$|\vec{\mu}\cdot\vec{B}| > |\xi(r)\, \vec{S}\cdot\vec{L}|$

$\vec{J} = \vec{L} + \vec{S}$, $\vec{S} \to 0$

Normal Zeeman Effect:-

For singlet states, the spin is zero and the total angular momentum J is equal to the orbital angular momentum L. In an external magnetic field, the energy of the atom changes because ~~the~~ of the energy of its magnetic moment in the field, which is given by

$\mu = IA$

$\mu = -\left(\frac{e}{2m}\right)L$

$\mu_B = \frac{e\hbar}{2m}$

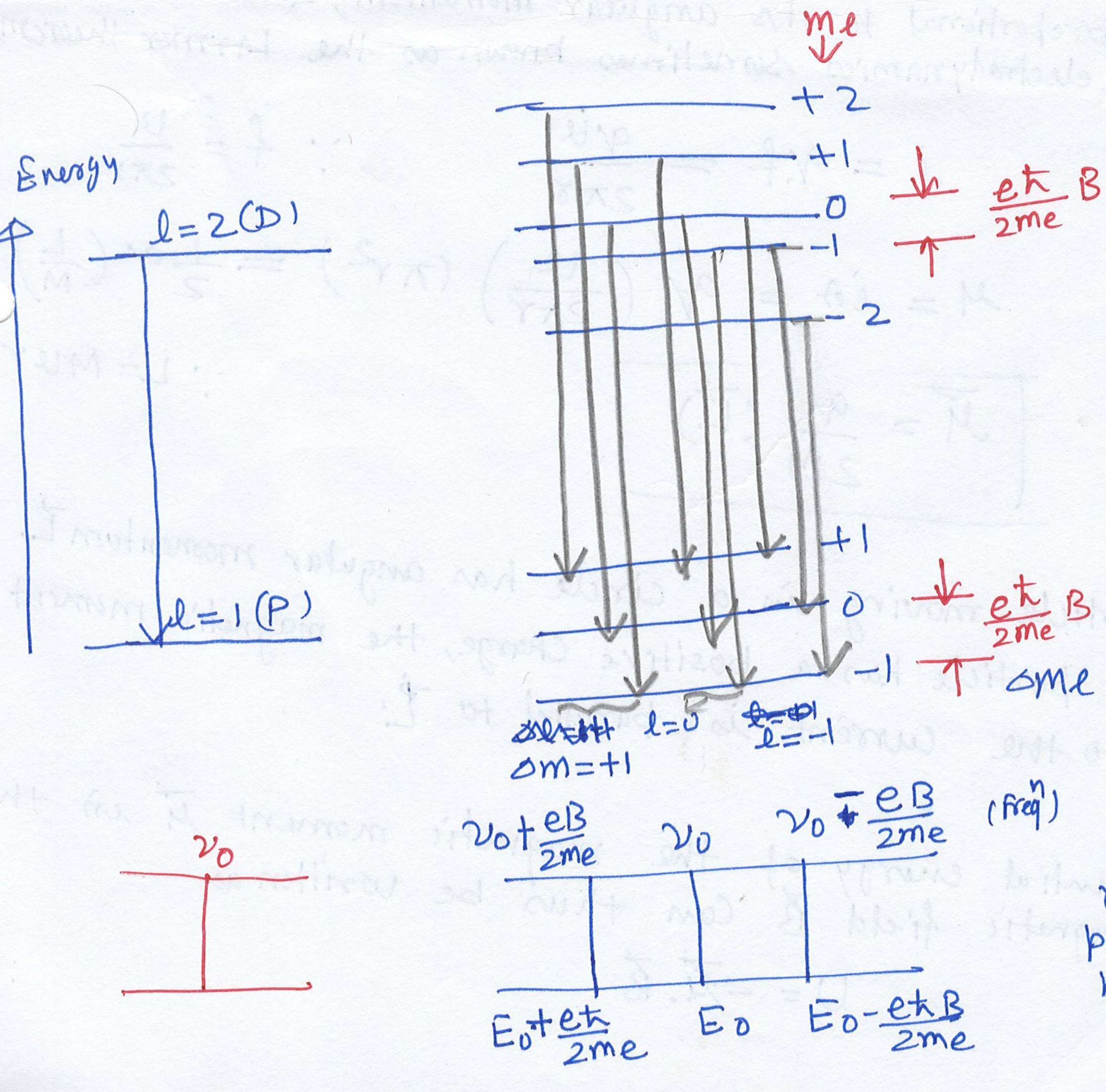
$$\Delta E = -\vec{\mu}\cdot\vec{B} = -\mu_z B$$

