The total energy is the sum of equations (7.69) and (7.79) where $g_J = (2j+1)/(2l+1)$, see footnote 24 on p. 306.

$$E_{tot} = -\frac{13.6\,\mathrm{eV}}{n^2}\left[1 + \frac{\alpha^2}{n^2}\left(\frac{n}{j+1/2} - \frac{3}{4}\right)\right] + \mu_B g_J B_{ext} m_j$$

Hence (see problem 7.20 for $l = 0$ exception)

n	l	j	m_j	E_{tot}
2	1	$\frac{3}{2}$	$\frac{3}{2}$	$-13.6\left(\frac{1}{4} + \frac{1}{64}\alpha^2\right) + 2\mu_B B_{ext}$
2	1	$\frac{3}{2}$	$-\frac{3}{2}$	$-13.6\left(\frac{1}{4} + \frac{1}{64}\alpha^2\right) - 2\mu_B B_{ext}$
2	1	$\frac{3}{2}$	$\frac{1}{2}$	$-13.6\left(\frac{1}{4} + \frac{1}{64}\alpha^2\right) + \frac{2}{3}\mu_B B_{ext}$
2	1	$\frac{3}{2}$	$-\frac{1}{2}$	$-13.6\left(\frac{1}{4} + \frac{1}{64}\alpha^2\right) - \frac{2}{3}\mu_B B_{ext}$
2	1	$\frac{1}{2}$	$\frac{1}{2}$	$-13.6\left(\frac{1}{4} + \frac{5}{64}\alpha^2\right) + \frac{1}{3}\mu_B B_{ext}$
2	1	$\frac{1}{2}$	$-\frac{1}{2}$	$-13.6\left(\frac{1}{4} + \frac{5}{64}\alpha^2\right) - \frac{1}{3}\mu_B B_{ext}$
2	0	$\frac{1}{2}$	$\frac{1}{2}$	$-13.6\left(\frac{1}{4} + \frac{5}{64}\alpha^2\right) + \mu_B B_{ext}$
2	0	$\frac{1}{2}$	$-\frac{1}{2}$	$-13.6\left(\frac{1}{4} + \frac{5}{64}\alpha^2\right) - \mu_B B_{ext}$