Chapter 30 Answers

1	out
2	1 and 3 tie (clockwise), then 2 and 5 tie (zero), then 4 and 6 tie (counterclockwise)
3	(a) all tie (zero); (b) 2, then 1 and 3 tie (zero)
4	(a) into; (b) counterclockwise; (c) larger
5	*d* and *c* tie, then *b*, *a*
6	(a) 2, 1, 3; (b) 2, 1, 3; (c) 1 counterclockwise; 2 clockwise; 3 counterclockwise
7	(a) more; (b) same; (c) same; (d) same (zero)
8	2 *a*, 4 *b*, 1 *c*, 3 *d*
9	(a) all tie (zero); (b) 1 and 2 tie, then 3; (c) all tie (zero)
10	*c*, *b*, *a*
11	*b*
12	(a) and (b): (1) and (2) tie, then (3 and (4) tie

WILEY

Halliday/Resnick/Walker Fundamentals of Physics

Classroom Response System Questions

Chapter 30 Induction

Reading Quiz Questions

WILEY

30.2.1. Complete the following sentence: The phenomenon of producing an induced emf with the aid of a magnetic field is

a) called electromotive production.

b) almost never observed.

c) a scientific curiosity with no practical application.

d) only produced by changing the magnetic field in the presence of a coil of wire.

e) called electromagnetic induction.

WILEY

30.2.1. Complete the following sentence: The phenomenon of producing an induced emf with the aid of a magnetic field is

a) called electromotive production.

b) almost never observed.

c) a scientific curiosity with no practical application.

d) only produced by changing the magnetic field in the presence of a coil of wire.

e) called electromagnetic induction.

WILEY

30.3.1. Which of the following phrases best describe the term magnetic flux?

a) the direction of the magnetic field relative to a surface

b) the amount of magnetic field that passes through a surface

c) the number of magnetic dipoles moving through a wire

d) the flow of magnetons in space

e) Choice (a) and (b) are both correct.

WILEY

30.3.1. Which of the following phrases best describe the term magnetic flux?

a) the direction of the magnetic field relative to a surface

b) the amount of magnetic field that passes through a surface

c) the number of magnetic dipoles moving through a wire

d) the flow of magnetons in space

e) Choice (a) and (b) are both correct.

WILEY

30.3.2. The plane of a conducting loop is oriented parallel to the *x*-*y* plane. A magnetic field is directed in the –*z* direction. Which one of the following actions will not change the magnetic flux through the loop?

a) Decrease the area of the loop.

b) Decrease the strength of the magnetic field.

c) Increase the strength of the magnetic field.

d) Rotate the loop about an axis that is directed in the *z* direction and that passes through the center of the loop.

e) Rotate the loop about an axis that is directed in the *y* direction and that passes through the center of the loop.

WILEY

30.3.2. The plane of a conducting loop is oriented parallel to the *x*-*y* plane. A magnetic field is directed in the –*z* direction. Which one of the following actions will not change the magnetic flux through the loop?

a) Decrease the area of the loop.

b) Decrease the strength of the magnetic field.

c) Increase the strength of the magnetic field.

d) Rotate the loop about an axis that is directed in the *z* direction and that passes through the center of the loop.

e) Rotate the loop about an axis that is directed in the *y* direction and that passes through the center of the loop.

WILEY

30.3.3. A conducting bar slides with a velocity **v** to the right on some conducting rails as shown. A uniform magnetic field is directed perpendicular to the bar. Answer the following two questions: (1) Will the light bulb "turn on" in this case? and (2) How is the magnetic flux through the conducting loop changing, if at all, as the bar slides to the right?

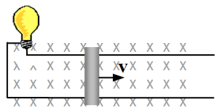
a) no, the magnetic flux remains constant

b) yes, the magnetic flux decreases

c) no, the magnetic flux increases

d) yes, the magnetic flux increases

e) yes, the magnetic flux remains constant



WILEY

30.3.3. A conducting bar slides with a velocity **v** to the right on some conducting rails as shown. A uniform magnetic field is directed perpendicular to the bar. Answer the following two questions: (1) Will the light bulb "turn on" in this case? and (2) How is the magnetic flux through the conducting loop changing, if at all, as the bar slides to the right?

