Name: _____ **Class:** _____ **Date:** _____ **ID: A**

AP physics B - Webreview ch 19 and 20 Magnetism

Multiple Choice

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

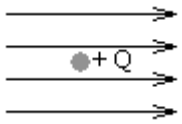
____ 1. The force on a charged particle created by its motion in a magnetic field is maximum at what angle between the particle velocity and field?
   a. zero
   b. 180°
   c. 90°
   d. 45°
   e. 135°

____ 2. A proton is released such that its initial velocity is from right to left across this page. The proton's path, however, is deflected in a direction toward the bottom edge of the page due to the presence of a uniform magnetic field. What is the direction of this field?
   a. out of the page
   b. into the page
   c. from bottom edge to top edge of the page
   d. from right to left across the page
   e. from left to right across the page

____ 3. A proton moving at a speed of 3.8×10^6 m/s cuts across the lines of a magnetic field at an angle of 70°. The strength of the field is 0.25×10^{-4} T. What is the magnitude of the force acting on the proton? ($q_p = 1.6 \times 10^{-19}$ C)
   a. 5.1×10^{-18} N
   b. 9.0×10^{-18} N
   c. 1.4×10^{-17} N
   d. 2.3×10^{-17} N
   e. 6.6×10^{-16} N

____ 4. If a proton is released at the equator and falls toward the Earth under the influence of gravity, the magnetic force on the proton will be toward the:
   a. north.
   b. south.
   c. east.
   d. west.

____ 5. A stationary positive charge $+Q$ is located in a magnetic field B, which is directed toward the right as indicated. The direction of the magnetic force on Q is:



   a. toward the right.
   b. up.
   c. down.
   d. toward the left.
   e. There is no magnetic force.

____ 6. A proton and a deuteron are moving with equal velocities perpendicular to a uniform magnetic field. A deuteron has the same charge as the proton but has twice its mass. The ratio of the magnetic force on the proton to that on the deuteron is:
   a. 0.5.
   b. 1.
   c. 2.
   d. 4.
   e. There is no magnetic force in this case.

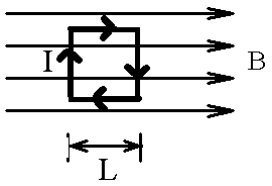
____ 7. A 2.0-m wire segment carrying a current of 0.60 A oriented parallel to a uniform magnetic field of 0.50 T experiences a force of what magnitude?
   a. 6.7 N
   b. 0.30 N
   c. 0.15 N
   d. 0.60 N
   e. zero

____ 8. The force exerted on a current-carrying wire located in an external magnetic field is directly proportional to which of the following?
   a. current strength
   b. field strength
   c. diameter of the wire
   d. both A and B
   e. None of the above is valid.

____ 9. The direction of the force on a current carrying wire located in an external magnetic field is which of the following?
   a. perpendicular to the current
   b. perpendicular to the field
   c. parallel to the wire
   d. Both choices A and B are valid.
   e. None of the above are valid.

____ 10. A horizontal wire of length 3.0 m carries a current of 6.0 A and is oriented so that the current direction is 50° S of W. The Earth's magnetic field is due north at this point and has a strength of 0.14×10^{-4} T. What is the size of the force on the wire?
   a. 0.28×10^{-4} N
   b. 2.5×10^{-4} N
   c. 1.9×10^{-4} N
   d. 1.6×10^{-4} N
   e. 5.9×10^{-4} N

____ 11. There is a current *I* flowing in a clockwise direction in a square loop of wire that is in the plane of the paper. If the magnetic field *B* is toward the right, and if each side of the loop has length *L*, then the net magnetic torque acting on the loop is:



a. $2ILB$.
b. ILB.
c. IBL^2.
d. I^2BL.
e. zero.

____ 12. A deuteron, with the same charge but twice the mass of a proton, moves with a speed of 3.0×10^5 m/s perpendicular to a uniform magnetic field of 0.20 T. Which of the paths described below would it follow? ($q_p = 1.6 \times 10^{-19}$ C and $m_d = 3.34 \times 10^{-27}$ kg)
a. a straight line path
b. a circular path of 1.6 cm radius
c. a circular path of 3.1 cm radius
d. a circular path of 0.78 cm radius
e. a circular path of 0.39 cm radius

____ 13. The path of a charged particle moving parallel to a uniform magnetic field will be a:
a. straight line.
b. circle.
c. ellipse.
d. parabola.
e. hyperbola.

____ 14. If a charged particle is moving in a uniform magnetic field, its path can be:
a. a straight line.
b. a circle.
c. a helix.
d. any of the above.
e. none of the above.

____ 15. A proton with initial kinetic energy E is moving in circular motion in a uniform magnetic field. When it has completed one eighth of a revolution, what is its kinetic energy?
a. 1.4 E
b. 0.71 E
c. E
d. E/4
e. The value is not given.

