TITLE

Date : / /

Mo Tu We Th Fr Sa Su

## Splitting of Nuclear energy levels (Zeeman effect) :-

The splitting of spectral lines on applied magnetic field is called the zeeman effect. The different energy levels are called the zeeman energy levels.

A spinning nucleus behaves like a tiny bar magnetic placed along the axis of the spin The strength of the magnetic is determined in terms of magnetic moment ($M_N$), which is given by-

$$M_N = g_N \cdot \beta_N \sqrt{I(I+1)} \quad \text{---(1)}$$

where $g_N$ is the nuclear factor.

for protons ($^1_1H$)

$g_N = 5.85$

$\beta_N$ is the unit of the nuclear magnetic moment called nuclear magnatone.

for protons ($^1_1H$)

$\beta_N = 5.05 \times 10^{-27}\ J\ T^{-1}$

Where T = tesla:

(a unit of magnetic field strength)

Neelgogan

Date : / /

TITLE

Mo Tu We Th Fr Sa Su

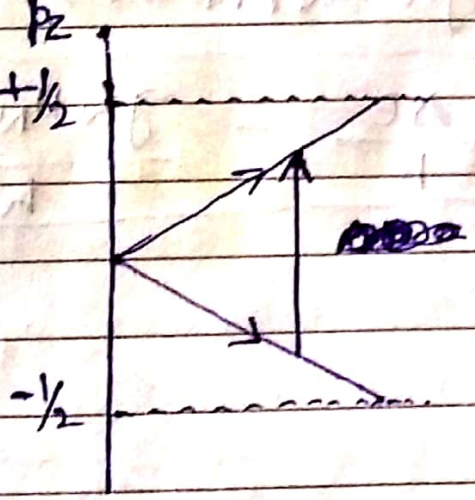
Thus –

$$\mu_N = 5.85 \times \frac{\sqrt{3}}{2} \beta_N .$$

In case of $^1H$ nucleus –

$$I = 1/2$$

The possible value of $m_I$ are $+1/2$ & $-1/2$ and hence, there are only two possible orientations of the angular momentum vector.




Since,

$$\Delta E = -g_N \beta_N H_N = h\nu .$$

$$E_{+1/2} = -\tfrac{1}{2} g_N H_N \beta_N$$

& $$E_{-1/2} = -\left(-\tfrac{1}{2} g_N H_N \beta_N\right)$$

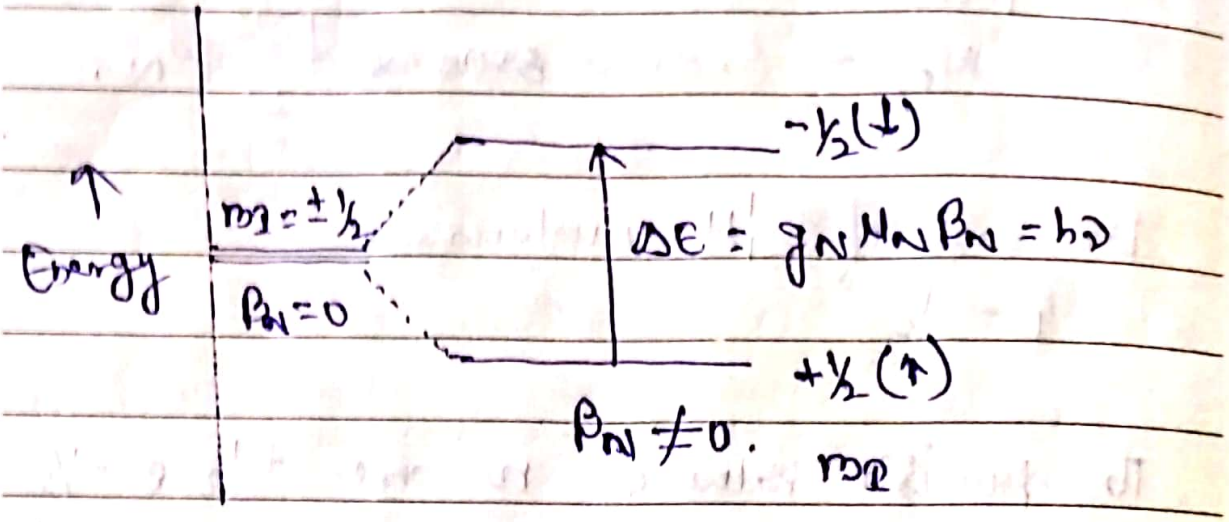
$$= +\tfrac{1}{2} g_N H_N \beta_N$$

Neelgagan

TITLE

Date : / /

Mo Tu We Th Fr Sa Su




Since,

$$\Delta E = g_N \mu_N \beta_N = h\nu$$

$$\boxed{\nu = \frac{\Delta E}{h} = \frac{g_N \mu_N \beta_N}{h}}$$