$$\psi(x,y,z) = e^{i(k_y y + k_z z)} \varphi(x)$$

⇒ Sustituyendo, se obtiene: el problema 1-D:

$$\left[-\frac{\hbar^2}{2m}\frac{d^2}{dx^2} + \frac{(\hbar k_y + eB_0 x)^2}{2m} + \frac{\hbar^2 k_z^2}{2m} + eE_0 x \right] \varphi(x) = \varepsilon \varphi(x)$$

Expandiendo el cuadrado, se tiene:

$$\frac{(\hbar k_y + eB_0 x)^2}{2m} + eE_0 x = \frac{\hbar^2 k_y^2}{2m} + \frac{(eB_0)^2}{2m} x^2 + \left(\frac{\hbar k_y e B_0}{m} + eE_0 \right) x$$

$$= \frac{\hbar^2 k_y^2}{2m} + \frac{(eB_0)^2}{2m} \left[x^2 + \frac{2m}{(eB_0)^2} \left(\frac{\hbar k_y e B_0}{m} + eE_0 \right) x \right]$$

$$= \frac{\hbar^2 k_y^2}{2m} + \frac{m}{2} \omega_c^2 \left[x - x_0 \right]^2 - \frac{m}{2} \omega_c^2 x_0^2$$

donde se han definido:

$$\omega_c \equiv \frac{eB_0}{m} \quad : \text{frecuencia ciclotrónica}$$

$$-x_0 \equiv \frac{m}{(eB_0)^2} \left(\frac{\hbar k_y e B_0}{m} + eE_0 \right) = \frac{e}{m\omega_c^2} \left(\frac{\hbar k_y}{m} B_0 + E_0 \right)$$