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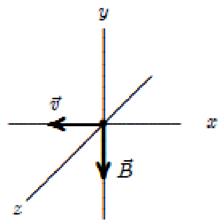
Name: ______________________ **Date:** __________

Quiz name: AP Physics 2 - Test 06 - Electromagnetism Pt. 1

1. An electron moves in the negative x direction, through a uniform magnetic field in the negative y direction. The magnetic force on the electron is



- (A) +x
- (B) +y
- (C) -y
- (D) +z
- (E) -z

2. The magnetic force on a charged particle is in the direction of its velocity if

- (A) it is moving in the direction of the field
- (B) it is moving opposite to the direction of the field
- (C) it is moving perpendicular to the field
- (D) it is moving in some other direction
- (E) never

3. A magnetic field exerts a force on a charged particle:

- (A) always
- (B) never
- (C) if the particle is moving across the field lines
- (D) if the particle is moving along the field lines
- (E) if the particle is at rest

4. A magnetic field CANNOT

- (A) exert a force on a charged particle
- (B) change the velocity of a charged particle
- (C) change the momentum of a charged particle
- (D) change the kinetic energy of a charged particle
- (E) change the trajectory of a charged particle

5. A proton (charge e), traveling perpendicular to a magnetic field, experiences the same force as an alpha particle (charge 2e) which is also traveling perpendicular to the same field. The ratio of their speeds, v_{proton}/v_{alpha}, is

- (A) 0.5
- (B) 1
- (C) 2
- (D) 4
- (E) 8

6. A helium atom that has lost its electrons (that's called a beta particle by the way!) is moving east in a region where the magnetic field is directed from south to north. It will be deflected

- (A) up
- (B) down
- (C) north
- (D) south
- (E) not at all

7. An electron travels due north through a vacuum in a region of uniform magnetic field B that is also directed due north. It will

- (A) be unaffected by the field
- (B) speed up
- (C) slow down
- (D) follow a right-handed corkscrew path
- (E) follow a left-handed corkscrew path

8. An electron and a proton are both initially moving with the same speed and in the same direction at 90° to the same uniform magnetic field. They experience magnetic forces, which are initially

- (A) identical
- (B) equal in magnitude but opposite in direction
- (C) in the same direction and differing in magnitude by a factor of 1840
- (D) in opposite directions and differing in magnitude by a factor of 1840
- (E) equal in magnitude but perpendicular to each other

9. Electrons are going around a circle in a counterclockwise direction on the surface of a page. At the center of the circle they produce a magnetic field that is:

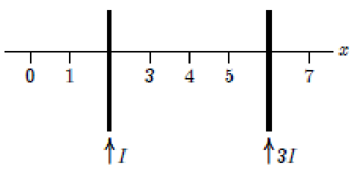
- (A) into the page
- (B) out of the page
- (C) to the left
- (D) to the right
- (E) zero

10. Lines of the magnetic field produced by a long straight wire carrying a current are

- (A) in the direction of the current
- (B) opposite to the direction of the current
- (C) outward from the wire
- (D) inward toward the wire
- (E) circles that are concentric with the wire

11. Two long straight current-carrying parallel wires cross the x axis and carry currents I and 3I in the same direction, as shown. At what location on the x-axis is the net magnetic field zero

- (A) 0
- (B) 1
- (C) 3
- (D) 5



Ⓔ 7

12. A long straight wire conductor is placed below a compass (the compass is on top) as shown in the top view figure. When a large conventional current flows in the conductor as shown, the N pole of the compass:

Ⓐ has its polarity reversed

Ⓑ points to the south

Ⓒ points to the west

Ⓓ points to the east

13. A charged particle with constant speed enters a uniform magnetic field whose direction is perpendicular to the particles velocity. The particle will:

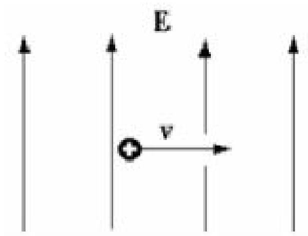
Ⓐ Speed up

Ⓑ Experience no change in velocity

Ⓒ Follow a parabolic arc

Ⓓ Follow a circular arc

14. A positively charged particle moves to the right. It enters a region of space in which there is an electric field directed up the plane of the paper as shown. In which direction does the magnetic field have to point in this region so that the particle maintains a constant velocity?



