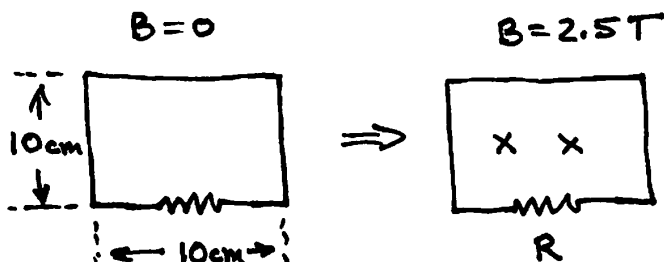


A square loop, 10cm on each side, has a total resistance $R = 20\Omega$. Initially the magnetic field in the plane of the loop is zero. During a period of 10ms, the magnetic field is increased to 2.5T, in the direction indicated.



- During the time the magnetic field is increasing, what current flows through the loop?
- In what direction does this current flow?

SOLUTION

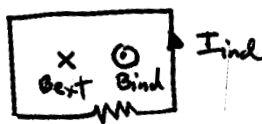
(a) Compute the emf using Faraday's Law:

$$\varepsilon = \frac{\Delta\Phi_B}{\Delta t} = \frac{BA - 0}{\Delta t} = \frac{(2.5T)(.1m)^2}{.01s} = 2.5 \text{ V}$$

Now compute the current:

$$I = \frac{\varepsilon}{R} = \frac{2.5}{20} = .125A$$

(b) The external magnetic field points into the page. The external flux is increasing, so the induced magnetic field will point opposite the external field, or out of the page:



Using RHR-1, the direction of the induced current must be counterclockwise to cause B_{ind} to point out of the page.