

Exercise 5.3

Periodic Trends

*Be aware that relative positions on the periodic table are *not* explanations for periodic trends. They are useful memory aids. Any time you have to explain a periodic trend, start with the number of protons and the electron configuration of each species.*

- List the following elements in order of increasing size: aluminum (Al), boron (B), nitrogen (N), scandium (Sc).
- List the following elements in order of increasing first ionization energy: helium (He), neon (Ne), argon (Ar), krypton (Kr).
- Which of the following elements has the larger electron affinity, boron (B) or carbon (C)?
- The ions Ca^{2+} , Cl^- , K^+ and S^{2-} all have the same electron configuration. Their ionic radii are 114, 152, 167 and 170 pm (not necessarily in that order).
 - Write the electron configuration for these ions. Do not use the noble gas abbreviation.
 - Write the electron configuration for these ions. Use the noble gas abbreviation.
 - Assign which ion has which radius.
 Ca^{2+} _____ pm Cl^- _____ pm K^+ _____ pm S^{2-} _____ pm
 - Briefly** explain why you assigned each radius in part (c).
- Explain why each of the following statements is true.
 - Hydrogen has a larger electron affinity than helium.
 - Potassium has a greater second ionization energy than calcium.
 - The ionic radius of Br^{-1} is larger than the atomic radius of Br.
 - The atomic radius of nitrogen is smaller than the atomic radius of boron.
- Of the first 20 elements of the periodic table, He, Ne, and Ar have the highest 1st ionization energy. Li, Na, and K, however, have the highest 2nd ionization energy.
 - Define the terms 1st and 2nd ionization energy, using equations where appropriate.
 - Explain why Li, Na, and K have the highest 2nd ionization energies of the first 20 elements.