9.12) FOR $B = 10\,T$ (A HUGE FIELD) AND AN e^- IN A p STATE WITH $L_z = \hbar$, WHAT IS THE MAGNETIC ENERGY DUE TO THE ORBITAL MAGNETIC MOMENT?

THE ENERGY OF $\vec{\mu}$ IN $B\hat{z}$ IS $-\mu_z B$.

FOR AN e^- IN ORBIT AROUND A PROTON, (9.35) GIVES

$$\mu_z = -\left(\frac{e}{2m_e}\right) L_z \qquad (9.35)$$

$\Rightarrow$ THE ENERGY OF A p e^- IN $B_z = 10\,T$ IS

$$E_{p,10T} = -\mu_z B_z = +\left(\frac{e}{2m_e}\right) L_z B_z$$

FOR A p STATE ($\ell = 1$) WITH $L_z = \hbar$ ($\Rightarrow m = 1$),

$$E_{p,10T} = +\left(\frac{e}{2m_e}\right)\hbar B_z = \frac{e\hbar}{2m_e} B_z$$

Σ BOHR MAGNETRON: $5.79\times10^{-5}\ \frac{eV}{T}$

$$E_{p,10T} = (5.79\times10^{-5})(10)$$

$$E_{p,10T} = 5.79\times10^{-4}\ eV \left(\frac{1.602\times10^{-19}\ J}{eV}\right)$$

$$E_{p,10T} = 9.28\times10^{-23}\ J$$

Σ ENERGY OF + p e^- WITH $m = 1$ IN $B_z = 10\,T$