

AP WORKSHEET 01G: Atomic and Ionic Size

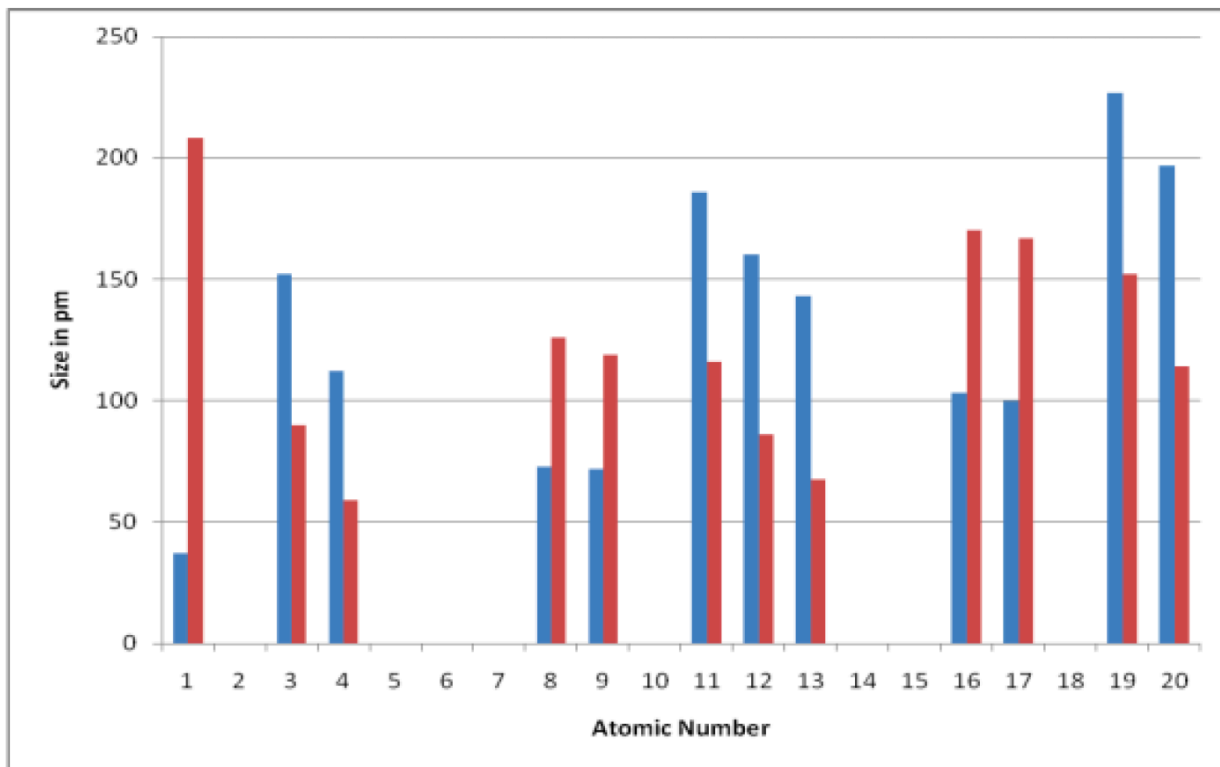
1. In each of the following pairs, pick the larger species. Explain your answer in each case. (6)
 - (a) Cu and Cu^{2+}
 - (b) F and F^-
 - (c) Na and K
2. Identify and explain the trend in atomic size for the following transitions in the periodic table. (4)
 - (a) Moving vertically from Ar to He

- (b) Moving horizontally from Na to Ar

3. Only one of the following statements is correct. Which one? (1)

- (a) All cations are larger than their corresponding atoms
- (b) All anions are smaller than their corresponding atoms
- (c) Atomic size increases on transitioning from left to right across period 2 of the periodic table
- (d) The most common ion of chlorine is smaller than a chlorine atom
- (e) The most common ion of strontium is larger than a strontium atom
- (f) The most common potassium ion is larger than the most common sodium ion
- (g) The ions most commonly formed by group 16 elements are smaller than their corresponding atoms

4. Consider the plot below that shows atomic and ionic radii of the most commonly formed ion (in units of pm) for selected elements, plotted against atomic number.



- (a) Which color represents the plot for atomic radii? Explain your answer by using any element as an example. (2)
- (b) What do the elements that have smaller ionic radii than their corresponding atomic radii have in common? (2)
- (c) Suggest a reason for the absence of comparative atomic and ionic radii data for elements with atomic numbers of 2, 10 and 18. (2)

- (d) Identify the element with atomic number 19, identify the formula of the ion that it commonly forms, and convert the radii of both the atom and the ion to units of cm. (2)
- (e) What common feature can be identified for all of the non-metals on the plot? (2)
- (f) What accounts for the sharp increase in height of the yellow lines that occurs at elements with atomic numbers 3, 11 and 19 respectively? (2)
- (g) Make a prediction about the relative heights of the blue line and red line if data were added to the plot for the element with an atomic number of 15. Explain. (2)
- (h) If the element with atomic number 1 is observed to have a red line that is taller than its blue line, then what does that suggest about the identity of the species that created the red line? Under what circumstance would the red line be shorter than the blue line for this element? (2)
- (i) If data were added to the plot for the element with atomic number 7, which would be taller, the blue or the red line? Explain. (2)