1. A long, straight wire has an internal resistance of 5 Ω/m. If it is moved at a velocity of 3 m/s in a magnetic field of 4 T, what is the current induced in the wire?

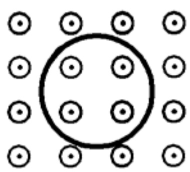
   A) 0 A

   B) 1.2 A

   C) 2.4 A

   D) 3.75 A

   E) 12 A

2. 

   A conducting loop with a radius of 0.25 m an internal resistance of 4.0Ω is situated in a 12.0 T magnetic field directed into the page as shown. If the area of the loop is shrinking at a rate of 0.05 m^2/s, what is the induced current in the loop?

   A) 0.15 A clockwise

   B) 0.60 A clockwise

   C) 1.2 A clockwise

   D) 0.60 A counterclockwise

   E) 0.15 A counterclockwise

3. A circular loop of wire with resistance R and radius a is oriented with its plane perpendicular to a magnetic field of strength B. What must be the rate of change of the intensity of the magnetic field in order to produce a current I in the loop?

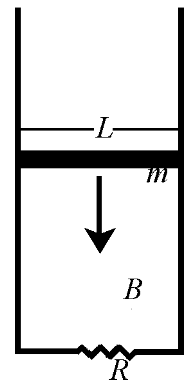
   A) $IR/\mathrm{p}a^2$

   B) $\mathrm{p}a^2/IR$

   C) $2\mathrm{p}a/IR$

   D) $IR/2\mathrm{p}a$

   E) $2\mathrm{p}aIR$

4. 

   A conducting rod of length L and mass m falls with a constant velocity. It is attached to two conducting rails joined at the bottom. The total resistance of the circuit is R and there is a magnetic field of strength B perpendicular to the plane of the circuit. In terms of L, m, B, R, and g, what is the velocity of the falling rod?

   A) $\dfrac{BL}{mgR}$

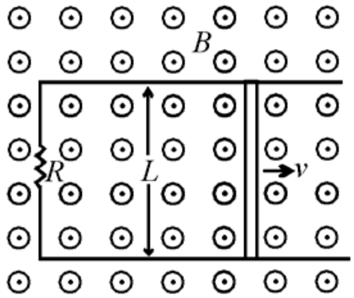
   B) $\dfrac{B^2L^2R}{mg}$

   C) $\dfrac{B^2L^2}{mgR}$

   D) $\dfrac{mgR}{B^2L^2}$

   E) $\dfrac{mgR}{BL}$

5. Base your answer to the following question on the diagram below of a metal rod with length L pushed along a set of conducting rails that completes a circuit with a total resistance R at a constant velocity v to the right. The circuit is in a magnetic field B that points out of the page.



The electrical power delivered to the circuit is

A) $RBlv$

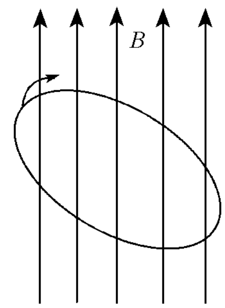
B) $\dfrac{Blv}{R}$

C) $R(Blv)^2$

D) $\dfrac{(Blv)^2}{R}$

E) $(RBlv)^2$

6. Base your answer to the following question on the diagram below, in which a circular loop of wire with a radius of 5 cm rotates clockwise at a constant angular velocity through a magnetic field B = 5 T. The plane of the loop goes from being perpendicular to the field to being at a 45º angle with the field in 0.25 s.



If the wire has a resistivity of 7.5×10^{-8} Ω•m and a cross-sectional area of 2.5p × 10^{-7} m^2, what will the average current induced in the loop be? (Looking down on the loop so that B is out of the page)

A) 0 A

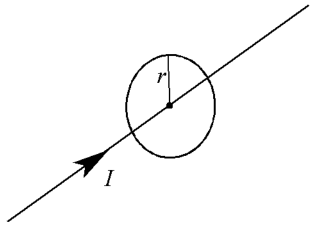
B) 6.13 A clockwise

C) 6.13 A counterclockwise

D) 61.3 A clockwise

E) 61.3 A counterclockwise

7.



A circular loop of wire with radius *r* surrounds a long, straight wire such that the wire passes through the center of the circle. If the current in the wire is *I*, determine the current induced in the loop. (Looking at the loop so that the current is into the page)

A) 0

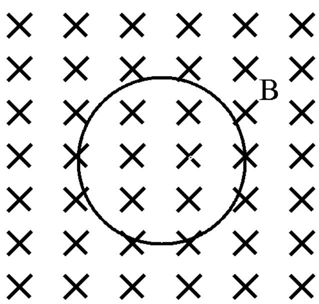
B) $\mu_0 Ir$ clockwise

C) $\mu_0 Ir$ counterclockwise

D) $2\mu_0 Ir$ clockwise

E) $2\mu_0 Ir$ counterclockwise

8.



