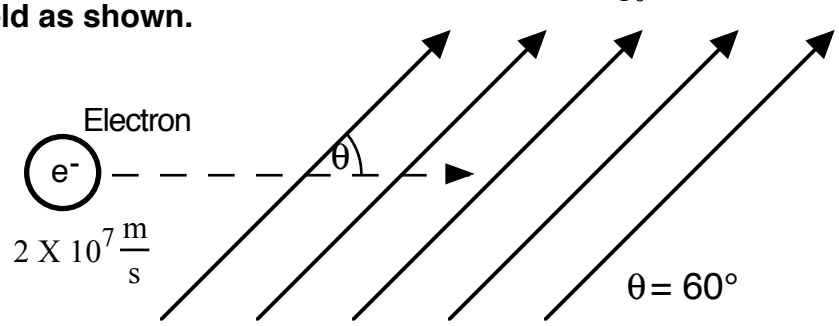
Magnetism note sheet

$q_e = 1.6 \times 10^{-19}\,C$

$M_e = 9.11 \times 10^{-31}\,kg$

$B = \frac{1}{10}\,T$

An electron enters a b-field as shown.

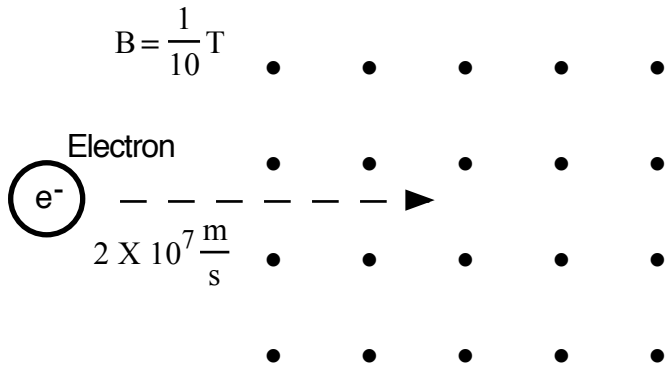


1 What force does the electron feel? (magnitude and direction)

2 What acceleration does the electron feel?

3 What radius does the electron travel in?

4 How much time does it take for the electron go around in a complete circle?



The electron is traveling perpendicular to the b-field.

Magnetism Worksheets

Note: for comparison purposes, the Earth's magnetic field is 0.005 T.

Do your work on a separate sheet of paper.

1. The wires leading to the home built in the mid-1990's can handle a maximum of 150 Amps. What is the magnetic field's magnitude and direction 1 cm above this wire if the wire's current runs from the bottom of the page to the top of the page? (Above means hovering above this piece of paper.)

2. An arc welder welds metal together using about 400 A. What is the b-field's direction and magnitude 10 cm below the wire the arc welder uses? (The wire's current travels from the top of the page to the bottom of the page.)

3. A bird flies from a power line while carrying a net charge of -112 C. The bird flies 55.0 m from east to west in 4.55 seconds. What is the magnitude of the b-field 0.500 m below the bird?

4. A car uses 545 A to get it started. If the wire that carries this current carries negative charges from this page's left sides to its right side, then what is the magnitude and direction of the magnetic field to the top of the page 15 cm away from the wire?

5. A hair dryer pulls 14.5 amps to operate when on high heat and high fan. The wire in the wall bringing the current to the dryer travels from the ground to the ceiling what is the magnitude and direction of the current of positive charges traveling upwards 1.00 mm away from this wire.

6. A lightning bolt delivers 20,000 A of electrons from the sky to the ground. If you are standing 11.5 meters east of the lightning strike, then what's the direction and magnitude of the b-field at your location?

