

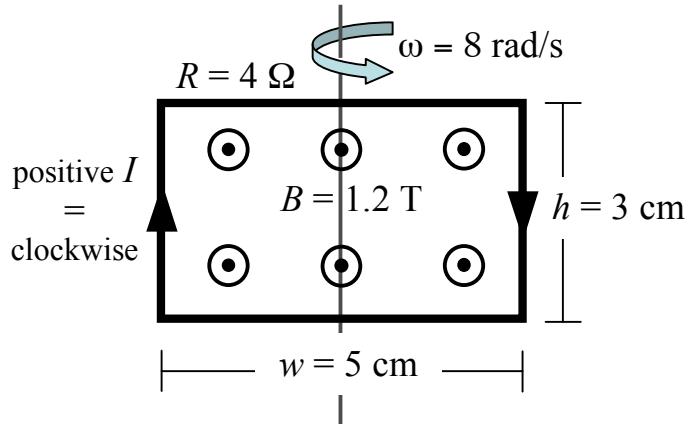
Discussion Question 9D

Phys141 Unit 26

Faraday's Law: Rotating Loop

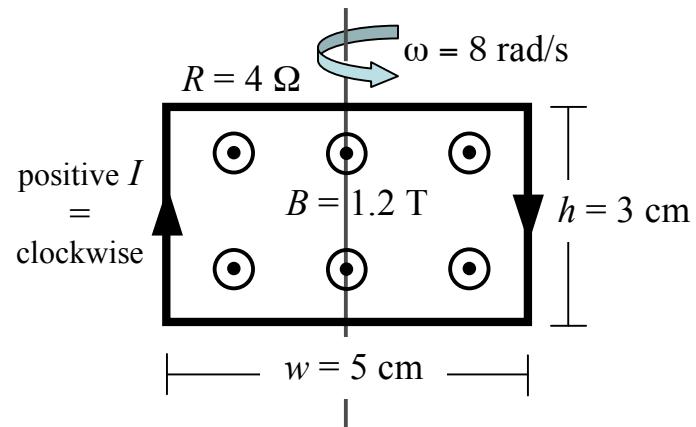
Consider a rectangular loop of wire with width w , height h , and total resistance R . The region of space occupied by the wire loop contains a uniform magnetic field \mathbf{B} pointing out of the page.

A motor attached to the loop keeps it rotating about the vertical axis with constant angular velocity ω . At time $t = 0$, the loop is parallel to the paper (as shown in the figure).



(a) Plot the magnetic flux Φ_B through the loop as a function of time. Find the maximum value (amplitude) of the flux, and write it on your plot.

(b) Plot the induced EMF \mathcal{E} through the loop as a function of time. Find the maximum value (amplitude) of the EMF, and write it on your plot.



(c) Plot the induced current I through the loop as a function of time. Find the maximum value (amplitude) of the current, and write it on your plot.

(d) Plot the torque τ provided by the motor to keep the loop rotating at a constant angular velocity. Find the maximum value (amplitude) of the torque, and write it on your plot.