$$\mu_z = -m_l \mu_B = -m_l\left(\frac{e\hbar}{2m_e}\right), \text{ and}$$

$$\Delta E = +m_l \frac{e\hbar}{2m_e} B$$

$$\boxed{\Delta E = m_l \mu_B B}$$

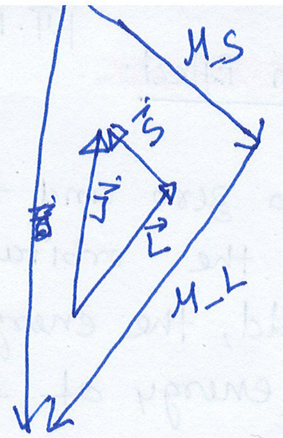
Since there are $2l+1$ values of m_l, each energy level splits into $2l+1$ levels.

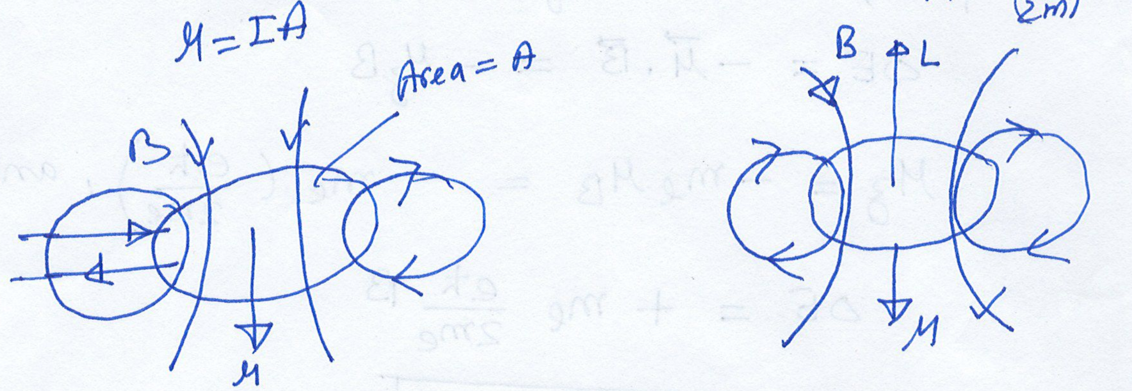


$\Delta m_l = +1, 0, -1$ or $\pm 1, 0$

Selection rule restricts the number of possible lines to the nine only.

N





a

Fig → (a) Magnetic moment of a current loop enclosing area A.
(b) Magnetic moment of an orbiting electron of angular momentum L.

N If a system of charged particles is rotating, it has a magnetic moment proportional to its angular momentum, a result from classical electrodynamics sometimes known as the Larmor theorem.

$$i = qf = \frac{qv}{2\pi r} \qquad \because f = \frac{v}{2\pi r}$$

$$\mu = iA = q\left(\frac{v}{2\pi r}\right)(\pi r^2) = \frac{1}{2} q \left(\frac{L}{M}\right)$$

$$\because L = Mvr$$

$$\boxed{\vec{\mu} = \frac{q}{2M}(\vec{L})}$$

N A particle moving in a circle has angular momentum $\vec{L}$. If the particle has a positive charge, the magnetic moment due to the current is parallel to $\vec{L}$.

N Potential energy of the magnetic moment $\vec{\mu}$ in the magnetic field $\vec{B}$ can thus be written as

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