

[lex122] Dynamic response of electric and magnetic moments to torque

Consider two solid spheres of mass M and radius r , one carrying an electric dipole moment \mathbf{p} and the other carrying a magnetic dipole moment \mathbf{m} . The electric dipole is caused by a sphere at rest with charge of opposite sign painted on the upper and lower hemispherical surfaces. The magnetic dipole is caused by a rotating sphere with positive charge painted over the entire surface. When the electric dipole \mathbf{p} (magnetic dipole \mathbf{m}) is positioned in an electric field \mathbf{E} (magnetic field \mathbf{B}) it experiences a torque $\mathbf{N} = \mathbf{p} \times \mathbf{E}$ ($\mathbf{N} = \mathbf{m} \times \mathbf{B}$).

Construct the equation of motion for both dipoles and describe in words the motion of either dipole when released at an arbitrary angle relative to the field.



Solution: