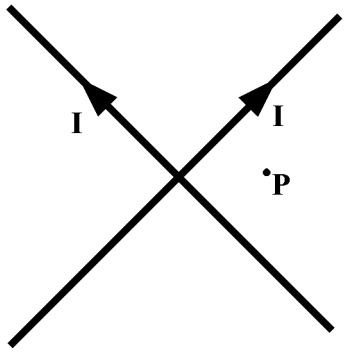
1. Two long straight intersecting wires carry currents *I* in the directions shown.



Which direction is the magnetic field pointed at the point *P*?

A) into the page

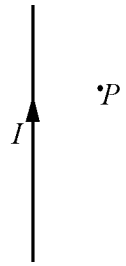
B) out of the page

C) towards the top of the page

D) towards the bottom of the page

E) the magnetic field at point P is zero.

2.



The direction of the magnetic field at point *P* due to the current *I* in the wire show above is

A) to the left

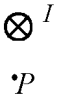
B) to the right

C) into the page

D) out of the page

E) toward the top of the page

3.



The direction of the magnetic field at point *P* due to the current *I* in the wire shown above is

A) to the left

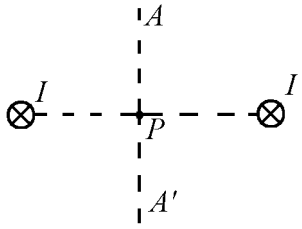
B) to the right

C) toward the top of the page

D) toward the bottom of the page

E) into the page

4.



Two long, straight, parallel wires are separated by a distance *d*, as shown above. They each carry a steady current *I* into the page. At what points in the plane of the page and outside the wires, besides the points at infinity is the magnetic field due to the currents zero.

A) Only at point *P*

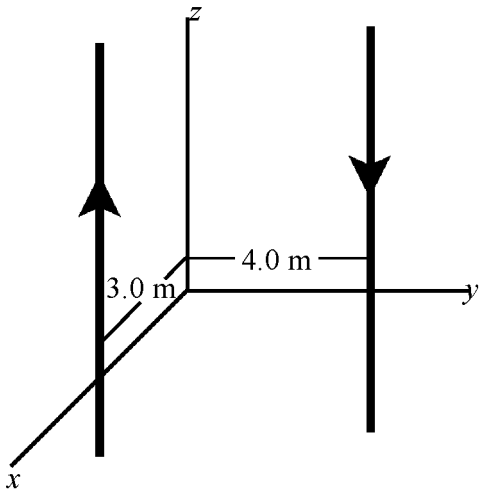
B) At all points on the line *AA′*

C) At all points on the line connecting the two wires

D) At all points on a circle of radius 2*d* centered at point *P*

E) At no points

5. The diagram below shows two wires running parallel to the *z*-axis. One carries a current *I* towards the top of the page and intersects the *x*-axis at a distance of 3.0 meters from the origin. The other carries a current *I* towards the bottom of the page and intersects the *y*-axis at a distance of 4.0 meters from the origin.



What is the magnitude of the magnetic field at the origin?

A) 0

B) $\frac{1}{12}f_0 I$

C) $\frac{25}{144}f_0 I$

D) $\frac{1}{5}f_0 I$

E) $\frac{7}{12}f_0 I$

6. The magnetic field due to a long straight wire at a distance *d* from it has a magnitude *B*. If the current in the wire is doubled, the magnetic field at a distance *d* would be.

A) $\frac{1}{4}B$

B) $\frac{1}{2}B$

C) B

D) $2B$

E) $4B$

7. Which of the following are true about magnetic forces and fields

I. Magnetic field lines are always perpendicular to electric field lines.
II. Magnetic field lines are always perpendicular to magnetic force lines.
III. Magnetic field lines are always parallel to magnetic force lines.

A) I only

B) II only

C) III only

D) I and II only

E) I and III only

8. Which of the following are true about electromagnetic forces and fields?

I. The magnetic field lines due to a current-carrying wire radiate away from the wire.
II. Electric field lines due to a current-carrying wire circle the wire and their direction is determined by the right hand rule.
III. Magnetic force vectors and electric force vectors for a charged particle always point in opposite directions.

