The magnetic moment acquire an energy

$$U = -\vec{\mu_0} \cdot \vec{B}$$

if $\vec{B}$ is along the z-axis: $U = \frac{eB}{2m_e} L_z$

$U = \hbar \omega_L m_\ell$ ← it is quantized!

$\hbar \omega_L$: Zeeman energy

The total energy of the electron is

$$E = E_0 + \hbar \omega_L m_\ell$$

E_0: without $\vec{B}_{ext}$; $\hbar \omega_L m_\ell$: because of $\vec{B}_{ext}$

Example:

$n=2 \longrightarrow \ell = 0 \quad m_\ell = 0$ and $\ell = 1 \quad m_\ell = 0, \pm 1$

$E = E_2 + \hbar \omega_L m_\ell$

without $\vec{B}_{ext}$ with $\vec{B}_{ext}$

$\Rightarrow$ Transitions occur only when $\begin{cases} \Delta\ell = \pm 1 \\ \Delta m_\ell = 0, \pm 1 \end{cases}$