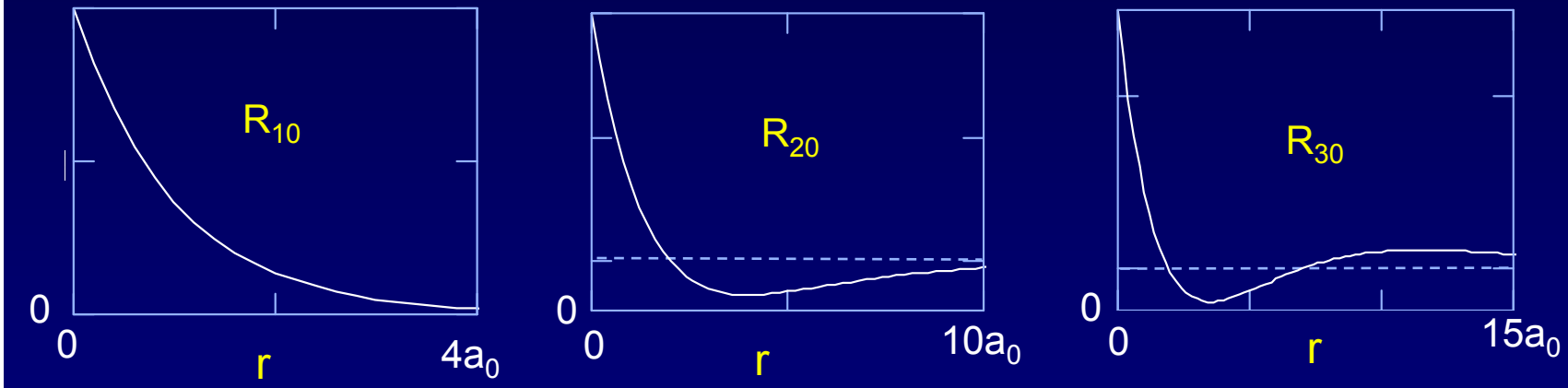
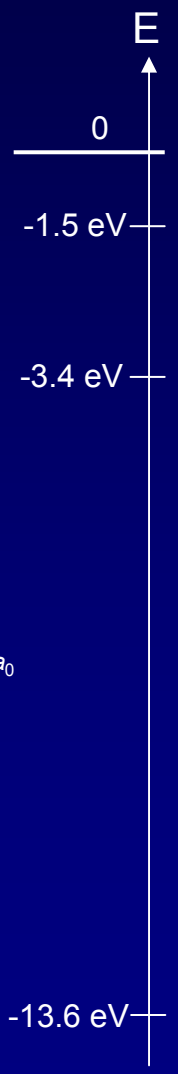
Radial Eigenstates of Hydrogen

Here are graphs of the s-state wave functions, $R_{no}(r)$, for the electron in the Coulomb potential of the proton. The zeros in the subscripts are a reminder that these are states with $l = 0$ (zero angular momentum!).





$$R_{1,0}(r) \propto e^{-r/a_0}$$

$$R_{2,0}(r) \propto \left(1 - \frac{r}{2a_0}\right) e^{-r/2a_0}$$

$$R_{3,0}(r) \propto \left(3 - \frac{2r}{a_0} + 2\left(\frac{r}{3a_0}\right)^2\right) e^{-r/3a_0}$$

$$a_0 \equiv \frac{\hbar^2}{m_e \kappa e^2} = 0.053 \text{ nm}$$

$$E_n \equiv \frac{-13.6 \text{ eV}}{n^2}$$

You will not need to memorize these functions.

You can prove these are solutions by plugging into the 'radial SEQ' (Appendix).