A) III only

B) I and II only

C) I and III only

D) I, II, and III

E) none of the above are true

9. Which of the following statements is true about magnetic forces and fields?

A) The magnetic field lines are always parallel to the magnetic force lines.

B) The magnetic field lines are always parallel to the velocity vector.

C) The magnetic force can never change the velocity vector of a particle.

D) The magnetic field from a current-carrying wire is related to the inverse square of the distance from the wire.

E) A charged particle can move through a magnetic field without feeling a magnetic force.

10. A long straight wire carries a current of 3 A. Find the magnitude of the magnetic field 6 cm from the wire.

A) 1×10^{-6} T

B) 2×10^{-6} T

C) 1×10^{-5} T

D) 2×10^{-5} T

E) 1×10^{-4} T

11. A long straight wire carries a current of 1.5 A. Find the force on a proton traveling at a distance of 10 cm from the wire in the direction of current flow, if its velocity is $2 \rfloor 10^5$ m/s.

A) 9.6×10^{-26} T

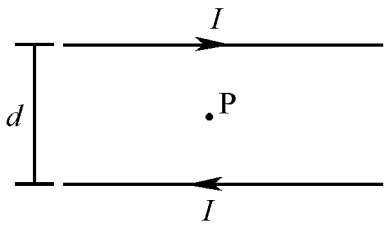
B) 4.8×10^{-20} T

C) 9.6×10^{-20} T

D) 4.8×10^{-13} T

E) 9.6×10^{-13} T

12.



As shown above, point *P* is midway between two long, straight, parallel wires a distance *d* apart. Wire *A* has current *I* running to the right, Wire *B* has current *I* running to the left. Find the magnetic field at point *P*.

A) $\frac{\mu_0 I}{2d}$ out of the page

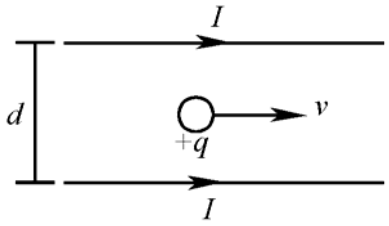
B) $\frac{2\mu_0 I}{\pi d}$ out of the page

C) 0

D) $\frac{\mu_0 I}{2\pi d}$ into the page

E) $\frac{2\mu_0 I}{\pi d}$ into the page

13.



Two parallel, straight, long wires a distance *d* apart each carry a current *I* in the same direction. A particle with charge +*q* is traveling midway between and parallel to the wires at velocity *v*. The force on the particle is equal to

A) $2\mu_0 Iqv \times \frac{1}{\pi d}$ upward, in the plane of the page

B) $2\mu_0 Iqv \times \frac{1}{\pi d}$ downward, in the plane of the page

C) $2\mu_0 Iqv \times \frac{1}{\pi d}$ out of the page

D) $2\mu_0 Iqv \times \frac{1}{\pi d}$ into the page

E) zero

14. Near a long, straight wire carrying a current *I*, the lines of magnetic force appear as

A) straight lines parallel to the wire

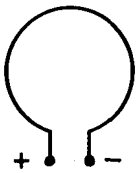
B) straight lines perpendicular to the wire

C) circles in a plane perpendicular to the wire

D) circles in a plane parallel to the wire

E) parabolas in a plane parallel to the wire

15.



A piece of wire is bent into a loop and a potential difference applied to its ends as shown in the diagram above. The magnetic field near the center of the loop is

A) directed into the page

B) directed out of the page

C) directed towards the left

D) directed towards the right

E) zero

16. A current carrying wire is bent into a square loop and is placed perpendicular to a magnetic field coming out the page. The motion of the wire will be

A) into the page and to the left

B) out of the page

C) downward and into the page

D) there is no motion as the forces are in equilibrium

E) upward, to the left, and out of the page

17. If the resistance of a long straight wire is doubled and the voltage remains constant, the magnetic field produced by the wire

A) increased by a factor of 2

B) decreases by a factor of 2

C) increase by a factor of 4

D) decreases by a factor of 4

E) the magnetic field is not influenced by a change in resistance

18. A charged particle is a certain distance away from a current-carrying wire. The particle is moving at a constant velocity, perpendicular to the magnetic field produced by the wire. If the distance from the wire is doubled and the velocity of the particle is halved, the force on the particle

