Physics 202 MWF10:20 Spring 2005 (Ford)

Name (printed) with Answers

Name (signature as on ID)_____

Lab Section_____

Exam II Chapts. 20–22 in Cutnell and Johnson 6e

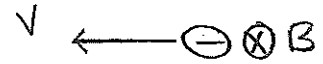
Multiple choice questions. Circle the correct answer. No work needs to be shown and no partial credit will be given.

(4 pts) 1. The magnitude of the induced emf in a coil is 6.0 V at the instant when the current in the coil is 2.0 A and increasing at a constant rate of 3.0 A/s. What is the self-inductance of the coil?

(a) 0.60 H
C (b) 1.2 H
(c) 2.0 H
(d) 3.0 H
(e) 12.0 H
(f) 18.0 H

(5 pts) 2. A particle with negative charge is moving to the left. There is a magnetic field directed into the plane of the paper, away from you. The magnetic force on the charge has direction

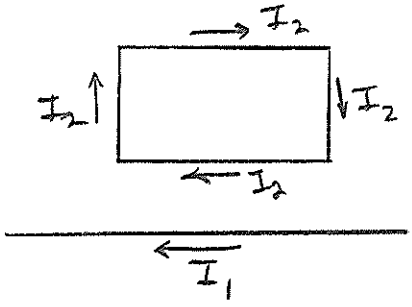
(a) to the left
C (b) to the right
(c) toward the top of the page
(d) toward the bottom of the page
(e) into the page
(f) out of the page



(5 pts) 3. A rectangular loop with current I_2 in the direction shown is parallel to a long straight wire that has current I_1, in the direction shown. Does the wire attract or repel the loop, or is the net force on the loop zero?

a

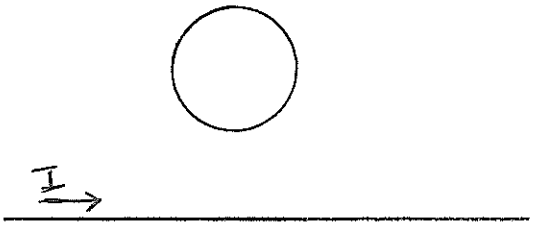
(a) wire attracts the loop
(b) wire repels the loop
(c) net force on the loop is zero



(5 pts) 4. A conducting loop lies above a long straight wire as shown the sketch. Both the loop and the wire are in the plane of the paper. There is current I in the wire, in the direction shown. If the current in the wire is increasing, is the current induced in the loop clockwise, counterclockwise, or zero?

a

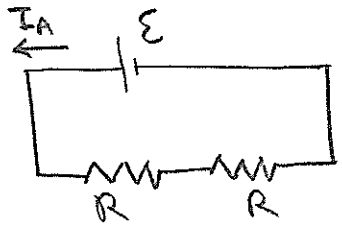
(a) clockwise
(b) counterclockwise
(c) zero



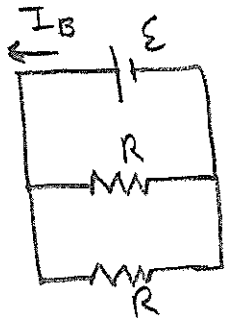
(5 pts) 5. In circuit A two identical resistors are connected in series to a battery with negligible internal resistance and the current through the battery is I_A. In circuit B the same two resistors are connected in parallel to the same battery and the current through the battery is I_B. How are I_A and I_B related?

C

(a) $I_A = I_B$
(b) $2I_A = I_B$
(c) $4I_A = I_B$
(d) $16I_A = I_B$
(e) $I_A = 2I_B$
(f) $I_A = 4I_B$
(g) $I_A = 16I_B$



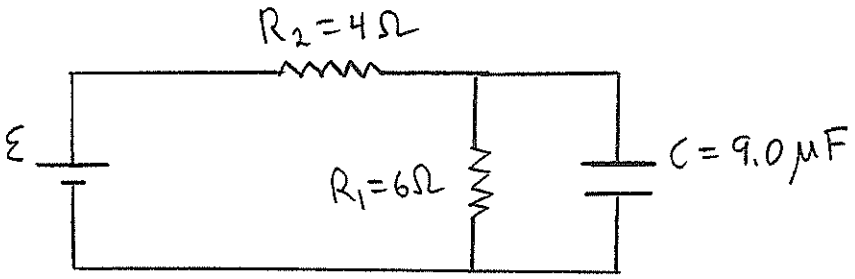
A



B

Show all your work for partial credit. Write your answers in the blanks provided.