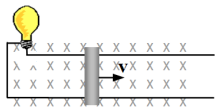
a) no, the magnetic flux remains constant

b) yes, the magnetic flux decreases

c) no, the magnetic flux increases

d) yes, the magnetic flux increases

e) yes, the magnetic flux remains constant



WILEY

30.3.4. Which of the following choices is the SI unit for magnetic flux?

a) gauss (G)

b) tesla (T)

c) weber (Wb)

d) Lumen (L)

e) Fluxon (Fl)

WILEY

30.3.4. Which of the following choices is the SI unit for magnetic flux?

a) gauss (G)

b) tesla (T)

c) weber (Wb)

d) Lumen (L)

e) Fluxon (Fl)

WILEY

30.3.5. Which of the flowing expressions equals the magnetic flux?

a) $BA\cos\phi$

b) $\frac{B\cos^2\phi}{A}$

c) $BA\sin^2\phi$

d) $\frac{B}{A}$

e) $\mu_0 IBA$

WILEY

30.3.5. Which of the flowing expressions equals the magnetic flux?

a) $BA\cos\phi$

b) $\frac{B\cos^2\phi}{A}$

c) $BA\sin^2\phi$

d) $\frac{B}{A}$

e) $\mu_0 IBA$

WILEY

30.3.6. A coil of wire with N turns and area A is placed into a magnetic field of magnitude B. The angle of the normal to the plane of the coil is at an angle ϕ with respect to the magnetic field. According the Faraday's law, which of the following changes will produce an emf in a coil of wire?

a) B is decreased

b) A is increased

c) ϕ is decreased

d) any of the above choices

e) none of the above choices

WILEY

30.3.6. A coil of wire with N turns and area A is placed into a magnetic field of magnitude B. The angle of the normal to the plane of the coil is at an angle ϕ with respect to the magnetic field. According the Faraday's law, which of the following changes will produce an emf in a coil of wire?

a) B is decreased

b) A is increased

c) ϕ is decreased

d) any of the above choices

e) none of the above choices

WILEY

30.4.1. Complete the following statement: Lenz's law indicates that induced currents form to oppose

a) a change in the magnetic field direction.

b) a change in the magnetic field.

c) the magnetic flux.

d) a change in the electric flux.

e) a change in the magnetic flux.

WILEY

30.4.1. Complete the following statement: Lenz's law indicates that induced currents form to oppose

a) a change in the magnetic field direction.

b) a change in the magnetic field.

c) the magnetic flux.

d) a change in the electric flux.

e) a change in the magnetic flux.

WILEY

30.4.2. Which one of the following actions will not result in an induced current?

a) Drop a magnet through a closed metal ring.

b) Move a metal loop away from a current carrying wire.

c) Drop an iron sheet through a region with a constant magnetic field.

d) Hold a copper loop next to a current carrying wire.

e) All of the above choices result in an induced current.

WILEY

30.4.2. Which one of the following actions will not result in an induced current?

a) Drop a magnet through a closed metal ring.

b) Move a metal loop away from a current carrying wire.

c) Drop an iron sheet through a region with a constant magnetic field.

d) Hold a copper loop next to a current carrying wire.

e) All of the above choices result in an induced current.

WILEY

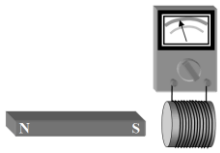
30.4.3. An ammeter is connected to a coil of wire. A magnet is sitting motionless next to the wire such that its south end is near the coil and perpendicular to the plane of the coil as shown. The meter indicates that a current is flowing through the wire from the left toward the right. What, if anything, is wrong with this picture?

a) The current should be flowing from the right toward the left.

b) The needle should be slanted toward the right.

c) The needle should indicate that there is no current flowing.

d) There is nothing wrong with the picture.



WILEY

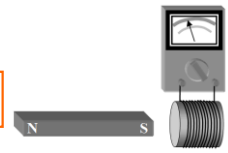
30.4.3. An ammeter is connected to a coil of wire. A magnet is sitting motionless next to the wire such that its south end is near the coil and perpendicular to the plane of the coil as shown. The meter indicates that a current is flowing through the wire from the left toward the right. What, if anything, is wrong with this picture?

a) The current should be flowing from the right toward the left.

b) The needle should be slanted toward the right.

c) The needle should indicate that there is no current flowing.

d) There is nothing wrong with the picture.



WILEY

30.4.4. Complete the following sentence: In a coil of wire, the direction of the induced current caused by an increasing magnetic flux is

a) directed in the direction of the original magnetic field.

b) directed opposite to the original magnetic field.

c) such that the induced magnetic field decreases the magnetic flux.

d) such that the net magnetic flux is equal to zero webers.

e) such that the induced magnetic field increases the magnetic flux.

WILEY

30.4.4. Complete the following sentence: In a coil of wire, the direction of the induced current caused by an increasing magnetic flux is

a) directed in the direction of the original magnetic field.

b) directed opposite to the original magnetic field.

c) such that the induced magnetic field decreases the magnetic flux.

d) such that the net magnetic flux is equal to zero webers.

e) such that the induced magnetic field increases the magnetic flux.

