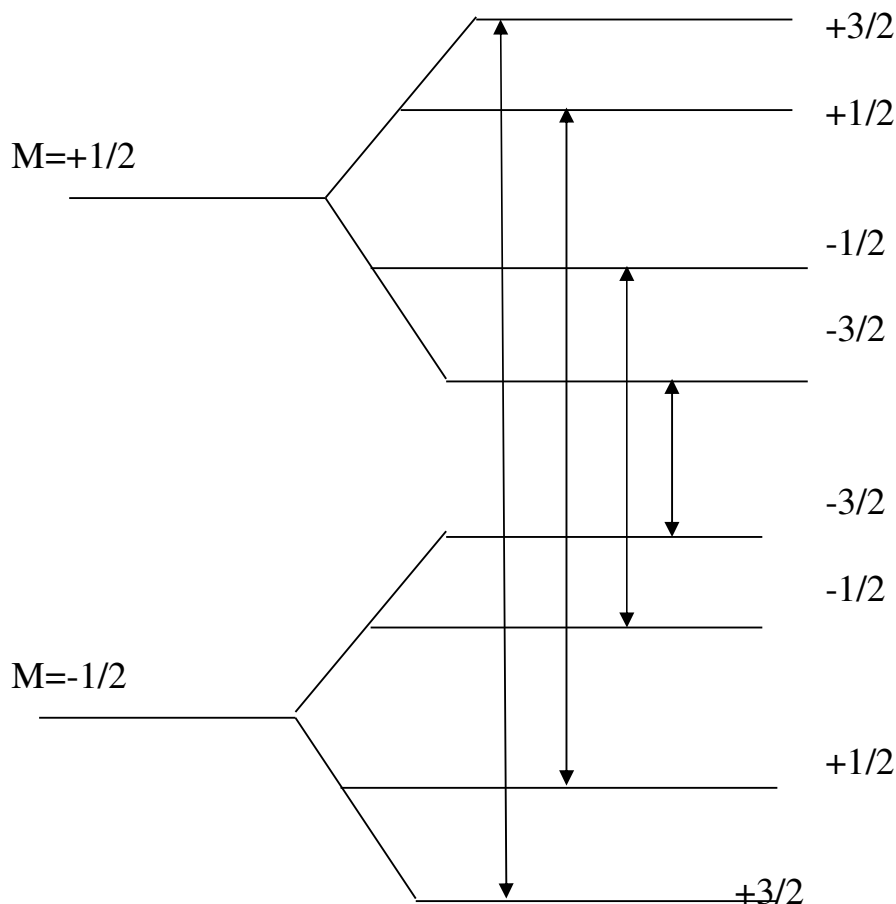


File-4: Hyperfine splitting involving more than one Nucleus.

For a nucleus with any nuclear spin, the projection of the nuclear magnetic moment along the effective field direction at the nucleus can take any of the $2I+1$ values corresponding to the quantum numbers $-I, -I+1, I-1, I$. These orientations give rise to $2I+1$ different nuclear energy states.

Methyl radical

Addition of the nuclear spin angular momentum quantum numbers of the individual protons results in four different values for the total nuclear spin moment.



In general, when the absorption spectrum is split by equivalent nuclei of equal spin I_i , the number of lines is given by $2nI_i+1$. When the splitting is caused by both a set of n equivalent nuclei of spin I_i and a set of m equivalent nuclei of spin I_j , the number of line is given by $(2nI_i + 1)(2mI_j + 1)$

1. If a radical contains n non – equivalent protons onto which the electron is delocalized a spectrum consisting of 2^n lines will arise.
2. If the odd electron is delocalized over a number n , of equivalent protons, a total of $n+ 1$ line ($2nI + 1$) will appear in the spectrum.

