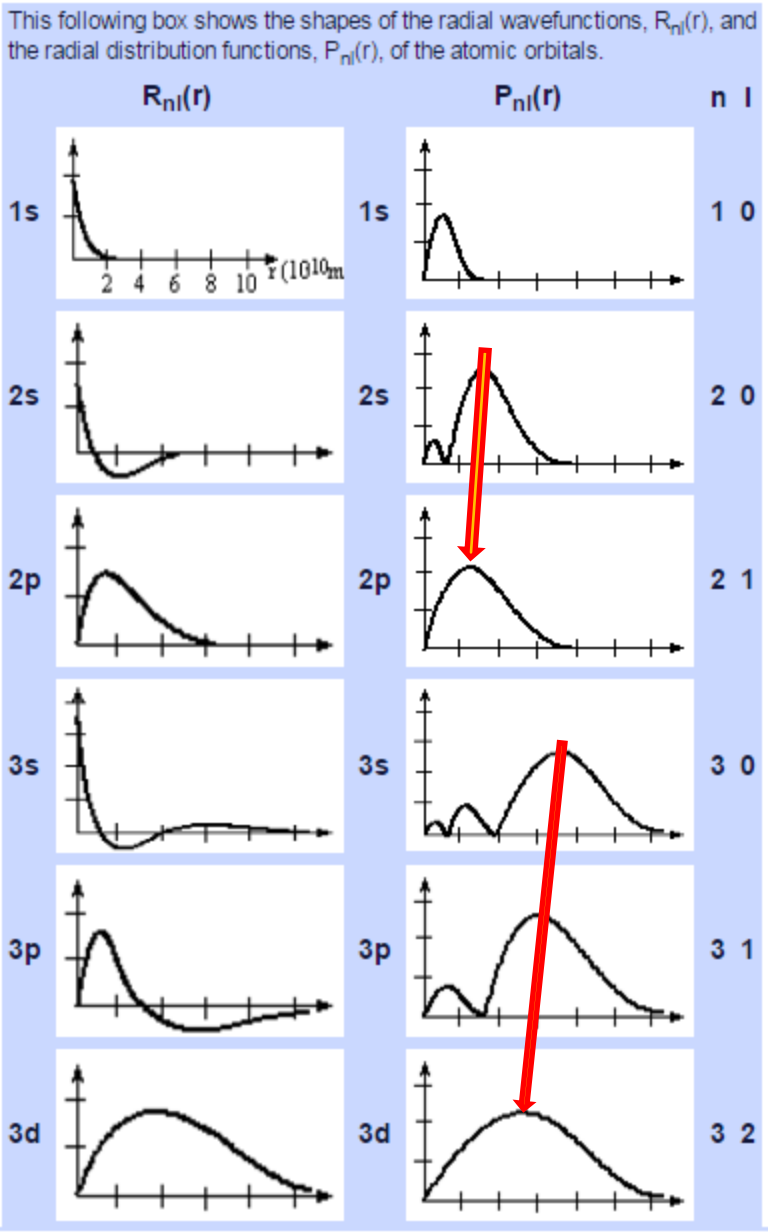
Hydrogen Orbital Radial Probability Density



$$\frac{d^2(rR_{n\ell})}{dr^2} = -\frac{2m}{\hbar^2}\left[E - V_{eff}\right](rR_{n\ell})$$

$$V_{eff}(r) = -\frac{e^2}{4\pi\varepsilon_0 r} + \frac{\ell(\ell+1)\hbar^2}{2mr^2}$$

$$P_{n\ell}(r) = 4\pi r^2 \left|R_{n\ell}(r)\right|^2$$

$$\int_0^\infty P_{n\ell}(r)\, dr = 1$$

Note the shift of probability density inward with increasing ℓ for given n. This results in increased Coulomb repulsion with the core electrons, which favors the filling of smaller- ℓ orbitals before higher ℓ.

http://www.everyscience.com/Chemistry/Inorganic/Atomic_Structure/c.1101.php