

Table 13.2 The radial wave functions for $n=1$ through $n=3$.

$R_{10}(r) = 2\sqrt{\frac{1}{a_0^3}}e^{-r/a_0}$	$R_{30}(r) = \frac{2}{9}\sqrt{\frac{1}{3a_0^3}}\left[\frac{2}{9}\left(\frac{r}{a_0}\right)^2 - 2\frac{r}{a_0} + 3\right]e^{-r/3a_0}$
$R_{20}(r) = \frac{1}{2}\sqrt{\frac{1}{2a_0^3}}\left(-\frac{r}{a_0} + 2\right)e^{-r/2a_0}$	$R_{31}(r) = \frac{4}{27}\sqrt{\frac{1}{24a_0^3}}\left[-\frac{2}{3}\frac{r}{a_0} + 4\right]\left(\frac{r}{a_0}\right)e^{-r/3a_0}$
$R_{21}(r) = \frac{1}{2}\sqrt{\frac{1}{6a_0^3}}\left(\frac{r}{a_0}\right)e^{-r/2a_0}$	$R_{32}(r) = \frac{8}{81}\sqrt{\frac{1}{120a_0^3}}\left(\frac{r}{a_0}\right)^2e^{-r/3a_0}$

Table 13.1 The spherical harmonics for $l=0$ through $l=3$.

$Y_0^0(\theta, \phi) = \frac{1}{\sqrt{4\pi}}$	$Y_2^{\pm 2}(\theta, \phi) = \sqrt{\frac{15}{32\pi}}\sin^2\theta e^{\pm i2\phi}$
$Y_1^0(\theta, \phi) = \sqrt{\frac{3}{4\pi}}\cos\theta$	$Y_3^0(\theta, \phi) = \sqrt{\frac{7}{16\pi}}(5\cos^3\theta - 3\cos\theta)$
$Y_1^{\pm 1}(\theta, \phi) = \mp\sqrt{\frac{3}{8\pi}}\sin\theta e^{\pm i\phi}$	$Y_3^{\pm 1}(\theta, \phi) = \mp\sqrt{\frac{21}{64\pi}}\sin\theta(5\cos^2\theta - 1)e^{\pm i\phi}$
$Y_2^0(\theta, \phi) = \sqrt{\frac{5}{16\pi}}(3\cos^2\theta - 1)$	$Y_3^{\pm 2}(\theta, \phi) = \sqrt{\frac{105}{32\pi}}\sin^2\theta\cos\theta e^{\pm i2\phi}$
$Y_2^{\pm 1}(\theta, \phi) = \mp\sqrt{\frac{15}{8\pi}}\sin\theta\cos\theta e^{\pm i\phi}$	$Y_3^{\pm 3}(\theta, \phi) = \mp\sqrt{\frac{35}{64\pi}}\sin^3\theta e^{\pm i3\phi}$