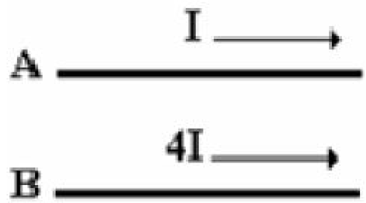
Ⓐ into the plane of the page

Ⓑ out of the plane of the page

Ⓒ to the right

Ⓓ to the left

15. Two parallel wires are carrying different electric current in the same direction as shown. How does the magnitude of the force of A from B compare to the force of B from A



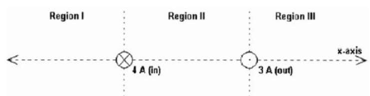
Ⓐ $F_{B \text{ on } A} = (1/4)\, F_{A \text{ on } B}$

Ⓑ $F_{B \text{ on } A} = (2)\, F_{A \text{ on } B}$

Ⓒ $F_{B \text{ on } A} = (1/2)\, F_{A \text{ on } B}$

Ⓓ $F_{B \text{ on } A} = F_{A \text{ on } B}$

16. Two very long current–carrying wires are shown end on in the figure. The wire on the left has a 4A current going into the plane of the paper and the wire on the right has a 3A current coming out of the paper. Disregarding the case of x approaching ∞, in which region(s) could the magnetic field from these two wires add to zero on the x–axis.



Ⓐ Region I only

Ⓑ Region II only

Ⓒ Region III only

Ⓓ Regions I and III only

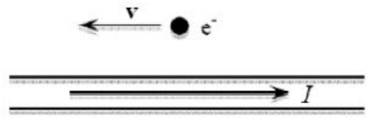
17. A wire has a conventional current I directed to the right. At the instant shown in the figure, an electron has a velocity directed to the left. The magnetic force on the electron at this instant is

Ⓐ directed toward the top of the page.

Ⓑ directed toward the bottom of the page.

Ⓒ directed out of the plane of the page.

Ⓓ directed into the plane of the page.



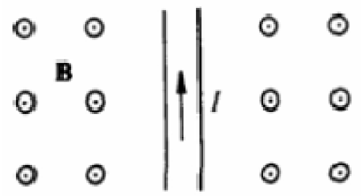
18. A wire in the plane of the page carries a current directed toward the top of the page as shown. If the wire is located in a uniform magnetic field B directed out of the page, the force on the wire resulting from the magnetic field is

Ⓐ directed to the left

Ⓑ directed out of the page

Ⓒ directed to the right

Ⓓ zero



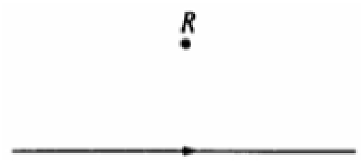
19. The direction of the magnetic field at point R caused by the current I in the wire shown is

Ⓐ to the left

Ⓑ to the right

Ⓒ into the page

Ⓓ out of the page



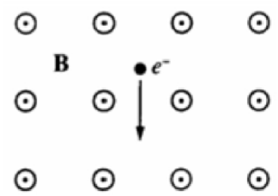
20. An electron is in a uniform magnetic field B that is directed out of the plane of the page, as shown. When the electron is moving in the plane of the page in the direction indicated by the arrow, the force on the electron is directed

Ⓐ toward the right

Ⓑ out of the page

Ⓒ into the page

Ⓓ toward the top of the page



21. Two very long parallel wires carry equal currents in the same direction into the page, as shown. At point P, which is 10 centimeters from each wire, the magnetic field is

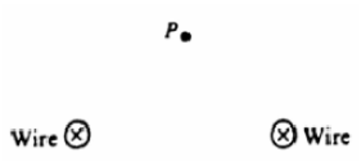
Ⓐ zero

Ⓑ directed into the page

Ⓒ directed out of the page

Ⓓ directed to the right

Ⓔ directed to the left



A proton traveling with speed v enters a uniform electric field of magnitude E, directed parallel to the plane of the page, as shown in the figure. There is also a magnetic force on the proton that is in the direction opposite to that of the electric force.

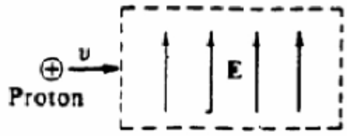
22. Which of the following is a possible direction for the magnetic field?

A. Down

B. Up

C. Out of the page

D. Into the page



23. The currents in three parallel wires, X, Y, and Z, each have magnitude I and are in the directions shown. Wire y is closer to wire X than to wire z. The magnetic force on wire y is

A. zero

B. into the page

C. out of the page

D. toward the left

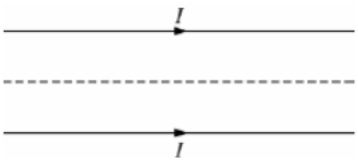
24. Two long, straight, parallel wires in the plane of the page carry equal currents I in the same direction, as shown above. Which of the following correctly describes the forces acting on the wires and the resultant magnetic field at points along the dotted line midway between the wires?