WILEY

30.4.5. Which one of the following principle's or laws allows one to determine the direction of an induced current in a conducting loop of wire due to a changing magnetic flux?

a) Lenz's law

b) Gauss' law

c) equivalence principle

d) Faraday's law

e) principle of induced magnetic flux

WILEY

30.4.5. Which one of the following principle's or laws allows one to determine the direction of an induced current in a conducting loop of wire due to a changing magnetic flux?

a) Lenz's law

b) Gauss' law

c) equivalence principle

d) Faraday's law

e) principle of induced magnetic flux

WILEY

30.4.6. According to the text, which prominent guitarist was known to have rewrapped the wire in the pick up coils in his electric guitar?

a) Eric Clapton

b) James Burton

c) Jimi Hendrix

d) Paul McCartney

e) Ace Frehley

WILEY

30.4.6. According to the text, which prominent guitarist was known to have rewrapped the wire in the pick up coils in his electric guitar?

a) Eric Clapton

b) James Burton

c) Jimi Hendrix

d) Paul McCartney

e) Ace Frehley

WILEY

30.5.1. Lenz's law is a consequence of what other physical law?

a) Newton's first law

b) conservation of energy

c) Newton's third law

d) conservation of momentum

e) Gauss' law

WILEY

30.5.1. Lenz's law is a consequence of what other physical law?

a) Newton's first law

b) conservation of energy

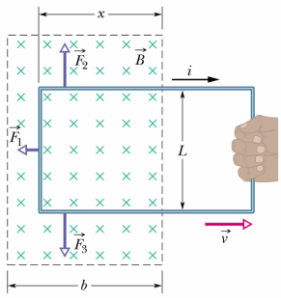
c) Newton's third law

d) conservation of momentum

e) Gauss' law

WILEY

30.5.2. Consider the drawing in which someone is pulling a rectangular conducting loop out of a region containing a magnetic field at a constant velocity. Which one of the following is an expression of the rate of work, the power, the person is doing?



a) $P = i^2R$

b) $P = iv$

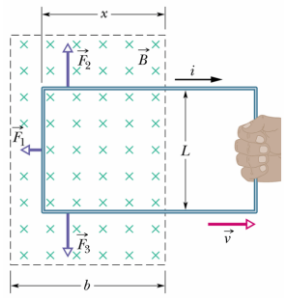
c) $P = Fv$

d) $P = iBLv$

e) $P = FiB/L$

WILEY

30.5.2. Consider the drawing in which someone is pulling a rectangular conducting loop out of a region containing a magnetic field at a constant velocity. Which one of the following is an expression of the rate of work, the power, the person is doing?



a) $P = i^2R$

b) $P = iv$

c) $P = Fv$

d) $P = iBLv$

e) $P = FiB/L$

WILEY

30.5.3. When a metal sheet is pulled from a region containing a magnetic field, currents are induced in the metal sheet. What is the name given to these currents?

a) andy currents

b) betty currents

c) curie currents

d) drew currents

e) eddy currents

WILEY

30.5.3. When a metal sheet is pulled from a region containing a magnetic field, currents are induced in the metal sheet. What is the name given to these currents?

a) andy currents

b) betty currents

c) curie currents

d) drew currents

e) eddy currents

WILEY

30.6.1. Complete the following statement: Faraday's law indicates that a changing magnetic field produces

a) an electric field.

b) an induced magnetic field.

c) a force field.

d) light.

e) global warming.

WILEY

30.6.1. Complete the following statement: Faraday's law indicates that a changing magnetic field produces

a) an electric field.

b) an induced magnetic field.

c) a force field.

d) light.

e) global warming.

WILEY

30.7.1. What unit is used for inductance?

a) weber (Wb)

b) henry (H)

c) ampere (A)

d) morgan (M)

e) volt (V)

WILEY

30.7.1. What unit is used for inductance?

a) weber (Wb)

b) henry (H)

c) ampere (A)

d) morgan (M)

e) volt (V)

WILEY

30.9.1. When a battery, a resistor, a switch, and an inductor form a circuit and the switch is closed, the inductor acts to oppose the change in the current. How is the time constant of the inductor affected by doubling its inductance?

a) The time constant would increase to four times its original value.

b) The time constant would increase to twice its original value.

c) The time constant would remain the same.

d) The time constant would decrease to one-half its original value.

e) The time constant would decrease to one-fourth its original value.

WILEY

30.9.1. When a battery, a resistor, a switch, and an inductor form a circuit and the switch is closed, the inductor acts to oppose the change in the current. How is the time constant of the inductor affected by doubling its inductance?

a) The time constant would increase to four times its original value.

b) The time constant would increase to twice its original value.

c) The time constant would remain the same.

d) The time constant would decrease to one-half its original value.

e) The time constant would decrease to one-fourth its original value.