Magnetism Worksheets

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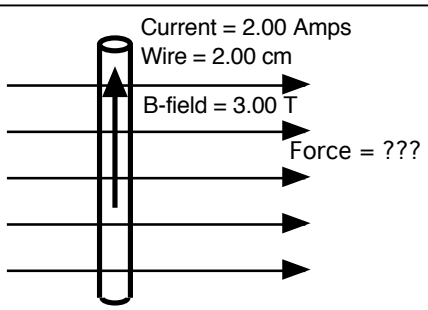

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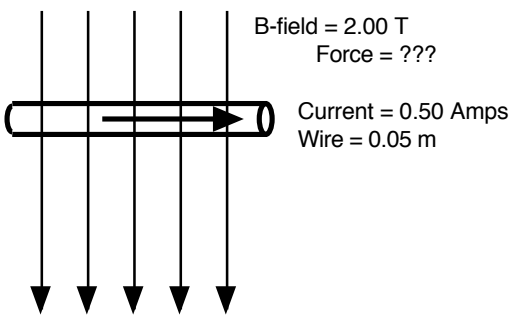

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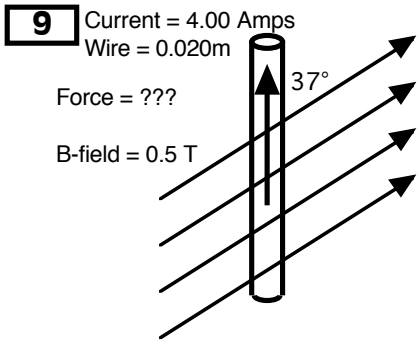

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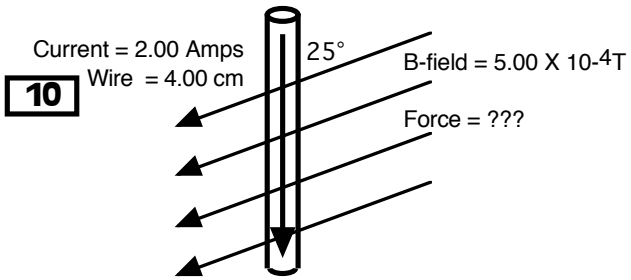

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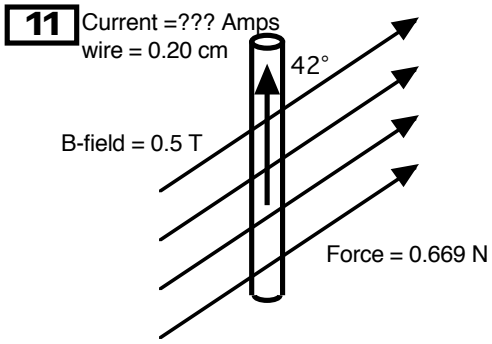

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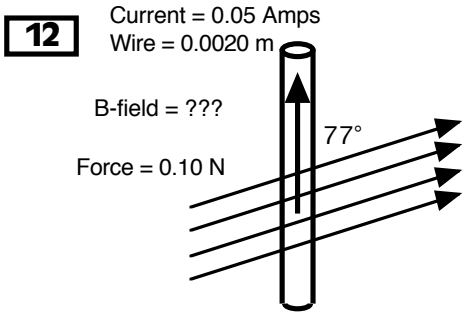

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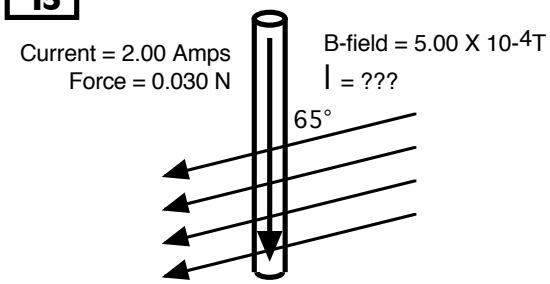