The above diagram shows a metal loop of wire in a uniform magnetic field pointing into the page. If the magnetic field *B* uniformly decreases, the induced electric current within the loop is

A) clockwise and increasing.

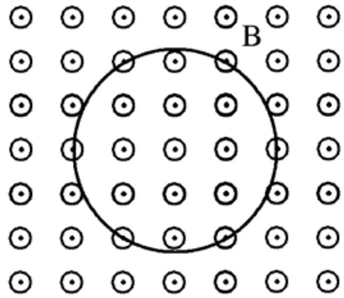
B) clockwise and constant.

C) clockwise and decreasing.

D) counterclockwise and increasing.

E) counterclockwise and decreasing.

9.



The above diagram shows a metal loop of wire in a uniform magnetic field pointing out of the page. If the loop is moved out of the page without changing its orientation to the field, the current induced in the loop is

A) clockwise and decreasing

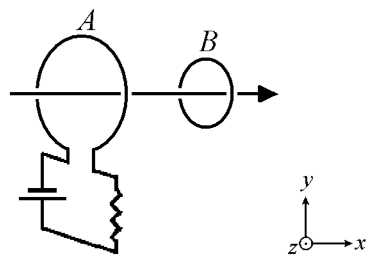
B) clockwise and constant

C) counterclockwise and decreasing

D) counterclockwise and constant

E) zero

10.



Two circular coils are situated perpendicular to the *x*-axis as shown above. There is a current in coil *A*. All the following procedures would induce a current in the secondary coil EXCEPT

A) moving the secondary coil along the *x*-axis

B) rotating the secondary coil about the *x*-axis

C) rotating the secondary coil about a diameter

D) increasing the current in the primary coil

E) changing the area of the secondary coil

11. A magnetic field is directed out of the page and passes through a circular loop of wire in the plane of the page. Which of the following would NOT induce a current in the loop?

A) varying the strength of the magnetic field

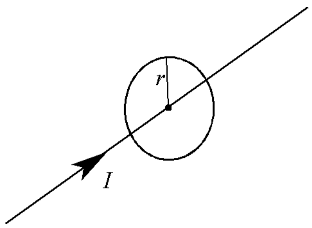
B) changing the size of the loop

C) rotating the loop about a diameter

D) rotating the loop about an axis perpendicular to the page

E) none of the above

12.



The above diagram shows a loop of wire with radius r centered around a long, straight wire that carries a current I in the direction shown. Which of the following would produce emf in the loop?

A) Changing the size of the loop

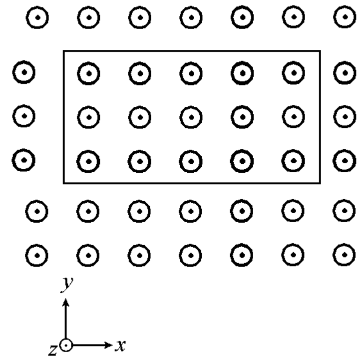
B) Changing the current in the wire

C) Rotating the coil about the length of the wire

D) Rotating the coil about its diameter

E) Moving the coil down the length of the wire

13.



The diagram above shows a wire loop in a uniform magnetic field B that points out of the page. In which way should the loop be moved to induce a current within the loop?

A) Along the x-axis with increasing velocity

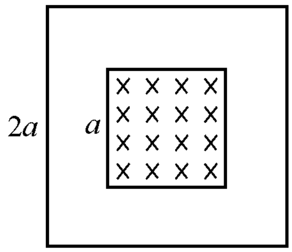
B) Along the y-axis with constant velocity

C) Rotate the loop about the z-axis

D) Along the z-axis with constant velocity

E) Current cannot be induced in the loop because the magnetic field is uniform

14. Base your answer to the following question on the diagram below of two square loops of the same wire, one with side length a and side length $2a$. A uniform magnetic field B directed into the page is contained within the area enclosed by the square of side a.



The magnetic field B varies at a constant rate such that the current induced in the wire with side a is I. Find the current induced in the loop with side $2a$.

A) $\frac{I}{4}$

B) $\frac{I}{2}$

C) I

D) $2I$

E) $4I$

Answer Key
Induced Voltages MC Questions [Mar 28, 2011]

1. ___A___
2. ___E___
3. ___A___
4. ___D___
5. ___D___
6. ___E___
7. ___A___
8. ___B___
9. ___E___
10. ___B___
11. ___D___
12. ___D___
13. ___A___
14. ___B___

Name ______________________________ Class ________________________ Date __________

1. ________

2. ________

3. ________

4. ________

5. ________

6. ________

7. ________

8. ________

9. ________

10. ________

11. ________

12. ________

13. ________

14. ________