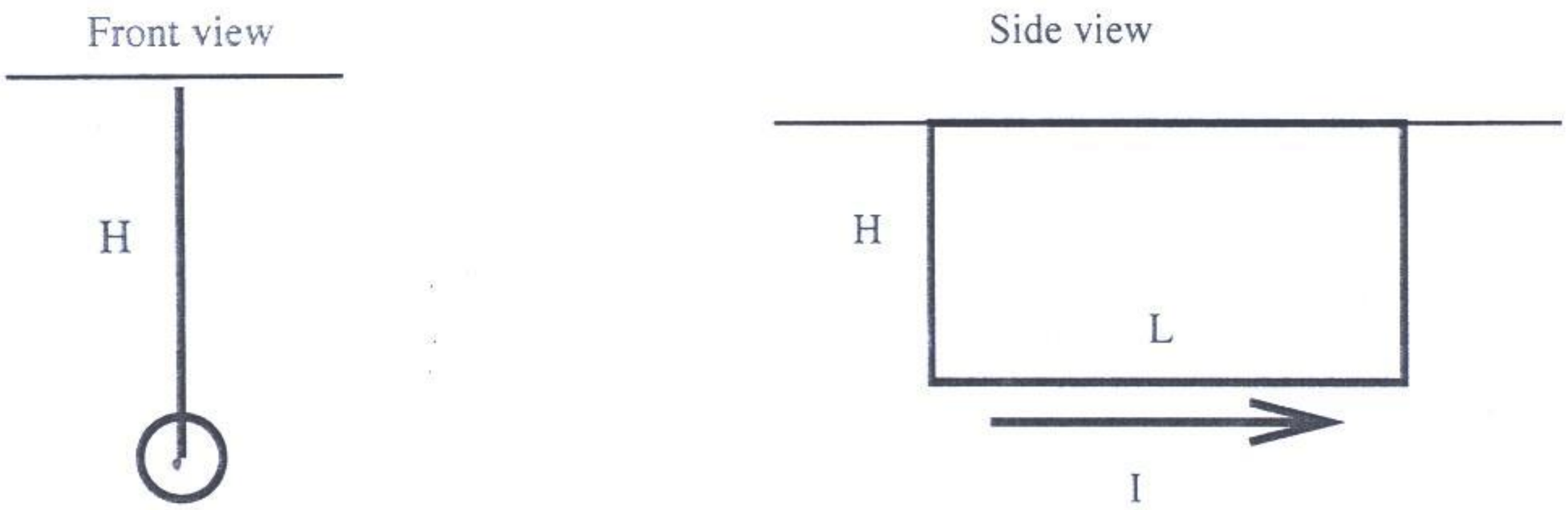
Consider a rectangular coil of wire with 100 turns which hangs, hinged from the cieling in a uniform 0.5T magnetic field pointing straight up. The height of the coil is $H = 20\,\text{cm}$ and the length is $L = 40\,\text{cm}$. The current in the wire is $3.0\,A$

1. Looking at the side view, what is the magnitude and direction of the force on the left rail? right rail? top rail? bottom rail? Indicate direction as seen from the side view (i.e. one of right/left/up/down/into page/out of page)

2. What is the net force on the coil of wire?

3. What is the torque about the hinge from the left rail? right rail? top rail? bottom rail? Indicate the direction as clockwise or counter-clockwise as seen from the top view.

4. What is the net torque about the hinge?



① $\vec{F} = I\vec{L} \times \vec{B}$

Directions

Left: 0

Right: 0

Top: Into

Bottom: out of

$|\vec{F}_{Bottom}| = NILB = (100)(3A)(0.4m)(0.5T)$

$|\vec{F}_{Bottom}| = 60N$

$|\vec{F}_{Top}| = 60N$

② Zero

③ Torques

$\tau_{bottom} = R_\perp F = (0.2m)(60N) = 12\ N\cdot m$

Direction

Left: 0 Top: 0 because $r_\perp = 0$

Right: 0 Bottom: Counter clockwise

④ 12 Nm

+8 +6 6