WILEY

30.9.2. When a battery, a resistor, a switch, and an inductor form a circuit and the switch is closed, the inductor acts to oppose the change in the current. How is the time constant of the inductor affected by doubling the resistance in the circuit?

a) The time constant would increase to four times its original value.

b) The time constant would increase to twice its original value.

c) The time constant would remain the same.

d) The time constant would decrease to one-half its original value.

e) The time constant would decrease to one-fourth its original value.

WILEY

30.9.2. When a battery, a resistor, a switch, and an inductor form a circuit and the switch is closed, the inductor acts to oppose the change in the current. How is the time constant of the inductor affected by doubling the resistance in the circuit?

a) The time constant would increase to four times its original value.

b) The time constant would increase to twice its original value.

c) The time constant would remain the same.

d) The time constant would decrease to one-half its original value.

e) The time constant would decrease to one-fourth its original value.

WILEY

30.10.1. In a circuit containing an emf, a resistor, and an inductor, where is the magnetic potential energy stored?

a) in the inductance of the inductor

b) in the resistor

c) in the magnetic field

d) in the magnetic flux

e) in the current

WILEY

30.10.1. In a circuit containing an emf, a resistor, and an inductor, where is the magnetic potential energy stored?

a) in the inductance of the inductor

b) in the resistor

c) in the magnetic field

d) in the magnetic flux

e) in the current

WILEY

30.12.1. Which one of the following terms is used for the effect in which a changing current in one circuit induces an emf in another circuit?

a) self-induction

b) coherence

c) interference

d) Lenz effect

e) mutual induction

WILEY

30.12.1. Which one of the following terms is used for the effect in which a changing current in one circuit induces an emf in another circuit?

a) self-induction

b) coherence

c) interference

d) Lenz effect

e) mutual induction

WILEY

Halliday/Resnick/Walker Fundamentals of Physics

Classroom Response System Questions

Chapter 30 Induction

Interactive Lecture Questions

WILEY

WILEY

30.3.1. A rigid, conductive loop is falling through a uniform magnetic field that is perpendicular to the plane of the loop. Initially, the loop is completely within the field, but then it falls into a region where no magnetic field is present. Which one of the following quantities varies during the fall?

a) the magnetic field penetrating the loop

b) the area of the loop penetrated by the magnetic field

c) the magnetic flux

d) the current in the loop

e) all of the above

WILEY

30.3.1. A rigid, conductive loop is falling through a uniform magnetic field that is perpendicular to the plane of the loop. Initially, the loop is completely within the field, but then it falls into a region where no magnetic field is present. Which one of the following quantities varies during the fall?

a) the magnetic field penetrating the loop

b) the area of the loop penetrated by the magnetic field

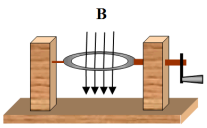
c) the magnetic flux

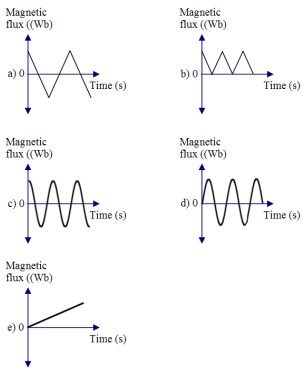
d) the current in the loop

e) all of the above

WILEY

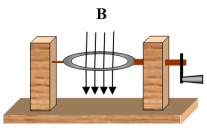
30.3.2. A circular ring is rotated clockwise at a constant rate for an extended period of time using the apparatus shown. Which of the graphs below correctly shows the magnetic flux through the ring as a function of time? Note: At time $t = 0$ s, the plane of the ring is perpendicular to the

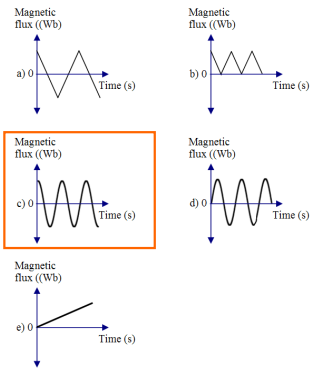




WILEY

30.3.2. A circular ring is rotated clockwise at a constant rate for an extended period of time using the apparatus shown. Which of the graphs below correctly shows the magnetic flux through the ring as a function of time? Note: At time $t = 0$ s, the plane of the ring is perpendicular to the





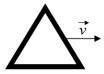
WILEY

30.4.1. Consider the situation shown. A triangular, aluminum loop is slowly moving to the right. Eventually, it will enter and pass through the uniform magnetic field region represented by the tails of arrows directed away from you. Initially, there is no current in the loop. When the loop is entering the magnetic field, what will be the direction of any induced current present in the loop?

a) clockwise

b) counterclockwise

c) No current is induced.



