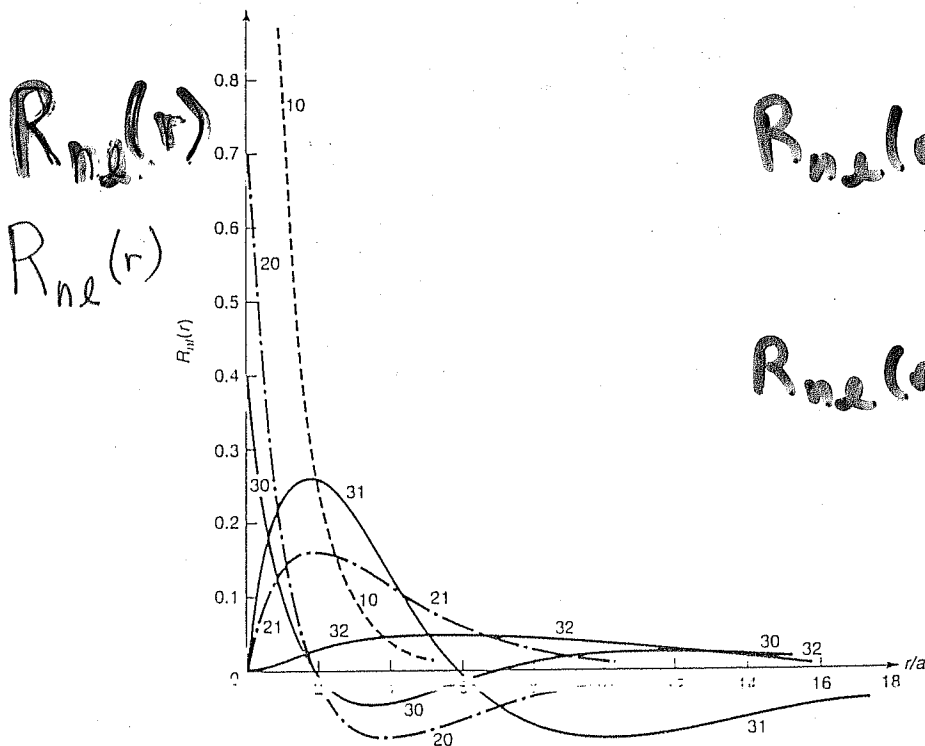


Table 4.6: The first few radial wave functions for hydrogen,  $R_{nl}(r)$ .

$R_{10} = 2a^{-3/2} e^{-r/a}$
$R_{20} = \frac{1}{\sqrt{2}} a^{-3/2} \left(1 - \frac{1}{2} \frac{r}{a}\right) \exp\left(-\frac{r}{2a}\right)$
$R_{21} = \frac{1}{\sqrt{24}} a^{-3/2} \frac{r}{a} \exp\left(-\frac{r}{2a}\right)$
$R_{30} = \frac{2}{\sqrt{27}} a^{-3/2} \left(1 - \frac{2}{3} \frac{r}{a} + \frac{2}{27} \left(\frac{r}{a}\right)^2\right) \exp\left(-\frac{r}{3a}\right)$
$R_{31} = \frac{8}{27\sqrt{6}} a^{-3/2} \left(1 - \frac{1}{6} \frac{r}{a}\right) \left(\frac{r}{a}\right) \exp\left(-\frac{r}{3a}\right)$
$R_{32} = \frac{4}{81\sqrt{30}} a^{-3/2} \left(\frac{r}{a}\right)^2 \exp\left(-\frac{r}{3a}\right)$
$R_{40} = \frac{1}{4} a^{-3/2} \left(1 - \frac{3}{4} \frac{r}{a} + \frac{1}{8} \left(\frac{r}{a}\right)^2 - \frac{1}{192} \left(\frac{r}{a}\right)^3\right) \exp\left(-\frac{r}{4a}\right)$
$R_{41} = \frac{\sqrt{5}}{16\sqrt{3}} a^{-3/2} \left(1 - \frac{1}{4} \frac{r}{a} + \frac{1}{80} \left(\frac{r}{a}\right)^2\right) \frac{r}{a} \exp\left(-\frac{r}{4a}\right)$
$R_{42} = \frac{1}{64\sqrt{5}} a^{-3/2} \left(1 - \frac{1}{12} \frac{r}{a}\right) \left(\frac{r}{a}\right)^2 \exp\left(-\frac{r}{4a}\right)$
$R_{43} = \frac{1}{768\sqrt{35}} a^{-3/2} \left(\frac{r}{a}\right)^3 \exp\left(-\frac{r}{4a}\right)$



$R_{nl}(r) \sim r^l V(r)$   
as  $r \rightarrow 0$

$R_{nl}(r) \sim e^{-r/na_{0n}}$   
as  $r \rightarrow \infty$

$\frac{r}{a_0}$   
A. Behr.

Figure 4.4: Graphs of the first few hydrogen radial wave functions,  $R_{nl}(r)$ .