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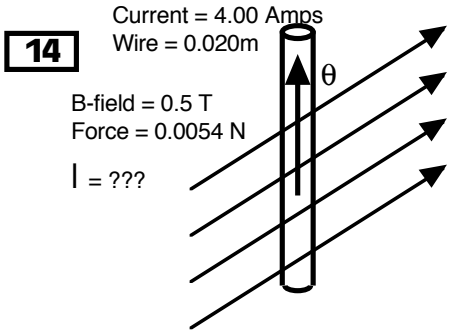

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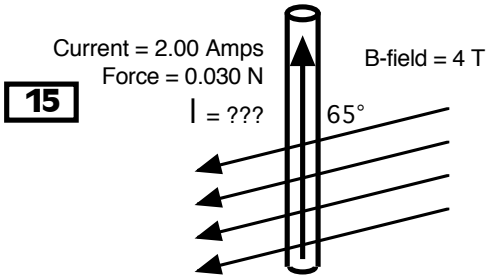

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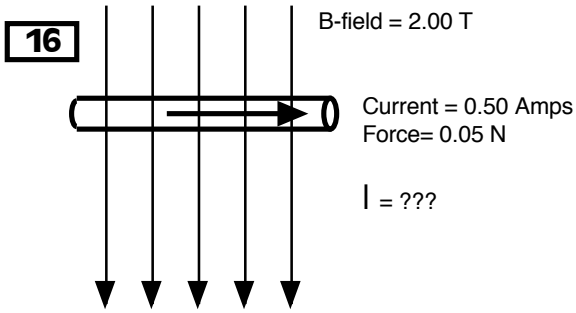
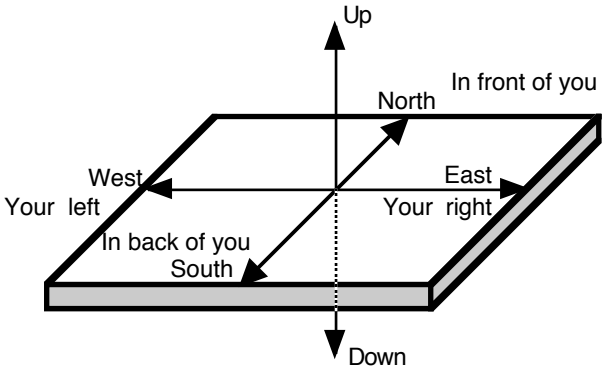
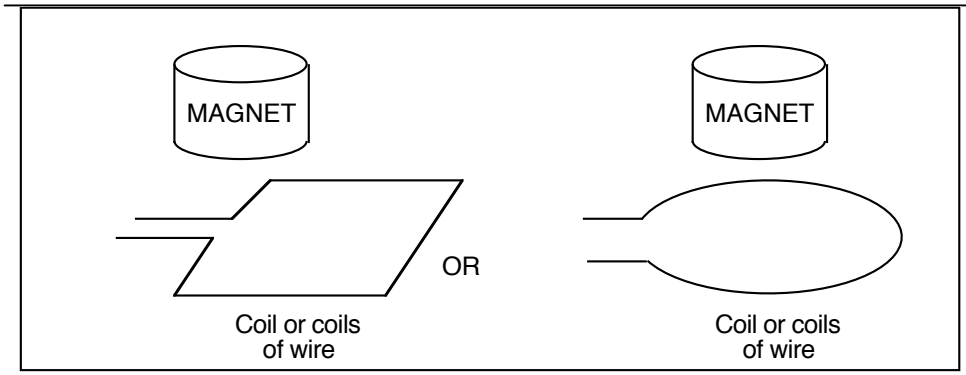


RULES, so you will understand the questions below.
"North" is in front of you.
"South" is behind of you.
"East" is to you right.
"West" is to you left.
"Up" is over your head.
"Down" is at your feet.



