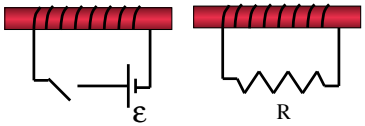
Problem 20.16

What's the direction of the current in the secondary coil when:

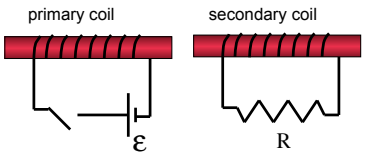


a.) at the instant the switch is closed.

b.) several minutes after the switch closed.

c.) at the instant the switch is opened.

What's the direction of the current in the secondary coil when:



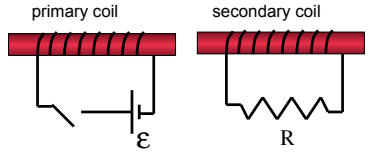
a.) at the instant the switch is closed.

As the switch is closed, the increasing current in the primary coil produces an increasing B-fld along that coil's axis. That field is to the left (lop-handed rule). That field produces a magnetic flux through the secondary coil which increases to the left. Lenz's Law says that for that situation (i.e., an increasing external magnetic flux), the INDUCED B-fld in the secondary coil must be in the OPPOSITE direction of the external B fld, or to the right. The current required to do that (again, the hop-hand rule) must be to counterclockwise through R.

b.) several minutes after the switch closed.

There is no changing flux if the current through the primary coil has been steady-state for several minutes (or even just a few seconds aftger the switch is closed), so there is no induced EMF in the secondary coil and, hence, no current through R.

What's the direction of the current in the secondary coil when:



c.) at the instant the switch is opened.

As the switch is opened, the decreasing current in the primary coil produces an decreasing B-fld along that coil's axis. That field is still to the left (lop-handed rule). That field produces a magnetic flux through the secondary coil which decreases to the left. Lenz's Law says that for that situation (i.e., an decreasing external magnetic flux), the INDUCED B-fld in the secondary coil must be in the SAME direction of the external B fld, or to the left. The current required to do that (again, the hop-hand rule) must be to clockwise through R.