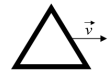
WILEY

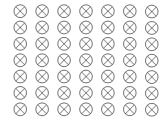
30.4.1. Consider the situation shown. A triangular, aluminum loop is slowly moving to the right. Eventually, it will enter and pass through the uniform magnetic field region represented by the tails of arrows directed away from you. Initially, there is no current in the loop. When the loop is entering the magnetic field, what will be the direction of any induced current present in the loop?

a) clockwise

b) counterclockwise

c) No current is induced.





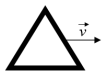
WILEY

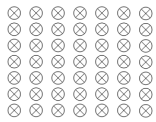
30.4.2. Consider the situation shown. A triangular, aluminum loop is slowly moving to the right. Eventually, it will enter and pass through the uniform magnetic field region represented by the tails of arrows directed away from you. Initially, there is no current in the loop. When the loop is exiting the magnetic field, what will be the direction of any induced current present in the loop?

a) clockwise

b) counterclockwise

c) No current is induced.





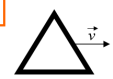
WILEY

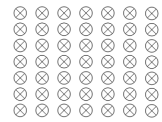
30.4.2. Consider the situation shown. A triangular, aluminum loop is slowly moving to the right. Eventually, it will enter and pass through the uniform magnetic field region represented by the tails of arrows directed away from you. Initially, there is no current in the loop. When the loop is exiting the magnetic field, what will be the direction of any induced current present in the loop?

a) clockwise

b) counterclockwise

c) No current is induced.





WILEY

30.4.3. A rigid, circular metal loop begins at rest in a uniform magnetic field directed away from you as shown. The loop is then pulled through the field toward the right, but does not exit the field. What is the direction of any induced current within the loop?

a) clockwise

b) counterclockwise

c) No current is induced.

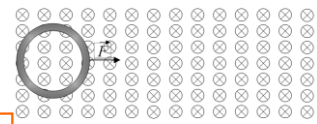
WILEY

30.4.3. A rigid, circular metal loop begins at rest in a uniform magnetic field directed away from you as shown. The loop is then pulled through the field toward the right, but does not exit the field. What is the direction of any induced current within the loop?

a) clockwise

b) counterclockwise

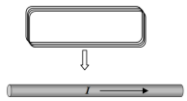
c) No current is induced.



WILEY

30.4.4. A coil of wire that forms a complete loop is moving with a constant speed v toward a very long, current carrying wire, only a portion of which is shown. What affect, if any, does the current carrying wire have on the coil of wire?

a) Since the magnetic field increases as the coil approaches the wire, a current is induced in the coil.



b) The rectangle will be distorted as it is pulled in the direction of the current in the wire.

c) Close to the wire, a magnetic force acts on the loop that accelerates the loop away from the wire.

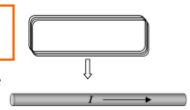
d) Since the magnetic field around the wire is not changing, there is no effect on the coil.

e) Since the coil and the wire are not touching, there is no effect.

WILEY

30.4.4. A coil of wire that forms a complete loop is moving with a constant speed v toward a very long, current carrying wire, only a portion of which is shown. What affect, if any, does the current carrying wire have on the coil of wire?

a) Since the magnetic field increases as the coil approaches the wire, a current is induced in the coil.



b) The rectangle will be distorted as it is pulled in the direction of the current in the wire.

c) Close to the wire, a magnetic force acts on the loop that accelerates the loop away from the wire.

d) Since the magnetic field around the wire is not changing, there is no effect on the coil.

e) Since the coil and the wire are not touching, there is no effect.

WILEY

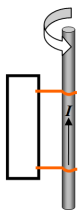
30.4.5. A rectangular loop of wire is attached to a metal rod using rigid, electrically insulating rods so that the distance between the loop and metal rod is constant as the metal rod is rotated uniformly as shown. The metal rod carries a current in the direction indicated. Which of the following statements concerning an induced current in the rectangular loop as a result of the current in the metal rod is true?

a) The induced current in the loop is clockwise around the loop.

b) The induced current in the loop is counterclockwise around the loop.

c) The induced current in the loop alternates between clockwise and counterclockwise around the loop.

d) There is no induced current in the loop.



WILEY

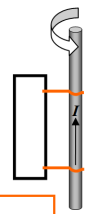
30.4.5. A rectangular loop of wire is attached to a metal rod using rigid, electrically insulating rods so that the distance between the loop and metal rod is constant as the metal rod is rotated uniformly as shown. The metal rod carries a current in the direction indicated. Which of the following statements concerning an induced current in the rectangular loop as a result of the current in the metal rod is true?

a) The induced current in the loop is clockwise around the loop.

b) The induced current in the loop is counterclockwise around the loop.

c) The induced current in the loop alternates between clockwise and counterclockwise around the loop.

d) There is no induced current in the loop.



