\_\_\_.
  5. Sulfur will \_\_\_\_\_ electrons to form an ion with a charge of \_\_\_\_\_.
  6. Silicon will \_\_\_\_\_ OR \_\_\_\_\_ electrons to form two different ions with charges of \_\_\_\_\_ or \_\_\_\_\_.
  7. Aluminum will \_\_\_\_\_ electrons to form an ion with a charge of \_\_\_\_\_.
  8. Phosphorus will \_\_\_\_\_ electrons to form an ion with a charge of \_\_\_\_\_.
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2. Create a table to compare the properties of metals and non-metals in your notebook according to these properties. You may refer to *Nelson Science 10* (p. 184 – 187) or other sources.
    - a) lustre
    - b) conductivity
    - c) location on the periodic table
    - d) state at room temperature
    - e) number of outer orbit electrons (valence electrons)
    - f) tendency to lose or gain electrons
    - g) charge of the ions formed
    - h) examples
  3. When atoms become stable, their electron arrangement becomes the same as that of a their nearest noble gas (chemists say they are *isoelectronic* to each other).
    - a) Draw a Bohr-Rutherford diagram of a beryllium ion.
    - b) Identify the noble gas that has the same electron arrangement as the  $\text{Be}^{2+}$  ion.
    - c) Draw the Bohr-Rutherford diagram of a phosphorus ion.
    - d) Identify the noble gas that has the same electron arrangement as the  $\text{P}^{3-}$  ion.
  4. Although it is too difficult to draw a Bohr-Rutherford diagram for bromine, what ionic charge do you expect it will have? What noble gas will it become *isoelectronic* with?