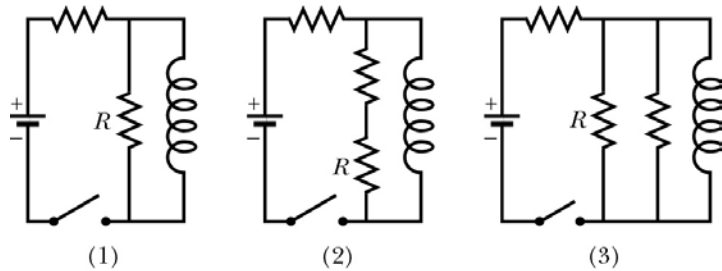


Quiz #8: Induction and Inductance

Problem 1 (2 points)

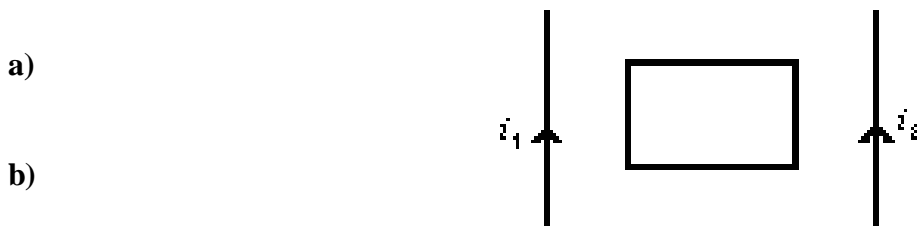
The figure below shows three circuits with identical batteries, inductors, and resistors. In each circuit, the switch has been closed for a *very long time*. Rank the circuits according to the current through the resistor labeled R (a) immediately after the switch is reopened, and (b) a long time after the switch is reopened, greatest first.

- 1) (a) $1 > 2 > 3$ (b) all tie
- 2) (a) $1 = 3 > 2$ (b) all tie
- 3) (a) $1 = 2 > 3$ (b) all tie
- 4) (a) $1 > 2 > 3$ (b) $1 = 3, 2$
- 5) none of the above



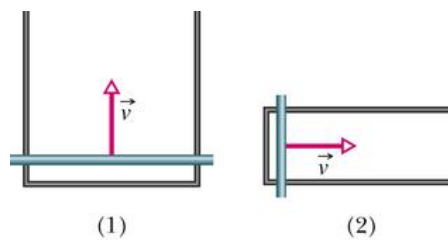
Problem 2 (2 points)

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. What is the direction of the induced current (if any) in the rectangular loop if (a) i_1 is increasing and i_2 is constant, (b) both i_1 and i_2 are decreasing at the same rate?



Problem 3 (2 points)

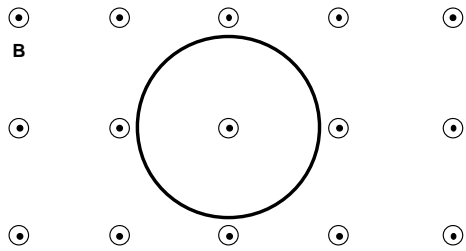
The figure below shows two circuits in which a conducting bar is slid at the same speed v through the same uniform magnetic field and along a U-shaped wire. The parallel lengths of the wire are separated by $2L$ in circuit 1 and by L in circuit 2. The current induced in circuit 1 is clockwise. (a) Is the direction of the magnetic field into or out of the page? (b) Is the emf induced in circuit 1 larger than, smaller than, or the same as that in circuit 2?



- a)
- b)

Problem 4 (4 points)

A copper wire with resistance $R = 2.50 \, \Omega$ and length 32.5 cm 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 $dB/dt = -0.400 \, \text{T/s}$

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