WILEY

30.4.6. A balloon has an initial radius of 0.075 m. A circle is painted on the balloon using silver metal paint. When the paint dries, the circle is a very good electrical conductor. With the balloon oriented such that a 1.5-T magnetic field is oriented perpendicular to the plane of the circle, air is blown into the balloon so that it expands uniformly. The silver circle expands to a radius 0.125 m in 1.5 s. Determine the induced emf for this silver circle during this period of expansion.

a) 0.021 V

b) 0.031 V

c) 0.047 V

d) 0.058 V

e) 0.075 V

WILEY

30.4.6. A balloon has an initial radius of 0.075 m. A circle is painted on the balloon using silver metal paint. When the paint dries, the circle is a very good electrical conductor. With the balloon oriented such that a 1.5-T magnetic field is oriented perpendicular to the plane of the circle, air is blown into the balloon so that it expands uniformly. The silver circle expands to a radius 0.125 m in 1.5 s. Determine the induced emf for this silver circle during this period of expansion.

a) 0.021 V

b) 0.031 V

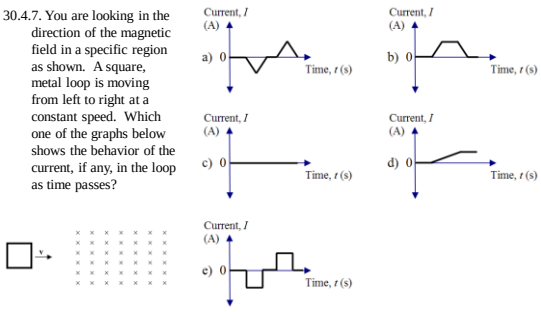
c) 0.047 V

d) 0.058 V

e) 0.075 V

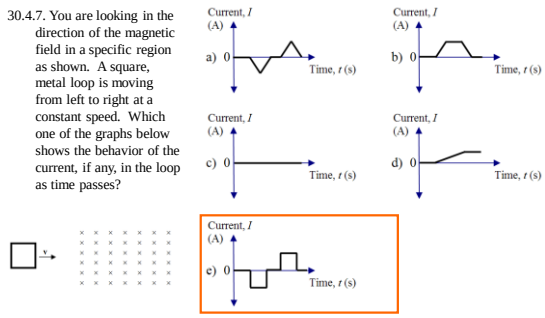
WILEY

30.4.7. You are looking in the direction of the magnetic field in a specific region as shown. A square, metal loop is moving from left to right at a constant speed. Which one of the graphs below shows the behavior of the current, if any, in the loop as time passes?



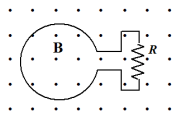
WILEY

30.4.7. You are looking in the direction of the magnetic field in a specific region as shown. A square, metal loop is moving from left to right at a constant speed. Which one of the graphs below shows the behavior of the current, if any, in the loop as time passes?



WILEY

30.4.8. Consider the situation shown in the drawing. A conducting loop is connected to a resistor. The resistor and loop are at rest in a magnetic field that is directed toward you. Within a short period of time the magnetic field is reduced to one half of its initial value. Which one of the following statements concerning an induced current, if any, in the loop is true?



a) During the time the magnetic field is decreasing, a current is induced that is directed counterclockwise around the loop.

b) During the time the magnetic field is decreasing, a current is induced that is directed clockwise around the loop.

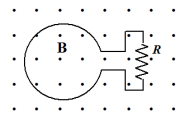
c) No current is induced in the loop at any time.

d) A current is induced that is directed clockwise around the loop, which also continues after the magnetic field attains a constant value.

e) A current is induced that is directed counterclockwise around the loop, which also continues after the magnetic field attains a constant value.

WILEY

30.4.8. Consider the situation shown in the drawing. A conducting loop is connected to a resistor. The resistor and loop are at rest in a magnetic field that is directed toward you. Within a short period of time the magnetic field is reduced to one half of its initial value. Which one of the following statements concerning an induced current, if any, in the loop is true?



a) During the time the magnetic field is decreasing, a current is induced that is directed counterclockwise around the loop.

b) During the time the magnetic field is decreasing, a current is induced that is directed clockwise around the loop.

c) No current is induced in the loop at any time.

d) A current is induced that is directed clockwise around the loop, which also continues after the magnetic field attains a constant value.

e) A current is induced that is directed counterclockwise around the loop, which also continues after the magnetic field attains a constant value.

