

Answer on Question #68047 - Physics / Electromagnetism

Question:

Two electrons (each of charge =  $e$  and mass =  $m$ ) are attached one at each end of a light rigid rod of length  $2r$ . The rod is rotated at constant angular speed about a perpendicular axis passing through its centre. The ratio of angular momentum about the axis of rotation to the magnetic dipole moment of the system is

Solution:

Angular momentum:

$$L = I\omega, I = 2mr^2, L = 2mr^2\omega$$

Magnetic moment:

$$B = \frac{\mu\mu_0 A}{2r}, A = \frac{q}{t} = \frac{\omega q}{2\pi} = \frac{\omega e}{\pi}, B = \frac{\mu\mu_0 \omega e}{2\pi r}$$

The ratio:

$$\frac{L}{B} = \frac{4m\pi r^3}{\mu\mu_0 e}$$