A. Force: Attractive
Field: Not zero

B. Force: Attractive
Field: Zero

C. Force: Repulsive
Field: Not zero

D. Force: Repulsive
Field: Zero



25. What is a paramagnetic material?

A. A material which is exhibits very strong magnetic effects.

B. A material which is exhibits very weak magnetic effects.

C. A material which is exhibits no magnetic effects.

26. What is a ferromagnetic material?

A. A material which is exhibits very strong magnetic effects.

B. A material which is exhibits very weak magnetic effects.

C. A material which is exhibits no magnetic effects.

27. Compared to the magnetic field at point A, the magnetic field at point B is

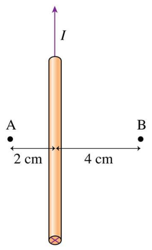
A. Half as strong, same direction.

B. Half as strong, opposite direction.

C. One-quarter as strong, same direction.

D. One-quarter as strong, opposite direction.

E. Can't compare without knowing I.



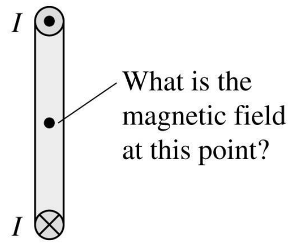
28. The following diagram shows a current loop perpendicular to the page; the view is a "slice" through the loop. The direction of the current in the wire at the top and at the bottom is shown. What is the direction of the magnetic field at a point in the center of the loop?

Ⓐ To the left

Ⓑ Up

Ⓒ To the right

Ⓓ Down



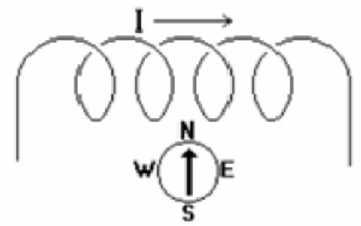
29. A compass is placed near a coil of wire. A conventional electrical current is then run through the coil from left to right as shown. This will cause the North pole of the compass to:

Ⓐ point toward the left

Ⓑ point toward the right

Ⓒ point toward the bottom of the paper

Ⓓ not move since the magnetic field of the coil is into the paper



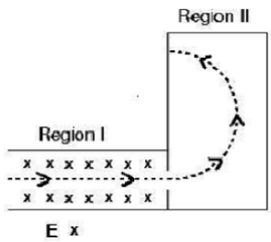
30. An electron moves in the plane of the page through two regions of space along the dotted-line trajectory shown in the figure. There is a uniform electric field in Region I directed into the plane of the page (as shown). There is no electric field in Region II. What is a necessary direction of the magnetic field in regions I and II? Ignore gravitational forces.

Ⓐ Region I: Toward the bottom of the page
Region II: Up on the page

Ⓑ Region I: Toward the top of the page
Region II: Into the page

Ⓒ Region I: Toward the top of the page
Region II: Out of the page

Ⓓ Region I: Toward the bottom of the page
Region II: Out of the page



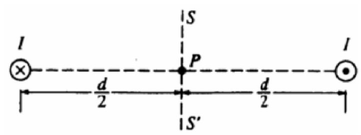
31. Two long, parallel wires are separated by a distance d, as shown. One wire carries a steady current I into the plane of the page while the other wire carries a steady current I out of the page. At what points in the plane of the page and outside the wires, besides points at infinity, is the magnetic field due to the currents zero?

Ⓐ Only at point P

Ⓑ At all points on the line SS'

Ⓒ At all points on the line connecting the two wires

Ⓓ At no points



32. A charged particle is projected with its initial velocity perpendicular to a uniform magnetic field. The resulting path is

Ⓐ a spiral

Ⓑ a circle

Ⓒ a straight line parallel to the field

Ⓓ a straight line perpendicular to the field

33. A charged particle is projected with its initial velocity parallel to a uniform magnetic field. The resulting path is

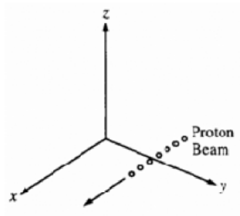
Ⓐ a spiral

Ⓑ a circle

C a straight line parallel to the field

D a straight line perpendicular to the field

34. A beam of protons moves parallel to the x-axis in the positive x-direction, as shown, through a region of crossed electric and magnetic fields balanced for zero deflection of the beam. If the magnetic field is pointed in the positive y-direction, in what direction must the electric field be pointed?



A Negative y-direction

B Positive z-direction

C Negative z-direction

D Negative x-direction