WILEY

30.7.1. Two solenoids, A and B, have the same length and cross-sectional area. Solenoid B has three times the number of turns per unit length. What is the ratio of the self-inductance of solenoid B to that of solenoid A?

a) 1/3

b) $\sqrt{3}$

c) 3

d) 6

e) 9

WILEY

30.7.1. Two solenoids, A and B, have the same length and cross-sectional area. Solenoid B has three times the number of turns per unit length. What is the ratio of the self-inductance of solenoid B to that of solenoid A?

a) 1/3

b) $\sqrt{3}$

c) 3

d) 6

e) 9

WILEY

30.8.1. A permanent magnet is moved toward a 320-turn solenoid such that the magnetic field inside the solenoid increases from zero to 0.50 T in 0.75 s. The radius of the solenoid is 0.035 m. The ends of the solenoid are connected in series with a light bulb. What emf is induced during this time interval?

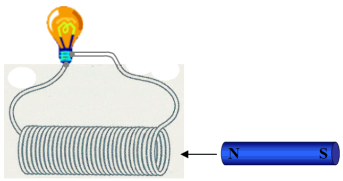
a) 24 V

b) 12 V

c) 2.8 V

d) 0.82 V

e) 0.026 V



WILEY

30.8.1. A permanent magnet is moved toward a 320-turn solenoid such that the magnetic field inside the solenoid increases from zero to 0.50 T in 0.75 s. The radius of the solenoid is 0.035 m. The ends of the solenoid are connected in series with a light bulb. What emf is induced during this time interval?

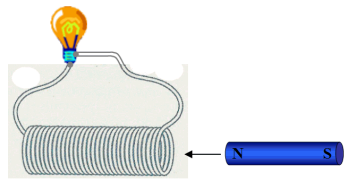
a) 24 V

b) 12 V

c) 2.8 V

d) 0.82 V

e) 0.026 V



WILEY

30.9.1. Circuit A contains a battery, a switch, and a resistor connected in series. Circuit B contains a battery, a switch, an inductor, and a resistor connected in series. Initially, the switch is closed in both circuits. How does the behavior of the current in circuit B compare with that in circuit A as both switches are opened at the same time?

a) The current in both circuits decreases at the same rate because inductors do not affect the current in a circuit.

b) The current in circuit B decreases more slowly than that for circuit A since the inductor acts to maintain the current in the circuit.

c) The current in circuit B decreases more quickly than that for circuit A since the inductor increases the current in the circuit as its stored energy is released.

d) The behavior of the current in the circuit depends on the inductance of the inductor. If the inductance is small, the current will decrease rapidly; and if the inductance is large, the current will increase for a short time before decreasing.

WILEY

30.9.1. Circuit A contains a battery, a switch, and a resistor connected in series. Circuit B contains a battery, a switch, an inductor, and a resistor connected in series. Initially, the switch is closed in both circuits. How does the behavior of the current in circuit B compare with that in circuit A as both switches are opened at the same time?

a) The current in both circuits decreases at the same rate because inductors do not affect the current in a circuit.

b) The current in circuit B decreases more slowly than that for circuit A since the inductor acts to maintain the current in the circuit.

c) The current in circuit B decreases more quickly than that for circuit A since the inductor increases the current in the circuit as its stored energy is released.

d) The behavior of the current in the circuit depends on the inductance of the inductor. If the inductance is small, the current will decrease rapidly; and if the inductance is large, the current will increase for a short time before decreasing.

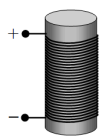
WILEY

30.9.2. A potential difference exists between the ends of an inductor. At the instant shown, the upper end is at a higher potential than the lower end. Which one of the following statements accurately describes the current in the inductor?

a) The current has a constant value and is directed from the top of the inductor toward the bottom of the inductor.

b) The current is increasing and is directed from the top of the inductor toward the bottom of the inductor.

c) The current is decreasing and is directed from the top of the inductor toward the bottom of the inductor.



d) The current is increasing and is directed from the bottom of the inductor toward the top of the inductor.

e) The current may be either increasing and directed from the top toward the bottom or decreasing and directed from the bottom toward the top of the inductor.

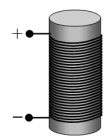
WILEY

30.9.2. A potential difference exists between the ends of an inductor. At the instant shown, the upper end is at a higher potential than the lower end. Which one of the following statements accurately describes the current in the inductor?

a) The current has a constant value and is directed from the top of the inductor toward the bottom of the inductor.

b) The current is increasing and is directed from the top of the inductor toward the bottom of the inductor.

c) The current is decreasing and is directed from the top of the inductor toward the bottom of the inductor.



d) The current is increasing and is directed from the bottom of the inductor toward the top of the inductor.

e) The current may be either increasing and directed from the top toward the bottom or decreasing and directed from the bottom toward the top of the inductor.

