Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

AP Physics 2 - Ch 20 Practice

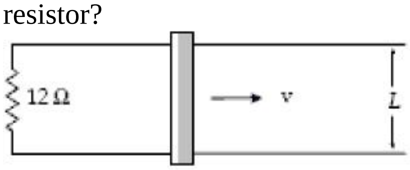
Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. A coil is wrapped with 300 turns of wire on the perimeter of a circular frame (radius = 8.0 cm). Each turn has the same area, equal to that of the frame. A uniform magnetic field is turned on perpendicular to the plane of the coil. This field changes at a constant rate from 20 to 80 mT in a time of 20 ms. What is the magnitude of the induced emf in the coil at the instant the magnetic field has a magnitude of 50 mT?
a. 24 V b. 18 V c. 15 V d. 10 V e. 30 V

____ 2. A flat coil of wire consisting of 20 turns, each with an area of 50 cm^2, is positioned perpendicularly to a uniform magnetic field that increases its magnitude at a constant rate from 2.0 T to 6.0 T in 2.0 s. If the coil has a total resistance of 0.40 Ω, what is the magnitude of the induced current?
a. 0.70 A b. 0.60 A c. 0.50 A d. 0.80 A e. 0.20 A

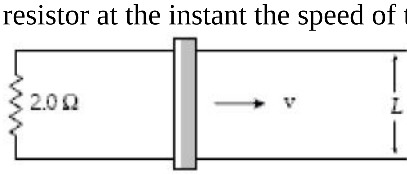
____ 3. A square coil (length of side = 24 cm) of wire consisting of two turns is placed in a uniform magnetic field that makes an angle of 60° with the plane of the coil. If the magnitude of this field increases by 6.0 mT every 10 ms, what is the magnitude of the emf induced in the coil?
a. 55 mV b. 46 mV c. 50 mV d. 60 mV e. 35 mV

____ 4. A rod (length = 10 cm) moves on two horizontal frictionless conducting rails, as shown. The magnetic field in the region is directed perpendicularly to the plane of the rails and is uniform and constant. If a constant force of 0.60 N moves the bar at a constant velocity of 2.0 m/s, what is the current through the 12-Ω load resistor?



a. 0.32 A b. 0.34 A c. 0.37 A d. 0.39 A e. 0.43 A

____ 5. In the arrangement shown, a conducting bar of negligible resistance slides along horizontal, parallel, frictionless conducting rails connected as shown to a 2.0-Ω resistor. A uniform 1.5-T magnetic field is perpendicular to the plane of the paper. If L = 60 cm, at what rate is thermal energy being generated in the resistor at the instant the speed of the bar is equal to 4.2 m/s?



a. 8.6 W b. 7.8 W c. 7.1 W d. 9.3 W e. 1.8 W

____ 6. A small airplane with a wing span of 12 m flies horizontally and due north at a speed of 60 m/s in a region where the magnetic field of the earth is 60 «T directed 60° below the horizontal. What is the magnitude of the induced emf between the ends of the wing?
a. 50 mV b. 31 mV c. 37 mV d. 44 mV e. 22 mV

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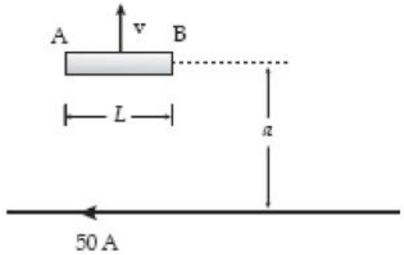
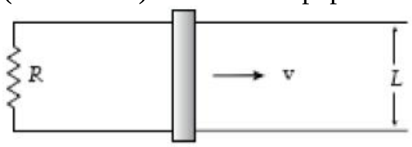
____ 7. A conducting bar moves as shown near a long wire carrying a constant 50-A current. If a = 4.0 mm, L = 50 cm, and v = 12 m/s, what is the potential difference, $V_A - V_B$?



a. +15 mV   b. –15 mV   c. +20 mV   d. –20 mV   e. +10 mV

____ 8. A bar (L = 80 cm) moves on two frictionless rails, as shown, in a region where the magnetic field is uniform (B = 0.30 T) and into the paper. If v = 50 cm/s and R = 60 mΩ, what is the magnetic force on the moving bar?



a. 0.48 N to the right
b. 0.48 N to the left
c. 0.32 N to the left
d. 0.32 N to the right
e. None of the above

____ 9. The magnetic flux through a loop perpendicular to a uniform magnetic field will change
a. if the loop is replaced by two loops, each of which has half of the area of the original loop.
b. if the loop moves at constant velocity while remaining perpendicular to and within the uniform magnetic field.
c. if the loop moves at constant velocity in a direction parallel to the axis of the loop while remaining in the uniform magnetic field.
d. if the loop is rotated through 180 degrees about an axis through its center and in the plane of the loop.
e. in none of the above cases.

____ 10. A current may be induced in a coil by
a. moving one end of a bar magnet through the coil.
b. moving the coil toward one end of the bar magnet.
c. holding the coil near a second coil while current in the second coil is increasing.
d. all of the above.
e. none of the above.

____ 11. An induced emf is produced in
a. a closed loop of wire when it remains at rest in a nonuniform static magnetic field.
b. a closed loop of wire when it remains at rest in a uniform static magnetic field.
c. a closed loop of wire moving at constant velocity in a nonuniform static magnetic field.
d. all of the above.
e. only (b) and (c) above.