(16 pts) 6. The circuit in the sketch shows two resistors, a capacitor and a battery. When the capacitor is fully charged, the charge on each of its plates has magnitude $q = 36.0\ \mu C$. What is the emf ε of the battery?

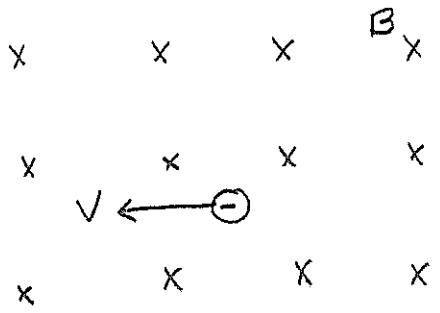


Ans. 6.7 V

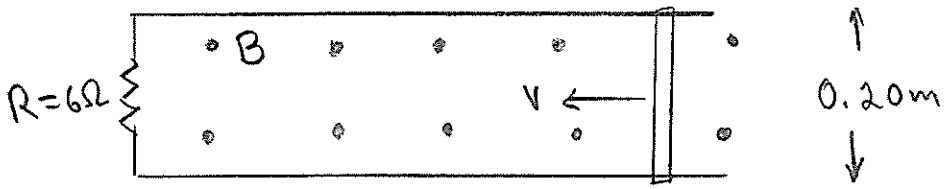
(18 pts) 7. A small particle with negative charge $q = -5.0 \times 10^{-9}$ C is moving to the left in a region of uniform magnetic field. The magnetic field has magnitude $B = 0.30$ T and is directed into the page, as shown. The particle has speed $v = 200$ m/s. What is the magnitude and direction of the uniform electric field in the region if the net force on the particle is zero? Clearly indicate on the sketch the direction of the electric field. Neglect gravity.

Ans. magnitude 60 N/m

direction (write in blank and show on sketch) toward top of page



(20 pts) 8. In the circuit shown in the sketch a conducting bar 0.20 m long slides toward the left on frictionless rails. The 6.0 Ω resistor is the only resistance in the circuit. There is a uniform magnetic field of 3.0 T directed out of the page, as shown. The motion of the bar gives rise to a current of 0.40 A through the resistor.



(a) Is the induced current in the circuit clockwise or counterclockwise?

Ans. counterclockwise

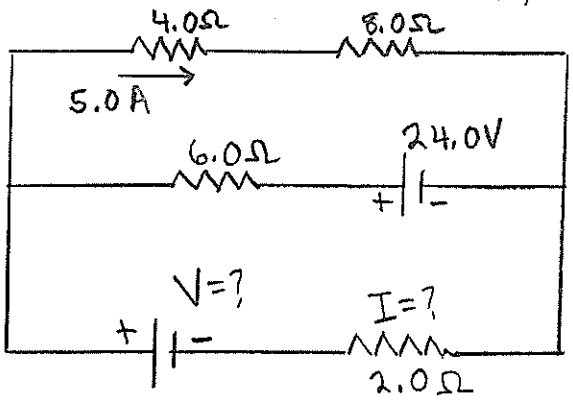
(b) What is the speed v of the bar?

Ans. 4.0 m/s

(c) What is the magnitude of the external force that must be applied to the bar to keep it moving at the constant speed you found in part (b)?

Ans. 0.24 N

(22 pts) 9. In the circuit shown in the sketch, note that one current is given.



(a) What is the current I through the 2.00 Ω resistor?

Ans. 11 A

(b) What is the voltage V of the battery that is to the left of the 2.00 Ω resistor?

Ans. 82 V