WILEY

30.9.3. A 150-Ω resistor and a 0.80-mH inductor are used in an LR circuit. If the initial current in the circuit is 2.0 A when a switch is thrown that allows the current in the circuit to decay, at what time will the current be 1.0 A?

a) 0.083 s

b) 0.12 s

c) 0.48 s

d) 0.80 s

e) 1.3 s

WILEY

30.9.3. A 150-Ω resistor and a 0.80-mH inductor are used in an LR circuit. If the initial current in the circuit is 2.0 A when a switch is thrown that allows the current in the circuit to decay, at what time will the current be 1.0 A?

a) 0.083 s

b) 0.12 s

c) 0.48 s

d) 0.80 s

e) 1.3 s

WILEY

30.10.1 A circuit contains a battery, a switch, an inductor, and a resistor connected in series. Initially, the switch is open. In which one of the following intervals does the energy stored in the inductor have the largest value?

a) before the switch is closed

b) immediately after the switch is closed when the current in the circuit is increasing

c) a long time after the switch is closed

WILEY

30.10.1 A circuit contains a battery, a switch, an inductor, and a resistor connected in series. Initially, the switch is open. In which one of the following intervals does the energy stored in the inductor have the largest value?

a) before the switch is closed

b) immediately after the switch is closed when the current in the circuit is increasing

c) a long time after the switch is closed

WILEY

30.11.1. Solenoid A has n turns per unit length and carries a current $4i$. Solenoid B has $3n$ turns per unit length and carries a current i. Solenoid C has $2n$ turns per unit length and carries a current $2i$. Solenoid D has n turns per unit length and carries a current $2i$. Which of the following expressions correctly expresses the relative energy density of these solenoids?

a) $\mu_A > \mu_D > \mu_B > \mu_C$

b) $\mu_B = \mu_D > \mu_A > \mu_C$

c) $\mu_A = \mu_C > \mu_B > \mu_D$

d) $\mu_C > \mu_A > \mu_B > \mu_D$

e) $\mu_D > \mu_B > \mu_C = \mu_A$

WILEY

30.11.1. Solenoid A has n turns per unit length and carries a current $4i$. Solenoid B has $3n$ turns per unit length and carries a current i. Solenoid C has $2n$ turns per unit length and carries a current $2i$. Solenoid D has n turns per unit length and carries a current $2i$. Which of the following expressions correctly expresses the relative energy density of these solenoids?

a) $\mu_A > \mu_D > \mu_B > \mu_C$

b) $\mu_B = \mu_D > \mu_A > \mu_C$

c) $\mu_A = \mu_C > \mu_B > \mu_D$

d) $\mu_C > \mu_A > \mu_B > \mu_D$

e) $\mu_D > \mu_B > \mu_C = \mu_A$

WILEY

30.11.2. Consider the magnetic field generated by a long, straight current-carrying wire of radius R. At which of the following locations is the magnetic energy density of the wire the largest?

a) $r = 0$, at the center of the wire

b) $0 < r < R$

c) $r = R$, at the surface of the wire

d) $R < r < 2R$

e) The magnetic field density will be the same everywhere.

WILEY

30.11.2. Consider the magnetic field generated by a long, straight current-carrying wire of radius R. At which of the following locations is the magnetic energy density of the wire the largest?

a) $r = 0$, at the center of the wire

b) $0 < r < R$

c) $r = R$, at the surface of the wire

d) $R < r < 2R$

e) The magnetic field density will be the same everywhere.

WILEY

30.12.1. In each of the three cases shown, a time-varying current is flowing through the larger coil that produces a magnetic field. Rank the mutual inductance for the three cases shown from smallest to largest.

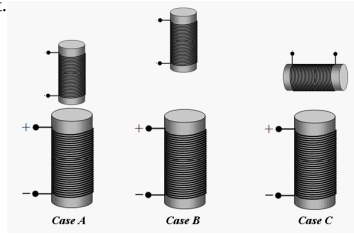
a) M_A, M_B, M_C

b) M_C, M_B, M_A

c) M_C, M_A, M_B

d) M_B, M_C, M_A

e) M_B, M_A, M_C



WILEY

30.12.1. In each of the three cases shown, a time-varying current is flowing through the larger coil that produces a magnetic field. Rank the mutual inductance for the three cases shown from smallest to largest.

a) M_A, M_B, M_C

b) M_C, M_B, M_A

c) M_C, M_A, M_B

d) M_B, M_C, M_A

e) M_B, M_A, M_C