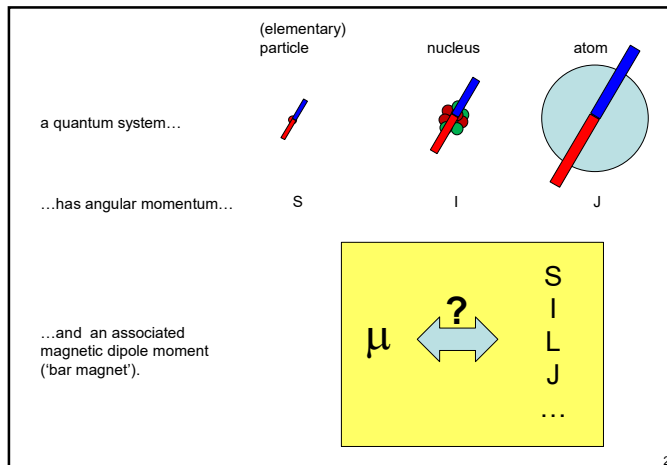


g-factor (bis)

www.hyperfinecourse.org

1



2

Wikipedia :

A g-factor (also called **g value** or **dimensionless magnetic moment**) is :
 a dimensionless quantity which characterizes the magnetic moment of a particle or nucleus.

It is essentially a proportionality constant that relates the observed magnetic moment μ of a particle to the appropriate angular momentum quantum number and the appropriate fundamental quantum unit of magnetism, usually the Bohr magneton or nuclear magneton.

$$\mu_B = \frac{e\hbar}{2m_e} = 9.2741 \cdot 10^{-24} \frac{J}{T}$$

$$\mu_N = \frac{e\hbar}{2m_p} = 5.0508 \cdot 10^{-27} \frac{J}{T}$$

3

(elementary) particle nucleus atom

a quantum system...

...has angular momentum... S I J

...and an associated magnetic dipole moment ('bar magnet').

$$\vec{\mu}_S = g_e \frac{\mu_B}{\hbar} \vec{S} \quad \vec{\mu}_n = g_n \frac{\mu_N}{\hbar} \vec{I} \quad \vec{\mu}_J = g_J \frac{\mu_B}{\hbar} \vec{J}$$

electron: $g_e = -2.002319$ Landé

neutron: $g_n = -3.82608545, I=1/2$
 proton: $g_p = 5.585694713, I=1/2$
 ground state ^{57}Fe : $g_n = 0.09062, I=1/2$

4

Wikipedia :

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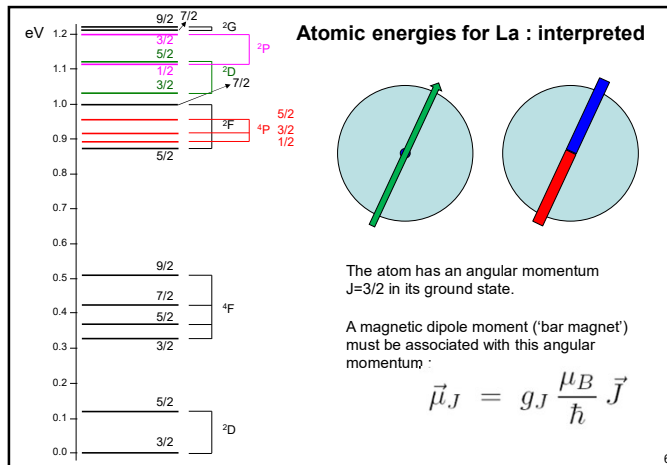
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$$\vec{\mu}_J = g_J \frac{\mu_B}{\hbar} \vec{J}$$

$$g_J = g_L \frac{J(J+1) - S(S+1) + L(L+1)}{2J(J+1)} + g_S \frac{J(J+1) + S(S+1) - L(L+1)}{2J(J+1)} \quad (g_S = -g_e = 2)$$

$$\vec{\mu}_L = g_L \frac{\mu_B}{\hbar} \vec{L} \quad (g_L = 1)$$

5



6