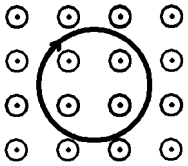
1. 

There is a clockwise current in a circular loop of wire in an external magnetic field directed out of the page as shown in the diagram above. The effect of the magnetic field is to make the loop

A) expand.

B) contract.

C) rotate in the plane of the page.

D) rotate perpendicularly to the page.

E) move into the page.

2. Two long parallel wires, fixed a distance d apart in space, each carry a current I. The force of attraction between them is F. Which other arrangement of currents in long parallel wires would produce the same force F?

A) a current of $3I$ and a distance of $3d$

B) a current of $3I$ and a distance of $9d$

C) a current of $3I$ and a distance of $6d$

D) a current of $6I$ and a distance of $3d$

E) a current of $9I$ and a distance of $3d$

3. Two particles, with equal charge and equal masses and velocities v_1 and v_2 travel in circular paths in a magnetic field with radii R_1 and R_2 respectively. Which of the following must be true?

A) The radii must be equal but the velocities might not be.

B) The velocities must be equal but the radii might not be.

C) Both the radii and the velocities must be equal.

D) $R_1v_1 = R_2v_2$

E) $R_1v_2 = R_2v_1$

4. Two long, straight, parallel wires 0.24 m apart are carrying the same current I in the same direction. The force per unit length felt by one wire from the other is 2 N/m. Find the value of the current I.

A) 1.55×10^{-4} A

B) 2.34×10^{-4} A

C) 1.55×10^{3} A

D) 2.34×10^{3} A

E) 4.55×10^{3} A

5. Two long, straight, parallel wires are placed a distance d apart. A current of I runs through each, in opposite directions. The force per unit length on each wire is

A) repulsive, magnitude $(\mu_0/2\pi)I^2/d$

B) repulsive, magnitude $(\mu_0/2\pi)I/d$

C) repulsive, magnitude $(\mu_0/2\pi)I^2/d$

D) attractive, magnitude $(\mu_0/2\pi)I/d$

E) attractive, magnitude $(\mu_0/2\pi)I^2/d^2$

6. Two long, straight, parallel wires are a distance d apart. Wire A carries a current of I, Wire B carries a current $2I$. The ratio of the force on Wire A to the force on Wire B is

A) 1:4

B) 1:2

C) 1:1

D) 2:1

E) 4:1

7. A wire in the plane of the page carries a current *I* directed toward the bottom of the page. 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

   A) directed to the left

   B) directed to the right

   C) directed into the page

   D) directed out of the page

   E) zero

8. A wire in the plane of the page carries a current *I* directed toward the bottom of the page. If the wire is located in a uniform magnetic field *B* directed toward the top of the page, the force on the wire resulting from the magnetic field is

   A) directed to the left

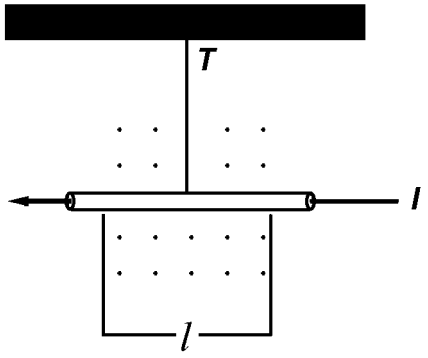
   B) directed to the right

   C) directed into the page

   D) directed out of the page

   E) zero

Base your answers to questions **9** and **10** on the diagram below.



9. In the picture above, a segment of length *l* of a current carrying wire is suspended by a string in a uniform magnetic field going out of the page. What is the tension *T* on the string?

   A) $mg - IBl$

   B) $mg + IBl$

   C) $mg - IB/2$

   D) $g + lB$

   E) $(BI - l/2) + mg$

10. If the direction of the magnetic field is reversed, a new tension *T* is established. What is the change in tension, with regards to the original *T*, after the field reversal?