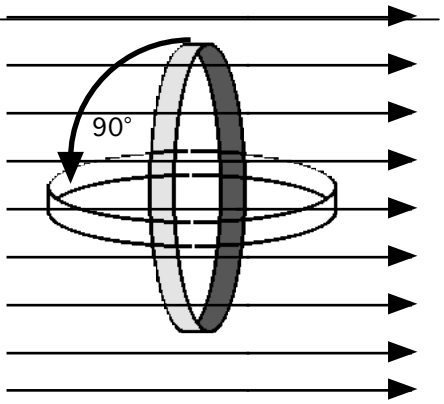
17. A current travels from east to west. A B-field travels from North to South. What is the direction of the force?
18. A current is traveling from north to south. A force pushes a wire east. What is the direction of the magnetic field?
19. A current is traveling from up to down. The B-field is traveling from North to South. What is the direction of the force on the current carrying wire?
20. A current travels from west to east. The B-field travels from east to west. What is the direction of the force on the wire?
21. A flow of positive ions travels west to east. The north pole of a magnet is up and the south pole is down. What is the direction of the force on the flow of charge?
22. A flow of electrons travel from north to south. A force pushes the flow of charge up. Where is the North pole of the magnetic field?
23. A flow of electrons travel from north to south. A force pushes the wire south. Where is the south pole of the magnetic field?
24. A flow positive ions travel from north to south. The south pole of a magnet is to the east and the north pole of a magnet is to the west. What direction is the force that pushes the flow of charged particles?
25. Electrons flow from east to west. They feel a force pulling them to the south. Where is the north pole of the magnetic field?
26. Electrons flow from north to south. The magnetic field points from down to up. Which direction is the force pointing?
27. The positive terminal of as battery is to your right. The negative terminal is to your left. When this battery is turned on, charge will flow by in front of you. The current carrying wire feels a force pushing it upwards. Where is the south pole of the magnetic field?
28. The positive terminal of as battery is above you. The negative terminal is at your feet. When this battery is turned on, charge will flow by in front of you. The magnetic field points from east to west. Which direction is the force pointing?



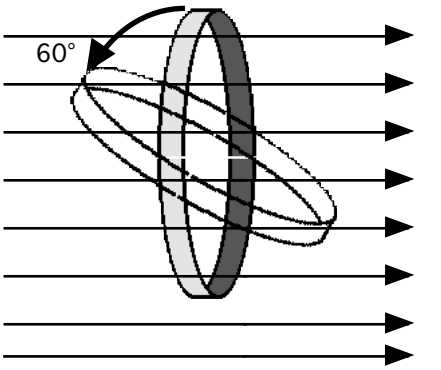
29. A coil is made up of 100 wraps of wire. The coil is a square 1 cm on each side. The b-field changes from 0.50 T to 2.50 T in 1/100 of a second by passing a magnet across the top of the coil. How much voltage is generated by this process?
30. A <u>circular</u> coil of wire is made of 1000 loops of wire. The b-field in the wire changes from 0.10 T to 0.30 T in 0.03 seconds. This generates a 5 volt difference in the coil. What is the AREA of the circular coil?
31. A rectangular coil with an area of 10 cm2 is made of 500 wraps of wire. What change in b-field is needed to create a 2 volt difference if the change is to occur in 1/10 of a second
32. A square coil is made up of 300 wraps of waire. The coil is 5.00 cm on each side. The b-field in the coil changes from 0.55 to 0.25 in 1/10 of a second. How much voltage is generated in the coil?
33. A circular coil made from 200 wraps of wire generates 2.0 volts when the b-field changes from 1.00 T to 2.5 T in 1/100 of a second. What is the radius of the coil.
34. A square coil is made from 2500 wraps of wire. The coil generates 5.0 volts when the b-field changes from 3.4 T to 1.1 T in 1/33 of a second. What is the length of each side of the square shaped coil?
35. A rectangular coil has one side that is 5.0 cm wide. It is made of 1500 wraps of wire. This coil generates 4000 volts when the b-field changes from 1.5 T to 1 T in 1/100 of a second. What is the length of the other side of the rectangle?
36. A coil with an area of 0.08 m2 generates a voltage of 8 volts when the b-field is changes in 1/10 of a second. What is the magnitude of the change if the magnetic field?
37. The pickup assembly of an electric guitar is a rectangular coil of wire made up of 700 wraps of wire. The rectangle is 1.0 cm by 7.0 cm. The b-field across the pickups change from 0.001 T to 0.0025T in 1/2000 of a second by a vibrating guitar string that. How much voltage is generated by the vibrating string?