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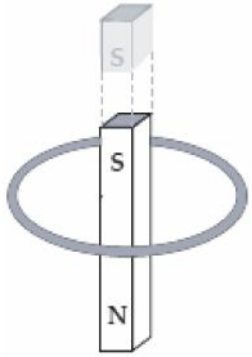
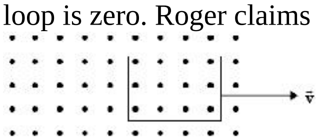
____ 12. A bar magnet is dropped from above and falls through the loop of wire shown below. The north pole of the bar magnet points downward towards the page as it falls. Which statement is correct?



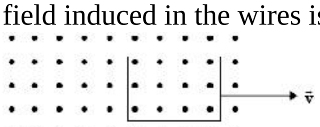
a. The current in the loop always flows in a clockwise direction.
b. The current in the loop always flows in a counterclockwise direction.
c. The current in the loop flows first in a clockwise, then in a counterclockwise direction.
d. The current in the loop flows first in a counterclockwise, then in a clockwise direction.
e. No current flows in the loop because both ends of the magnet move through the loop.

____ 13. As shown below, a square loop of wire of side *a* moves through a uniform magnetic field of magnitude *B* perpendicular to the page at constant velocity $\vec{\mathbf{v}}$ directed to the right. Judd says that the emf induced in the loop is zero. Roger claims that it has magnitude $B\ell^3$. Which one, if either, is correct, and why?



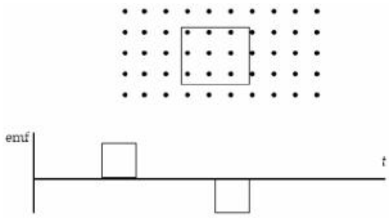
a. Judd, because the magnetic flux through the loop is constant.
b. Roger, because the magnetic flux through the loop is constant.
c. Judd, because the magnetic flux through the loop is not constant if $\vec{\mathbf{v}} \neq 0$.
d. Roger, because the magnetic flux through the loop is not constant if $\vec{\mathbf{v}} \neq 0$.
e. Roger, because the magnetic flux through the loop is $\Phi_B = 0$.

____ 14. As shown below, a square loop of wire of side *a* moves through a uniform magnetic field of magnitude *B* perpendicular to the page at constant velocity $\vec{\mathbf{v}}$ directed to the right. Which statement regarding the electric field induced in the wires is correct for the wires at the left and right sides of the loop?



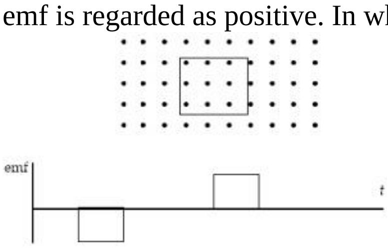
a. The electric field $\vec{\mathbf{E}}$ is directed upwards in both the right and left sides of the loop.
b. The electric field $\vec{\mathbf{E}}$ is directed upwards in the right side and downwards in the left side of the loop.
c. The electric field $\vec{\mathbf{E}}$ is directed upwards in the left side and downwards in the right side of the loop.
d. The electric field $\vec{\mathbf{E}}$ is directed downwards in both the right and left sides of the loop.
e. There is no electric field present in any side of the loop.

____ 15. Starting outside the region with the magnetic field, a single square coil of wire moves across the region with a uniform magnetic field $\vec{\mathbf{B}}$ perpendicular to the page. The loop moves at constant velocity $\vec{\mathbf{v}}$. As seen from above, a counterclockwise emf is regarded as positive. Roger claims that the graph shown below represents the induced emf. Martin says he's wrong. In which direction did the loop move over the plane of the page, or is Martin correct?



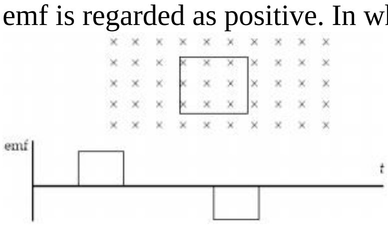
a. Roger is correct: the loop moved from bottom to top.
b. Roger is correct: the loop moved from top to bottom.
c. Roger is correct: the loop moved from left to right.
d. Roger is correct: the loop moved from right to left.
e. Martin is correct: none of these directions of motion will produce the graph of emf vs *t*.

____ 16. Starting outside the region with the magnetic field, a single square coil of wire enters, moves across, and then leaves the region with a uniform magnetic field $\vec{\mathbf{B}}$ perpendicular to the page so that the graph shown below represents the induced emf. The loop moves at constant velocity $\vec{\mathbf{v}}$. As seen from above, a counterclockwise emf is regarded as positive. In which direction did the loop move over the plane of the page?



a. The loop moved from bottom to top.
b. The loop moved from top to bottom.
c. The loop moved from left to right.
d. The loop moved from right to left.
e. All of these directions of motion will produce the graph of emf vs *t*.

____ 17. Starting outside the region with the magnetic field, a single square coil of wire enters, moves across, and then leaves the region with a uniform magnetic field $\vec{\mathbf{B}}$ perpendicular to the page so that the graph shown below represents the induced emf. The loop moves at constant velocity $\vec{\mathbf{v}}$. As seen from above, a counterclockwise emf is regarded as positive. In which direction did the loop move over the plane of the page?



a. The loop moved from bottom to top.
b. The loop moved from top to bottom.
c. The loop moved from left to right.
d. The loop moved from right to left.
e. All of these directions of motion will produce the graph of emf vs *t*.

AP Physics 2 - Ch 20 Practice
Answer Section

MULTIPLE CHOICE

1. B
2. C
3. D
4. A
5. C
6. C
7. A
8. B
9. D
10. D
11. C
12. D
13. A
14. D
15. E
16. E
17. E