

Chemguide – questions

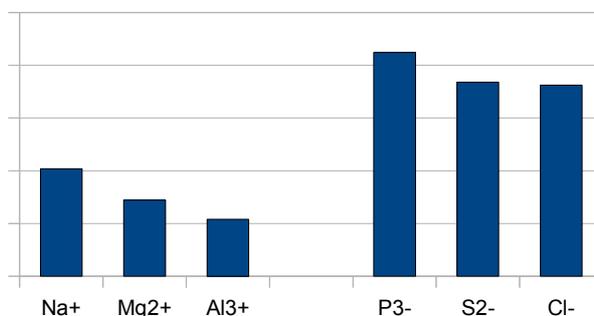
ATOMIC AND IONIC RADIUS

1. A data book gives two different values for the radius of an oxygen atom. One is the covalent radius (0.074 nm), and the other is the van der Waals radius (0.140 nm). Explain with the help of diagrams how the two different values arise, and why the covalent radius is smaller than the van der Waals radius.
2. The same data book gives the metallic radii of the Group 1 metals as follows:

	metallic radius (nm)
Li	0.152
Na	0.186
K	0.231
Rb	0.244
Cs	0.262

Explain why the radius increases as you go down the group.

3. Atomic radius tends to fall as you go across a period, provided you ignore the noble gas at the end of it.
 - a) Why is it necessary to ignore the noble gas at the end of the period if you are making this generalisation?
 - b) Explain why the atomic radius falls as you go from sodium to chlorine in Period 3.
4. Across the first row of the d-block elements from Sc to Zn, there is a small fall in atomic radius from Sc through Ti to V, but then the values fluctuate within the range 0.124 to 0.133 across the rest of the series. Explain why the atomic radius stays reasonably constant across the d-block elements.
5. The bar chart shows the relative radii of the ions of the elements in Period 3.



- a) The ions Na⁺, Mg²⁺ and Al³⁺ are said to be isoelectronic. Explain what that means, and state the electronic structures of these three ions. (Simple notation like 2,8,4 will be fine.)

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- b) The ions at the right of the chart are also isoelectronic. What are the electronic structures of these three ions?
- c) Explain why, in each of these two sets of ions, the radius falls as you go across the period.
- d) Why are the radii of the second set of ions bigger than the group of ions on the left of the chart?
6. Here is a list of assorted ions written (unhelpfully!) in alphabetical order:



Sort these into a list of increasing ionic radius, explaining your reasoning.