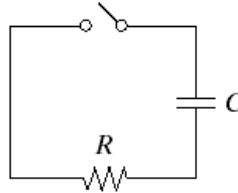


Review for Celebration #2: Circuits and Magnetism

Multiple Choice Questions

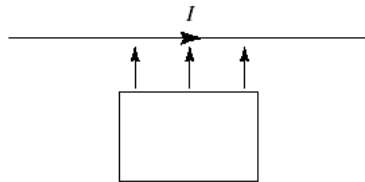
1) A simple circuit consists of a resistor R , a capacitor C charged to a potential V_0 , and a switch that is initially open but then thrown closed. Immediately after the switch is thrown closed, the current in the circuit is

- a) V_0/R .
- b) zero.
- c) need more information



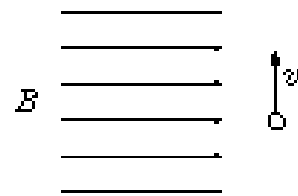
2) (Note: this is from Chapter 30 and will not be on Celebration #2 – it is a good review for the Final Celebration!) A long, straight wire carries a steady current I . A rectangular conducting loop lies in the same plane as the wire, with two sides parallel to the wire and two sides perpendicular. Suppose the loop is pushed toward the wire as shown. Given the direction of I , the induced current in the loop is

- a) clockwise.
- b) counterclockwise.
- c) need more information



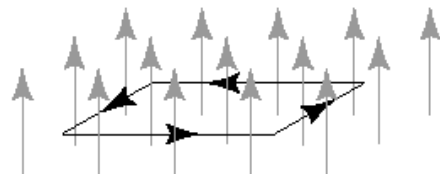
3) A negative particle moves upward along the trajectory shown. A magnetic field points toward the right. In which direction is the magnetic force on the particle?

- a) left
- b) right
- c) into the page
- d) out of the page



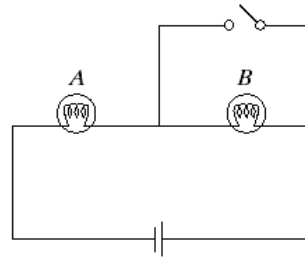
4) A rectangular loop is placed in a uniform magnetic field with the plane of the loop perpendicular to the direction of the field. If a current is made to flow through the loop in the sense shown by the arrows, the field exerts on the loop:

- a) a net force.
- b) a net torque.
- c) a net force and a net torque.
- d) neither a net force nor a net torque.



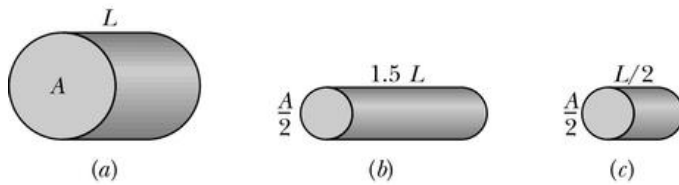
5) The circuit below consists of two identical light bulbs burning with equal brightness and a single 12 V battery. When the switch is closed, the brightness of bulb A

- a) increases
- b) decreases
- c) remains the same
- d) need more information

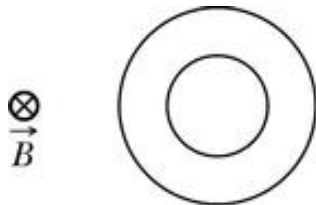


Short Answer Questions

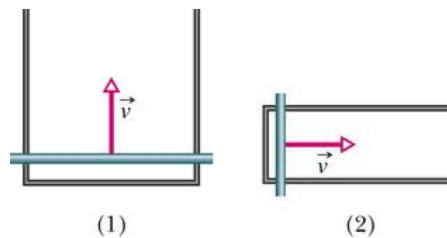
1) The figure here shows three cylindrical copper conductors along with their face areas and lengths. Rank them according to the current through them, greatest first, when the same potential difference V is placed across their lengths.



2) The figure here shows the circular paths of two particles that travel at the same speed in a uniform magnetic field, which is directed into the page. One particle is a proton; the other is an electron (which is less massive). (a) Which particle follows the smaller circle, and (b) does that particle travel clockwise or counterclockwise?

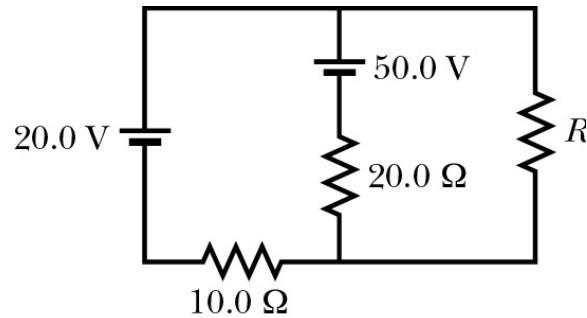


3) (Note: this is from Chapter 30 and will not be on Celebration #2 – it is a good review for the Final Celebration!) The figure below shows two circuits in which a conducting bar is slid at the same speed v through the same uniform magnetic field and along a U-shaped wire. The parallel lengths of the wire are separated by $2L$ in circuit 1 and by L in circuit 2. The current induced in circuit 1 is counterclockwise. (a) Is the direction of the magnetic field into or out of the page? (b) Is the direction of the current induced in circuit 2 clockwise or counterclockwise? (c) Is the emf induced in circuit 1 larger than, smaller than, or the same as that in circuit 2?