A) increases by a factor of 4

B) increases by a factor of 2

C) remains the same

D) decreases by a factor of 2

E) decreases by a factor of 4

19. A charged particle is a certain distance away from a current-carrying wire. The particle is moving at a constant velocity, perpendicular to the magnetic field produced by the wire. If the current traveling through the wire and the velocity of the particle are doubled, the force on the particle

A) decreases by a factor of 4

B) remains the same

C) increases by a factor of 2

D) increases by a factor of 4

E) increases by a factor of 8

20. A charged particle is a certain distance away from a current-carrying wire. The particle is moving at a constant velocity, perpendicular to the magnetic field produced by the wire. If the current in the wire is doubled and the velocity of the particle is halved, the force on the particle

A) increases by a factor of 8

B) increases by a factor of 4

C) increases by a factor of 2

D) remains the same

E) decreases by a factor 4

21. A charged particle is a certain distance away from a current-carrying wire. The particle is moving at a constant velocity, perpendicular to the magnetic field produced by the wire. If the current in the wire is doubled and the velocity and charge of the particle are halved, the force on the particle

A) is increased by a factor of 4

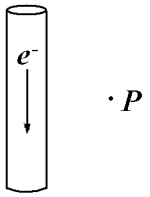
B) is increased by a factor of 2

C) remains the same

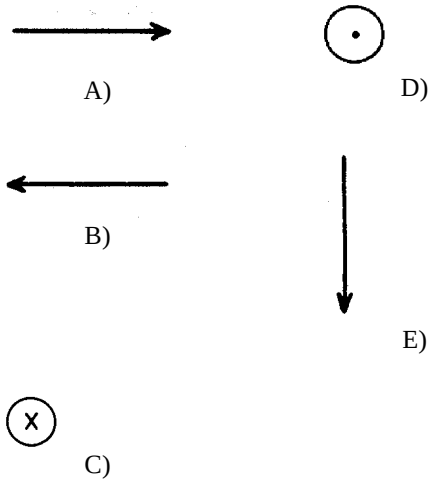
D) is decreased by a factor of 2

E) is decreased by a factor of 4

22. Base your answer to the following question on Base your answer to the following questions on the diagram below.



Which of the following shows the direction of the magnetic field at point *P*?



23. If two long parallel wires a distance *d* apart carry an identical current in the same direction, where is the magnetic field zero?

A) anywhere on the plane at a equal distance from the two wires

B) on the line an equal distance from the two wires in the plane of the wires

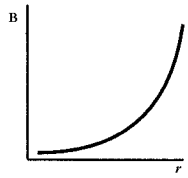
C) at a distance of *d* from both wires in the plane of the wires

D) there is no magnetic field produced by these wires

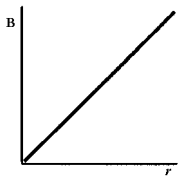
E) nowhere

24. Which of the following shows the relationship of the magnetic field *B* and the distance *r* from a current carrying wire?

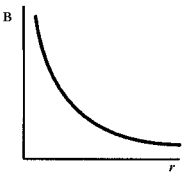
A)



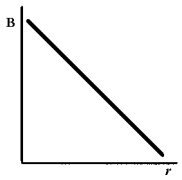
D)



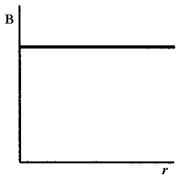
B)



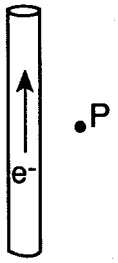
E)



C)



Base your answers to questions **25** and **26** on the diagram below.



25. If the current flows in this section of wire such that electrons move toward the top, what direction is the magnetic field at P?

A) toward the top of the page

B) toward the left

C) out of the page

D) into the page

E) toward the right

26. If the distance between P and the wire is halved, the magnetic field at P is

A) reduced by a factor of 4

B) halved

C) the same

D) doubled

E) increased by a factor of 4

Answer Key
[New Exam]

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

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