TRENDS IN SIZE ON THE P.T.

(... of Atoms and Ions)

Heath (see Text p. 318-319)
Bc. p299-310

(1) Atomic radii left to right in a period decreases. Compare Na to Cl

Why? Electrons are at about the same distance but the increased nuclear charge pulls e⁻ closer. (More power from the increased number of protons)

(2) Ionic radii of positive ions (cations) left to right in a period decreases. Na^+ Mg^{2+} 11p+ 10e⁻ 12p+ 10e⁻

Why? ~~Equal~~ electrons but increased proton charge in nucleus pulls existing electrons closer. (Greater p⁺ to e⁻ ratio)

(3) Ionic radii of negative ions (anions) O^{2-} F^-

Why? Same number of e⁻; e⁻ are at the same distance but the increased nuclear charge pulls e⁻ closer. (Greater p⁺ to e⁻ ratio) 8p+ 10e⁻ vs 9p+ 10e⁻

(5) Ionic radii of anion is greater than atomic radii of the same element F F⁻

Why? a) Extra electrons in same orbital repel each other and expand. 9p+ 9e⁻ 9p+ 10e⁻

b) less pull per electron more e⁻ for the number of p⁺ 9e⁻ 10e⁻

(6) Ionic radii of cation is smaller than atomic radii of the same element. Na^+ Na 11p+ 10e⁻ 11p+ 11e⁻

Why? Same proton pull but less electrons means existing electrons get pulled closer. (with greater pull per electron ratio)

(4.) Atomic radii and Ionic radii increase from top to bottom in a group (column).

Why?

A.) Electrons occupy a higher energy level which is farther from nucleus

B) Electrons are less strongly attracted to nucleus because inner layers "shield" outer layers from the positive pull of nucleus.

C) More electrons will also repel each other

Heath p. 320
Z p. 333