29 (ANSWER: 0.020 V)
30. (ANSWER: 0.00075 V)
31. (ANSWER: 0.040 T)
32. (ANSWER: 2.25 V)
33. (ANSWER: 0.065 m)
34. (ANSWER: 0.0051 m)
35. (ANSWER: 1.1 m)
36 (ANSWER: 10.0 T
37. (ANSWER: 1.47 V

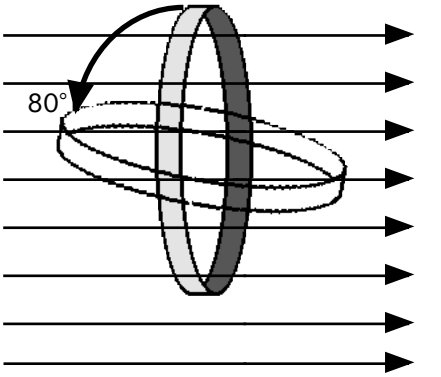
38. A looped single coil of wire has a radius of 5.5 cm. The wire is immersed perpendicular to a 0.66 Tesla b-field. The coil is rotated 90° in 2 seconds. What voltage in generated in the loop?



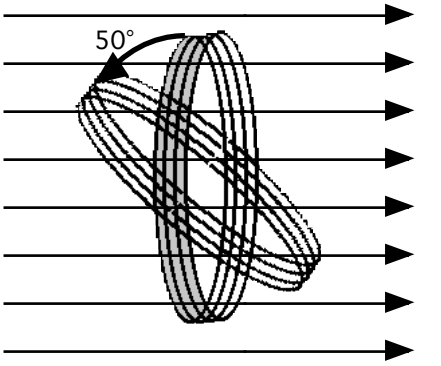
39. A looped single coil of wire has a radius of 7.5 cm. The wire is immersed perpendicular to a 1.54 Tesla b-field. The coil is rotated 60° in 0.50 seconds. What voltage in generated in the loop?



40. A looped single coil of wire is immersed perpendicular to a 12.5 T b-field. The coil is rotated 80° in 0.05 seconds. 0.10 volts is generated in the loop. If the loop is a circle then what is its radius?

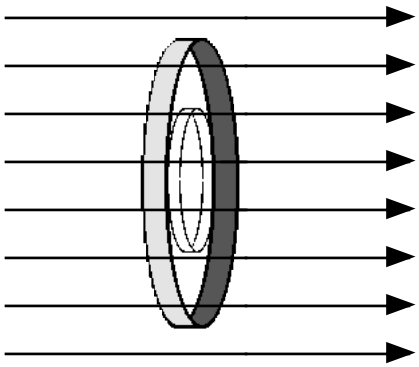


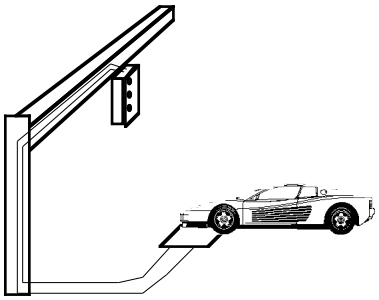
41. A circular coil of wire has a radius if 7.5 cm. The coil has 20 individual coils. The wire is immersed perpendicular to a 0.4 Tesla b-field. The coil is rotated 50° in 0.10 seconds. What voltage in generated in the coil?



