Classroom Response System Questions

Chapter 29 Magnetic Fields Due to Currents

Reading Quiz Questions
29.2.1. Which of the following choices correctly indicates the relationship between the magnetic field due to a current carrying, long straight wire at a distance $R$ from the wire?

a) $B \propto \frac{1}{R^2}$

b) $B \propto \frac{1}{R}$

c) $B \propto \frac{1}{R^3}$

d) $B \propto R^2$

e) $B \propto R$
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29.2.2. At a distance $R$ from a current carrying wire, what is the direction of the magnetic field relative to the wire?

a) radially toward the wire  

b) radially away from the wire  

c) parallel to the wire  

d) in the direction opposite to that of the current  

e) in the direction that is perpendicular to both the wire and to the radial direction
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29.2.3. A magnetic field is generated by a current-carrying wire. Which one of the following statements concerning this situation is false?

a) The magnitude of this magnetic field decreases with increasing distance away from the wire.

b) A right-hand rule is useful for determining the direction of the magnetic field at a particular location.

c) The magnitude of the magnetic field is directly proportional to the magnitude of the current.

d) The magnetic field is parallel to the direction of the current in the wire.
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29.2.4. Two circular loops carry identical currents, but the radius of one loop is twice that of the other. How do the magnetic fields at the centers of the loops compare?

a) In both cases, the magnetic field at the center would be zero tesla.

b) The magnetic field at the center of the larger loop is twice that at the center of the smaller loop.

c) The magnetic field at the center of the larger loop is the same as that at the center of the smaller loop.

d) The magnetic field at the center of the larger loop is one-half that at the center of the smaller loop.

e) The magnetic field at the center of the larger loop is one-fourth that at the center of the smaller loop.
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29.3.1. Consider two parallel wires carrying current in the same direction. Which one of the following statements to true concerning this situation?

a) The two wires will attract each other, even if no external magnetic field is applied to the wires.

b) The two wires will repel each other, even if no external magnetic field is applied to the wires.

c) The two wires will attract each other, only if an external magnetic field is applied to the wires.

d) The two wires will repel each other, only if an external magnetic field is applied to the wires.

e) The wires will be neither attracted nor repelled from each other when no external magnetic field is applied to the wires.
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e) The wires will be neither attracted nor repelled from each other when no external magnetic field is applied to the wires.
29.3.2. Consider two parallel wires carrying current in opposite directions. Which one of the following statements to true concerning this situation?

a) The two wires will attract each other, even if no external magnetic field is applied to the wires.

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29.3.3. Which one of the following parameters is not used to determine the magnetic force on a current-carrying wire in a magnetic field?

a) length of the wire

b) radius of the wire

c) direction of the magnetic field with respect to the direction of the current

d) the strength of the magnetic field

e) the magnitude of the electric current
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29.3.4. Two long wires are parallel to each other. One wire carries a current directed due east and the other carries a current of the same magnitude, but directed due west. Which one of the following statements concerning this situation is false?

a) The magnetic field in the plane of the wires at the midpoint between the two wires is equal to zero tesla.

b) The magnetic forces due to the currents carried by the wires causes the wires to move apart.

c) If you are looking toward the west along the wire carrying the current toward the west, the magnetic field lines are directed clockwise around the wire.

d) The magnetic field produced by each wire has its greatest magnitude outside, but near the surface of the wire.
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29.4.1. Which of the following may be determined using Ampere’s law?

a) electric fields due to current carrying wires
b) magnetic forces between two current carrying wires
c) magnetic fields due to current carrying wires
d) magnetic forces acting on charged particles
e) magnetic fields due to permanent magnets
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29.4.2. Under which of the following conditions is Ampere’s law most easily applied?

a) the currents are all in the same direction

b) the magnetic fields are spherically symmetrical

c) no currents are present within the system

d) the magnetic fields are cylindrically symmetric

e) no charged particles are present in the system
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29.4.3. Which one of the following statement concerning Ampere’s law for static magnetic fields is false?

a) The strength of the magnetic field produced by the current is not dependent on the distance from the current geometry that produces the magnetic field.

b) A closed path of arbitrary shape is constructed around the current.

c) This law may be applied to any current geometry that produces a magnetic field that does not change with time.

d) The component of the magnetic field that is parallel to the closed path is used in Ampere’s law.

e) The permeability of free space is a constant that appears in Ampere’s law.
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29.4.4. Ampere’s law may be written as \[ \oint \vec{B} \cdot d\vec{s} = \mu_0 i_{\text{enc}} \]. Consider the circular closed loop located near a current carrying wire as shown. What does the left side of the above equal for the closed loop if the current is directed to the right and has a magnitude of 2.0 A? The center of the loop, which has a radius of 2.5 cm, is located 4.0 cm from the wire.

a) zero

b) 3.1 T·m

c) 4.8 T·m

d) 7.2 T·m

e) This cannot be determined with only the information given.
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29.5.1. What is a solenoid?

a) a single loop of wire in the shape of a circle

b) a radio antenna

c) a long coil of wire in the shape of a helix

d) a scanning mechanism inside of a television

e) a magnet that is inserted into a coil of wire
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29.5.2. What is the name given to the wire object shown in the drawing?

a) D-ring
b) toroid
c) armature
d) solenoid
e) wiggler
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29.5.3. The coils of a solenoid are stretched so that the length of the solenoid is twice its original length. Assuming the same current is passed though the solenoid before and after it is stretched, how does the magnetic field inside the solenoid change, if at all, as a result of the stretching?

a) The magnetic field after the stretching is one-fourth the value it was before stretching.

b) The magnetic field after the stretching is one-half the value it was before stretching.

c) The magnetic field after the stretching is the same as the value it was before stretching.

d) The magnetic field after the stretching is twice the value it was before stretching.

e) The magnetic field after the stretching is four times the value it was before stretching.
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