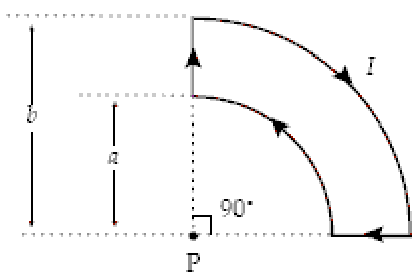
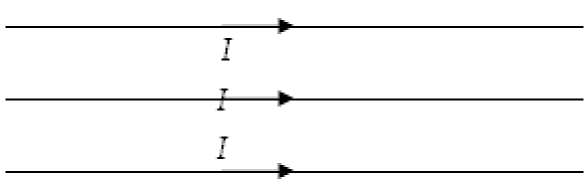
1. A current I moves in the –y direction. The direction of the magnetic field at a point on the positive x axis is in the
a) +x direction b) – z direction c) –x direction d) +z direction

2. Two long parallel wires separated by 4.0 mm each carry a current of 24 A. These two currents are in the same direction. What is the magnitude of the magnetic field at a point that is between the two wires and 1.0 mm from one of the two wires?
a. 4.8 mT
b. 6.4 mT
c. 3.2 mT
d. 9.6 mT
e. 5.3 mT

3. If a = 1.0 cm, b = 3.0 cm, and I = 30 A, what is the magnitude of the magnetic field at point P? (answers on next page)



4. Three coplanar parallel straight wires carry equal currents I to the right as shown below. Each pair of wires is a distance a apart. The direction of the magnetic force on the middle wire



a. is up out of the plane of the wires.
b. is down into the plane of the wires.
c. is in the plane of the wires, directed upwards.
d. is in the plane of the wires, directed downwards
e. cannot be defined, because there is no magnetic force on the middle wire.

5. Two current loops are coaxial and coplanar. One has radius a and the other has radius $2a$. Current $2I$ in the outer loop is antiparallel to current I in the inner loop. The magnitude of the magnetic field at the center of the two loops is
a. 0.
b. $\frac{\mu_0 I}{4a}$.

c. $\dfrac{\mu_0 I}{2a}$.

d. $\dfrac{\mu_0 I}{a}$.

e. $\dfrac{2\mu_0 I}{a}$.

6. A toroid is made of 2000 turns of wire of radius 2.00 cm formed into a donut shape of inner radius 10.0 cm and outer radius 14.0 cm. When a 30.0-A current is present in the toroid, the magnetic field at a distance of 11.0 cm from the center of the toroid is

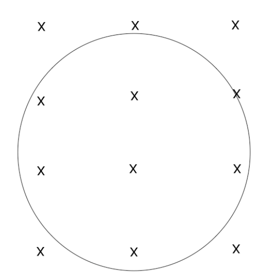
a. 0.0857 T.
b. 0.109 T.
c. 0.120 T.
d. 0.600 T.
e. 0.685 T.

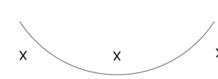
7. By using a compass to measure the magnetic field direction at various points adjacent to a long straight wire, you can show that the wire's magnetic field lines are

a. straight lines in space that go from one magnetic charge to another.
b. straight lines in space that are parallel to the wire. (more answers next page)
c. straight lines in space that are perpendicular to the wire.
d. circles that have their centers on the wire and lie in planes perpendicular to the wire.
e. circles that have the wire lying along a diameter of the circle.

8. In the diagram on the right, the magnetic field is decreasing. The direction of the induced current in the loop is

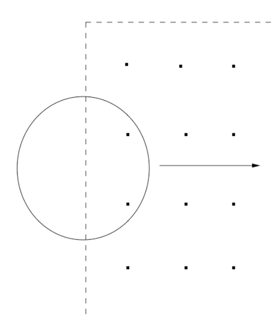
a) clockwise   b) counterclockwise





9. The loop on the right is being pushed into a magnetic field pointing out of the paper. The field outside of the dotted region is zero. The direction of the induced current in the loop is

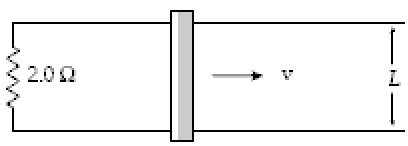
a) counterclockwise   b) clockwise



10. 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

11. 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

12. An electric field of 4.0 μV/m is induced at a point 2.0 cm from the axis of a long solenoid (radius = 3.0 cm, 800 turns/m). At what rate is the current in the solenoid changing at this instant?

a. 0.50 A/s
b. 0.27 A/s
c. 0.60 A/s
d. 0.70 A/s
e. 0.40 A/s

13. A 0.60 H inductor has a current passing through it that is changing at 1.8 A/s at some point in time. The EMF across the inductor is, in V

14. A 200 Ohm resistor and a 0.10 H inductor are connected in series across a 20 V battery at t=0. Find the current through the battery at t=1.00 ms.

15. An inductor has a stored energy of 2.0 mJ when a 20 A current is passing through it. What is its inductance?

16. An oscillating LC circuit has a 5.0 μF capacitor and an unknown inductor. The shortest period of time between the conditions where all of the energy is stored in the capacitor and and where all of the energy is stored in the inductor is 0.20 ms. What is the value of the inductance?

17. A 20 V AC generator is connected to a resistor. The average power generated as heat in the resistor is 100 W. What is the r.m.s. current through the resistor?

18. An ideal transformer has 20 turns on its primary and 300 turns on its secondary. If an AC voltage with an r.m.s. value of 120 V is conneted to the primary coil, what r.m.s. voltage appears on the secondary coil?

17. A capacitor with plates of area 4.0 m^2 is being charged with a current of 2.0 A. The magnitude of the displacement current between the capacitor's plates is
a) 2.0 A b) 1.0 A c) 0.50 A d) 4.0 A e) 8.0 A

18. Which of the following equations is Gauss' Law for magnetism?
a) $\oint_S \vec{E} \bullet d\vec{A} = q_{in} / \varepsilon_0$ b) $\oint_S \vec{B} \bullet d\vec{A} = 0$ c) $\oint_C \vec{E} \bullet d\vec{s} = -\frac{d\Phi_m}{dt}$ d) $\oint_C B \bullet ds = \mu_0 I_{in} + \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$

19. A circular region of space with radius 5 cm has a uniform electric field with a magnitude that changes like (10^9 V/m-s)t. The magnitude of the induced magnetic field 2.0 cm from the center of this field region is

20. Out of the following types of materials, which is repelled from a region of strong magnetic field?
a) paramagnetic b) diamagnetic c) ferromagnetic