

Name _____

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Quiz 28

November 13, 2002

1.

$$\text{Bohr radius} \quad r_n = a_0 n^2$$

$$\text{Rydberg Equation} \quad E_n = -\frac{\mathfrak{R}}{n^2}$$

Amplitude of wavefunction inside core: $\psi_n(r) \propto n^{-3/2}$ (innermost lobe)

$$E_{n+\delta/2} - E_{n-\delta/2} = \frac{2\delta\mathfrak{R}}{n^3}$$

- A. How does the transition probability (proportional to $|\langle 1s|r|np \rangle|^2$) for the $1s \rightarrow np$ Rydberg series scale with n ? [HINT: $1s$ is *entirely* inside the core; only the innermost lobe of np is inside the core.]
- B. The transition probability density (proportional to $|\langle 1s|r|np \rangle|^2 / [E_{n+1/2} - E_{n-1/2}]$) is supposed to be constant as $n \rightarrow \infty$ and beyond into the ionization continuum. Show that this is true. [HINT: Use the n -scaling of the numerator from Part A; use the n -scaling of the denominator from the box above.]