PHYSICS 232 – CHAPTER 41: ATOMIC STRUCTURE

Energy levels of the H atom:

$$E_n = -\frac{me^4}{8h^2\epsilon_0^2 n^2} = -\frac{13.6\ eV}{n^2}$$

Orbital angular momentum has magnitude

$$L = \sqrt{\ell(\ell+1)}\frac{h}{2\pi} \quad (\ell = 0, 1, \ldots, n-1)$$

and z-component

$$L_z = m_\ell \frac{h}{2\pi} \quad m_\ell = -\ell, \ldots, 0, \ldots, \ell$$

Similarly for spin ($s = 1/2$, $m_s = \pm 1/2$).

In a uniform magnetic field in the z-direction, the extra energy is

$$U = m_\ell \frac{eh}{4\pi m}\ B$$

For spin, $U = 2m_s \frac{eh}{4\pi m}\ B$ (Dirac).