42. A circular coil of wire has 300 individual coils. The wire is immersed perpendicular to a 20.2 T magnetic field. The coil is rotated 75° in 0.005 seconds. What is the radius of the coils if 1.5 volts are generated by this action.

43. A looped single coil of wire has a radius if 10.0 cm. The wire is immersed perpendicular to a 1.2 T magnetic field. The radius of the coil is reduced in 0.050 seconds. When this is done, the coil generates 0.0022 volts. What is the new radius of the coil.



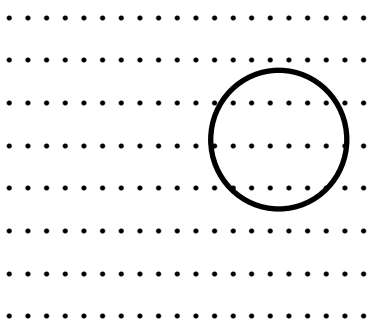


44. A current carrying wire is perpendicular to a magnetic field. The field strength is 100 N/Am. The current in the wire is 2.0 Amps. 0.37 m of the wire is in the magnetic field. What is the force on the wire?
45. A current carrying wire is perpendicular to a magnetic field. The field strength is 250 N/Am. The current in the wire is 5.5 Amps. 0.78 m of the wire is in the magnetic field. What is the force on the wire?
46. A current carrying wire is 53° to a magnetic field. The field strength is 25 T. The current in the wire is 5.5 Amps. 0.78 m of the wire is in the magnetic field. What is the force on the wire?
47. A current carrying wire is 15°to a magnetic field. The field strength is 15 T. The current in the wire is 1.5 Amps. 1.00 m of the wire is in the magnetic field. What is the force on the wire?
48. A current travels from east to west. What is the direction of the B-field above the wire?
49. A current is traveling from north to south. What is the direction of the B-field below the wire?
50. A current is traveling from up to down. What is the direction of the B-field to the right of the wire?
51. A current travels from west to east. what is the direction of the B-field above the wire?
52. A flow of positive ions travels west to east. What is the direction of the B-field above the flow?
53. A flow of electrons travel from north to south. What is the direction of the B-field to the right of the flow?
54. A flow of electrons travel from north to south. What is the direction of the B-field to the left of the flow?
55. What EMF is induced in a 6 cm long wire moving with a speed of 100 cm/s across a field of 200 N/Am?
56. What EMF is induced in a 0.020 cm long wire moving with a speed of 40 cm/s across a field of 1097 N/Am?
57. What EMF is induced in a 10 cm long wire moving with a speed of 4654 cm/s across a field of 1.2 T?
58. An EMF of 1.5 volts is induced in a wire 2.54 cm in length. The wire wire is traveling across a field of 1970 T. What is the speed of this wire?
59. An EMF of 45 volts is induced in a wire traveling at 11.5 m/s across a magnetic field. If the length of the wire is 60 cm, then what is the magnitude of the magnetic field?

Magnetism Worksheets …Determine the rotation of the current in the loop as it travels from the before to the after condition. (CW or CCW)

60.

BEFORE



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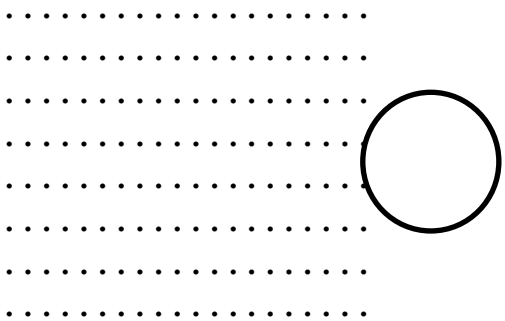

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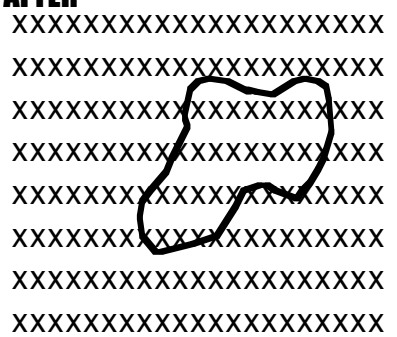

