

# Exercise 7.13

## Periodic Trends

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

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

- Arrange the following groups of atoms in order of increasing size.
  - Te, S, Se : \_\_\_\_\_
  - K, Br, Ni : \_\_\_\_\_
  - Ba, Si, F : \_\_\_\_\_
- Arrange the following groups of atoms in order of increasing first ionization energy.
  - Te, S, Se : \_\_\_\_\_
  - K, Br, Ni : \_\_\_\_\_
  - Ba, Si, F : \_\_\_\_\_
- In each of the following sets, which atom or ion has the smallest radius?
  - H, He : \_\_\_\_\_
  - Cl, In, Se : \_\_\_\_\_
  - element 120, element 119, element 116 : \_\_\_\_\_
  - Nb, Zn, Si : \_\_\_\_\_
  - $\text{Na}^-$ , Na,  $\text{Na}^+$  : \_\_\_\_\_
- Element 106 has been named seaborgium, Sg, in honor of Glenn Seaborg, discoverer of the first transuranium element.
  - Write the expected electron configuration for element 106. \_\_\_\_\_
  - What other element would be most like element 106 in its properties? \_\_\_\_\_
  - Predict the formula for a possible oxide and a possible oxyanion of element 106. \_\_\_\_\_
- The first ionization energy of As and Se are 0.947 and 0.941 MJ/mol, respectively. Rationalize these values in terms of electron configurations.

- Consider the following ionization energy for aluminum:  
 $\text{Al}(\text{g}) \rightarrow \text{Al}^+(\text{g}) + \text{e}^- \quad I_1 = 580 \text{ kJ/mol}$   
 $\text{Al}^+(\text{g}) \rightarrow \text{Al}^{2+}(\text{g}) + \text{e}^- \quad I_2 = 1815 \text{ kJ/mol}$   
 $\text{Al}^{2+}(\text{g}) \rightarrow \text{Al}^{3+}(\text{g}) + \text{e}^- \quad I_3 = 2740 \text{ kJ/mol}$   
 $\text{Al}^{3+}(\text{g}) \rightarrow \text{Al}^{4+}(\text{g}) + \text{e}^- \quad I_4 = 11,600 \text{ kJ/mol}$ 
  - Account for the trend in values of the ionization energies
  - Explain the large increase between  $I_3$  and  $I_4$