____ 16. The current in a long wire creates a magnetic field in the region around the wire. How is the strength of the field at distance r from the wire center related to the magnitude of the field?
a. field directly proportional to r
b. field inversely proportional to r
c. field directly proportional to r^2
d. field inversely proportional to r
e. field directly proportional to r^3

____ 17. A superconducting wire carries a current of 10^4 A. Find the magnetic field at a distance of 1.0 m from the wire. ($\mu_0 = 4\pi \times 10^{-7}$ T·m/A)
a. 2×10^{-3} T
b. 8×10^{-3} T
c. 1.6×10^{-2} T
d. 3.2×10^{-2} T
e. 9.9×10^{-1} T

____ 18. Two long parallel wires 40 cm apart are carrying currents of 10 A and 20 A in the same direction. What is the magnitude of the magnetic field halfway between the wires?
a. 1.0×10^{-5} T
b. 2.0×10^{-5} T
c. 3.0×10^{-5} T
d. 4.0×10^{-5} T
e. 5.0×10^{-5} T

____ 19. Two long parallel wires 40 cm apart are carrying currents of 10 A and 20 A in the opposite direction. What is the magnitude of the magnetic field halfway between the wires?
a. 1.0×10^{-5} T
b. 2.0×10^{-5} T
c. 3.0×10^{-5} T
d. 4.0×10^{-5} T
e. 5.0×10^{-5} T

____ 20. Two parallel conductors are carrying currents in the same direction. The currents are non-zero and not necessarily equal. The magnitude of the magnetic field midway between them is 40 μT. If one of the currents then has its direction reversed, what is the resulting magnitude of the magnetic field midway between them?
a. a value greater than 40 μT
b. 40 μT
c. a value less than 40 μT
d. 0 μT
e. It could be any value.

____ 21. Consider two long, straight parallel wires, each carrying a current I. If the currents are flowing in opposite directions:
a. the two wires will attract each other.
b. the two wires will repel each other.
c. the two wires will exert a torque on each other.
d. neither wire will exert a force on the other.
e. more information is needed.

____ 22. Two parallel wires are separated by 0.25 m. Wire A carries 5.0 A and Wire B carries 10 A, both currents in the same direction. The force on 0.80 m of Wire A is:
a. 3.2×10^{-5} N.
b. 2.6×10^{-5} N.
c. 1.6×10^{-5} N.
d. less than 1.0×10^{-5} N.
e. more than 1.0×10^{-4} N.

____ 23. Two insulated current-carrying straight wires of equal length are arranged in the lab so that Wire A carries a current northward and Wire B carries a current eastward, the wires crossing at their midpoints separated only by their insulation. Which of the following statements are true?
a. The net force on Wire B is southward.
b. The net force on Wire A is westward.
c. There are no forces in this situation.
d. There are forces, but the net force on each wire is zero.
e. The net force on Wire A is upward.

____ 24. A uniform 4.5-T magnetic field passes perpendicularly through the plane of a wire loop 0.10 m^2 in area. What flux passes through the loop?
a. 5.0 $T \cdot m^2$
b. 0.45 $T \cdot m^2$
c. 0.25 $T \cdot m^2$
d. 0.135 $T \cdot m^2$
e. 0.15 $T \cdot m^2$

____ 25. A loop of area 0.250 m^2 is in a uniform 0.020 0-T magnetic field. If the flux through the loop is 3.83×10^{-3} $T \cdot m^2$, what angle does the normal to the plane of the loop make with the direction of the magnetic field?
a. 40.0°
b. 50.0°
c. 37.5°
d. 45.5°
e. This is not possible.

____ 26. The principle or law that says "an induced emf in a circuit loop produces a current whose magnetic field opposes further change of magnetic flux" is credited to:
a. Faraday.
b. Lenz.
c. Ampere.
d. Volta.
e. Maxwell.

____ 27. A square coil, enclosing an area with sides 2.0 cm long, is wrapped with 2 500 turns of wire. A uniform magnetic field perpendicular to its plane is turned on and increases to 0.25 T during an interval of 1.0 s. What average voltage is induced in the coil?
a. 0.25 V
b. 0.12 V
c. 2.0 V
d. 2.5 V
e. 1.8 V

____ 28. A bar magnet is falling through a loop of wire with constant velocity. The south pole enters first. As the magnet leaves the wire, the induced current (as viewed from above):
a. is clockwise.
b. is counterclockwise.
c. is zero.
d. is along the length of the magnet.
e. More information is needed.

____ 29. 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. 70 mA
b. 140 mA
c. 500 mA
d. 800 mA
e. 900 mA

____ 30. Two loops of wire are arranged so that a changing current in one will induce a current in the other. If the current in the first is increasing clockwise by 1.0 A every second, the induced current in the second loop will:
a. be increasing counterclockwise.
b. stay constant.
c. increase clockwise also.
d. stay zero.
e. be decreasing by 1.0 A every second.

____ 31. If a bar magnet is falling through a loop of wire, the induced current in the loop of wire sets up a field which exerts a force on the magnet. This force between the magnet and the loop will be attractive when:
a. the magnet enters the loop.
b. the magnet is halfway through.
c. the magnet is leaving the loop.
d. never.
e. all the time.

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Answer Section

MULTIPLE CHOICE

1. C
2. B
3. C
4. C
5. E
6. B
7. E
8. D
9. D
10. D
11. C
12. C
13. A
14. D
15. C
16. B
17. A
18. A
19. C
20. A
21. B
22. A
23. D
24. B
25. A
26. B
27. A
28. B
29. C
30. B
31. C