Problems

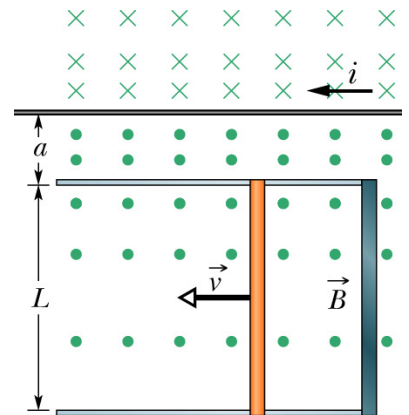
1) In the circuit shown below, $R = 25.0 \Omega$.



(a) Use Kirchoff's laws to find the current through each resistor. (8 points)

(b) Calculate the power from each battery and each resistor. (4 points)

2) (Note: this is from Chapter 30 and will not be on Celebration #2 – it is a good review for the Final Celebration!) The figure to the right shows a rod of length L caused to move at a constant speed v along horizontal rails. The magnetic field in which the rod moves is not uniform but is provided by a current i in a long wire parallel to the rails. Assume that $v = 3.00 \text{ m/s}$, $a = 5.0 \text{ cm}$, $L = 20.0 \text{ cm}$, and $i = 5.0 \text{ A}$.



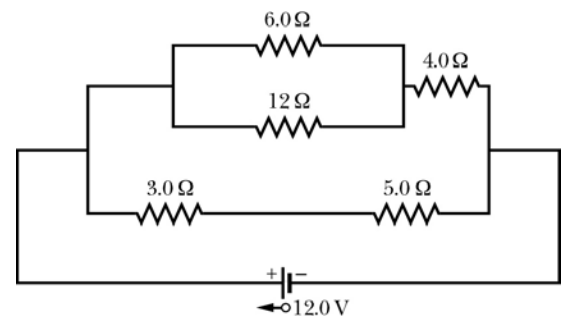
a) What is the direction of the induced current? (4 points)

b) Assuming that the resistance of the rod is 2.00Ω and the resistance of the rails and the strip that connects them is negligible, at what rate is thermal energy being generated in the rod? (12 points)

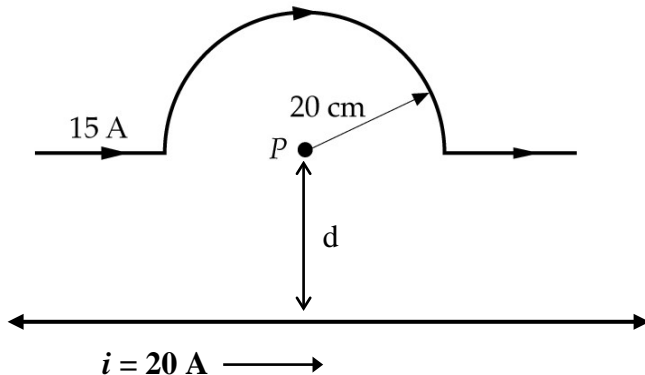
3) A circuit containing five resistors connected to a 12 V battery is shown to the right.

(a) What is the equivalent resistance of the circuit? (8 points)

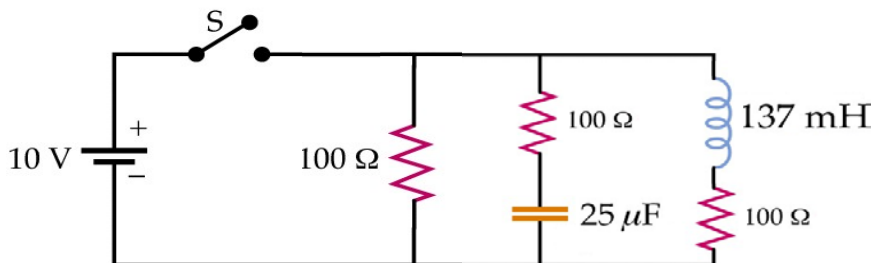
(b) What is the current through and the potential drop across the 3.0Ω and 6.0Ω resistors? (8 points)



4) In the figure below, what is d if the net magnetic field at point P is $8.60 \mu\text{T}$ into the page?
 (Note: the bottom wire is an infinitely long wire.)



5) (Note: this is from Chapter 30 and will not be on Celebration #2 – it is a good review for the Final Celebration!) In the figure below, what is the current through the battery (a) immediately after the switch is closed, (b) a long time after the switch is closed, and (c) 2.0 ms after the switch is closed?



6) A potential difference of 2.0 V produces a current of 3.4 A in a 250-m length of wire that is 0.30 cm in radius. (a) What is the resistivity of the wire? (b) What resistance R could you put in parallel with this wire, so that 25% of the current in the circuit flows through R ?