Physics 4B
Fall 2022

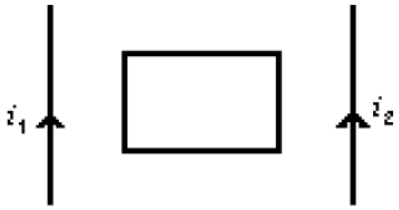
Name: _____

Lab (circle one): 8:00 am 11:15 am 2:30 pm

Quiz #8: Induction and Inductance

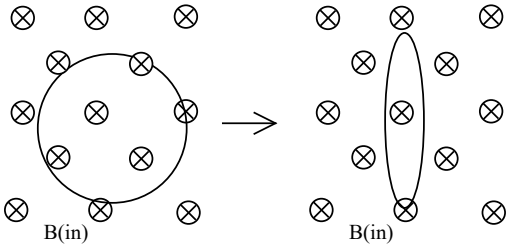
Problem 1 (1 point)
A rectangular loop of wire is placed midway between two long straight parallel wires as shown. The wires carry currents i_1 and i_2 as indicated. If i_1 is increasing and i_2 is constant, then the induced current in the loop is:

a) zero
b) clockwise
c) counterclockwise
d) depends on $i_1 - i_2$
e) depends on $i_1 + i_2$

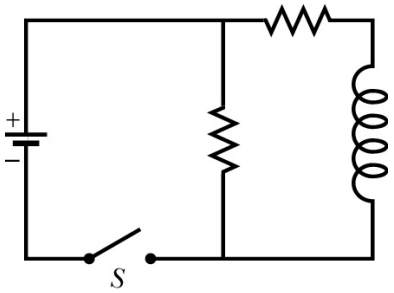


Problem 2 (1 point)
A loop of wire is sitting in a uniform, constant magnet field as shown. Suddenly, the loop is bent into a smaller area loop. During the bending of the loop, the induced current in the loop is

a) zero
b) clockwise
c) counterclockwise



Problem 3 (4 points)
The figure below shows a circuit with two identical resistors and an inductor. Is the current through the central resistor more than, less than, or the same as that through the other resistor **(a)** just after switch S is closed, **(b)** a long time after S is closed, **(c)** just after S is reopened, and **(d)** a long time after S is reopened?



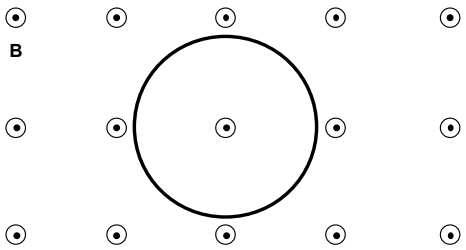
a)

b)

c)

d)

Problem 4 (4 points)
A copper wire (resistivity $\rho = 1.7\times10^{-8}\,\Omega\text{m}$) of length 25.0 cm and cross-sectional area 5.0×10^{-8} m^2 is formed into a circular loop and placed in a uniform magnetic field pointing out of the page as shown below.



a) What is the magnitude and direction of the induced emf if the magnitude of the magnetic field decreases at a rate of dB/dt = -0.400 T/s?

b) How much energy will the copper wire dissipate as heat in 2.50 minutes?