TL 7-27

- What is most probable location of electron in $n=2$, $\ell=1$ state?
- The radial probability is given by

$$P(r)\,dr = |R_{n\ell}(r)|^2 \, 4\pi r^2 \, dr$$

$$R_{21}(r) = C\, r\, e^{-r/2a_0}$$

So $P(r) = C' r^2 e^{-r/a_0} r^2$, where $C' = 4\pi C$

- To find the maximum of $P(r)$, set derivative equal to zero.

$$\frac{dP(r)}{dr} = 0 = 4r^3 e^{-r/a_0} - \frac{r^4}{a_0} e^{-r/a_0}$$

$$4r^3 - \frac{r^4}{a_0} = 0$$

$$r^3\left(4 - \frac{r}{a_0}\right) = 0 \quad \text{if} \quad r = 0$$

or $\boxed{r = 4a_0}$