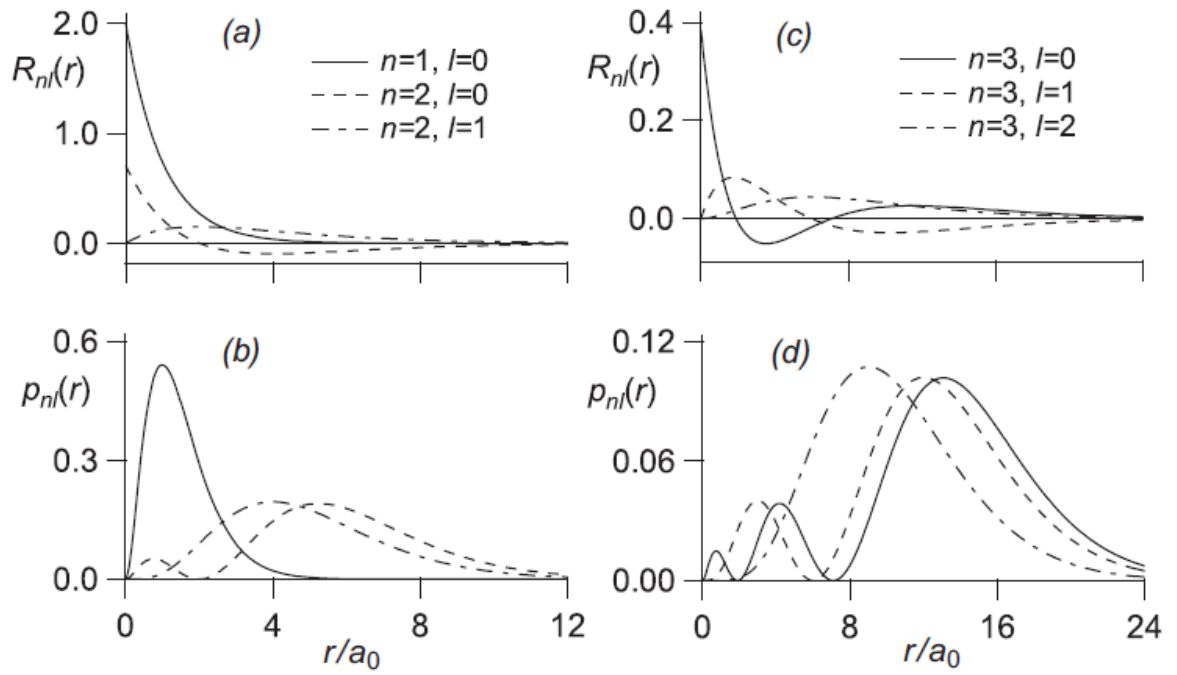


Fig 13.4 (a) Plots of the radial wave functions $R_{nl}(r)$ for $n=1$ and $n=2$, and (b) the corresponding radial probability densities $p_{nl}(r)$; the legend in (a) is also applicable to (b). (c) Plots of the radial wave functions $R_{nl}(r)$ for $n=3$, and (d) the corresponding radial probability densities $p_{nl}(r)$; the legend in (c) is also applicable to (d).

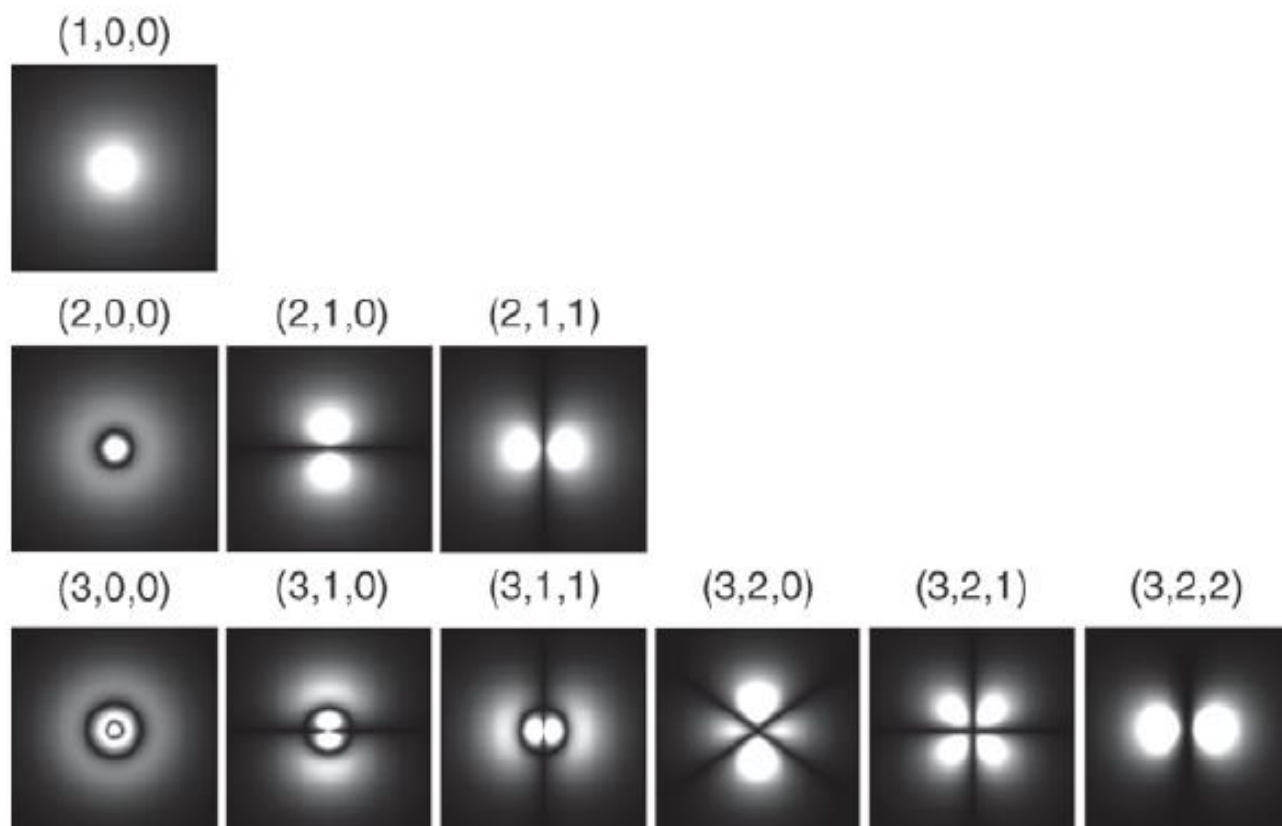


FIGURE 8.7 Grayscale density plots in the x - z plane of the absolute value of the wave function for hydrogen energy eigenstates $|n\ell m\rangle$ denoted by the labels above each plot. The spatial range of each plot is $-3n^2a_0$ to $+3n^2a_0$.