$$\Rightarrow \boxed{\vec{\mu_l} = \frac{-e}{2m} g_l \vec{L}} \qquad \boxed{\vec{\mu_s} = \frac{-e}{2m} g_s \vec{S}}$$

Now, $\vec{J} = \vec{L} + \vec{S}$

$$\Rightarrow \boxed{\vec{\mu_J} = \frac{-e}{2m} g_J \vec{J}}$$

$$\boxed{g_J = 1 + \left[\frac{J(J+1) + S(S+1) - L(L+1)}{2J(J+1)}\right]}$$

$^4D_{\frac{1}{2}}$
$\Rightarrow g = 0$

for purely orbital motion, $S = 0$ & $j = l$

$$\Rightarrow g_J = 1 + \frac{0}{l(l+1)} = 1$$

for purely spin motion, $l = 0$ & $j = s$

$$g_J = 1 + \frac{2s(s+1)}{2s(s+1)} = 2$$

If $\vec{J}$ precesses $\Rightarrow \vec{\mu_J}$ will precess as $\vec{\mu_J}$ is antiparallel to $\vec{J}$.

$\vec{J}$ precesses about $\vec{B} \Rightarrow \vec{\mu_J}$ precessing about $\vec{B}$

and

$$J_z = m_j \hbar$$