   A) $+ 2IBl$

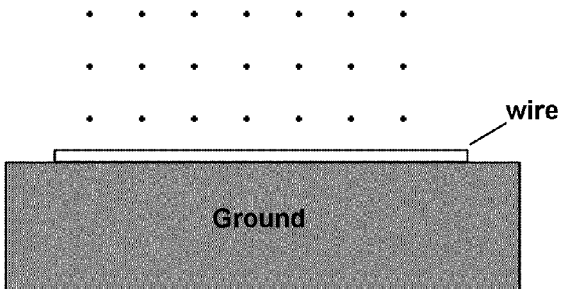
   B) $- 2IBl$

   C) $mg + 2IBl$

   D) $mg + IBl$

   E) $mg - 2IBl$

11.



A long straight wire of length 20 m with a mass per unit length of 0.25 kg/m is lying across the ground perpendicular to a uniform magnetic field of 4.5 T out of the page as shown in the picture above. How much, and in which direction, must current flow to reduce the normal force on the wire to 0 N?

A) 0.11 A from left to right

B) 0.11 A from right to left

C) 0.55 A from right to left

D) 1.1 A from right to left

E) 1.1 A from left to right

12. The force acting on long current carrying wire in a magnetic field is affected by all of the following **EXCEPT**

A) the length of strength of the magnetic field.

B) angle between the wire and the direction of the magnetic field.

C) the voltage across the wire.

D) the current in the wire.

E) the direction of current flow.

13. If two current carrying wires exert a force of 50 N on each other, what force will they feel if the distance between them is halved?

A) 12.5 N

B) 25 N

C) 50 N

D) 100 N

E) 200 N

14. If two current carrying wires exert a force of 10 N on each other, what force will they feel if the distance between them is doubled?

A) 2.5 N

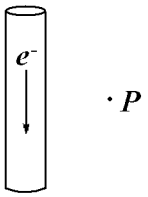
B) 5 N

C) 10 N

D) 20 N

E) 40 N

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



If wire is placed through point *P* parallel to the first wire, which of the following best describes the force on the new wire due to the original one?

A) It is non-zero.

B) It depends on the sign and magnitude of the charge on the new wire.

C) It depends on the magnitude and direction of the current in the new wire.

D) It is parallel to the magnetic field.

E) It is directed in the same plane as the wires.

16. Two long parallel wires are fixed at a distance d apart and each carry a current of I. The force of attraction between them is F. If the distance between the wires is doubled and the current in each of the wires is doubled, what is the new force of attraction between the wires?

A) $F/4$

B) $F/2$

C) F

D) $2F$

E) $4F$

17. Two long parallel wires carry unequal currents in opposite directions. One of the currents is much greater than the other. Compared to the force felt by the wire with the smaller current the force felt by the wire with the greater current is

A) smaller and in the same direction

B) smaller and in the opposite direction

C) equal and in the same direction

D) equal and in the opposite direction

E) greater and in the same direction

18. Two long parallel wires each carry a current I and are a distance $2d$ apart. If a third wire carrying no current is placed between the two wires at a distance d from each of the original wires, what is the force felt by the new wire?

A) 0

B) $f_0 I^2/2\pi d$

C) $f_0 I^2/\pi d$

D) $2f_0 I^2/\pi d$

E) $4f_0 I^2/\pi d$

19. What is the magnitude of the force per unit length on a long wire with charge density Ø from a wire that carries a current of 3 A and is a distance of 3 m away?

A) f_0Ø/2?

B) f_0Ø/6?

C) $3f_0$Ø/2?

D) f_0Ø/3

E) 0

Answer Key
Cyclotron MC Questions [Mar 28, 2011]

1. B
2. B
3. E
4. C
5. C
6. C
7. A
8. E
9. A
10. A
11. C
12. C
13. D
14. B
15. C
16. D
17. D
18. A
19. E

Name _____ Class _____ Date _____

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