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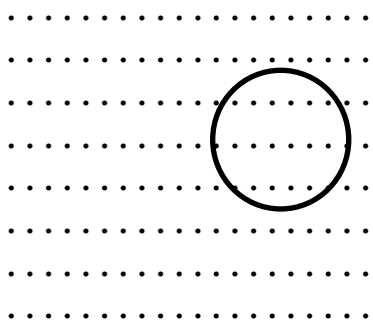

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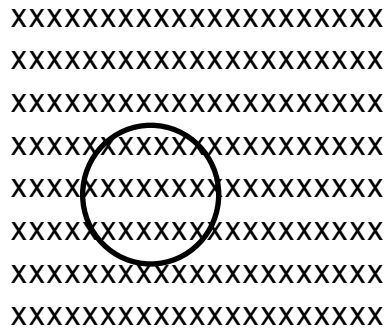

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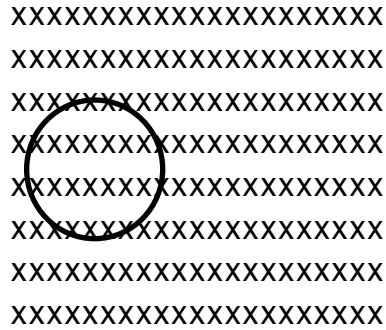

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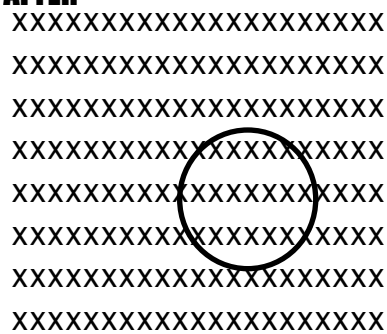

Magnetism Worksheets …Determine the rotation of the current in the loop as it travels from the before to the after condition. (CW or CCW)

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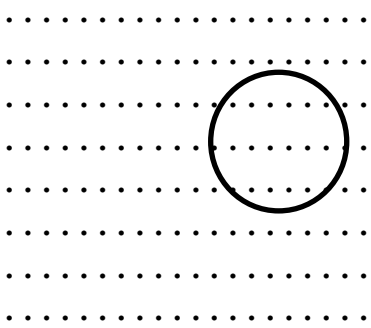

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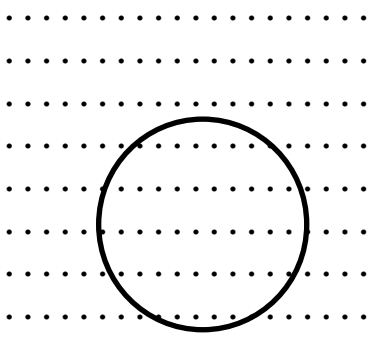

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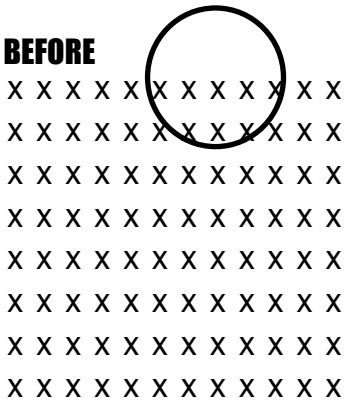

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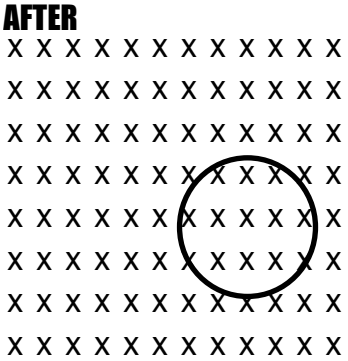

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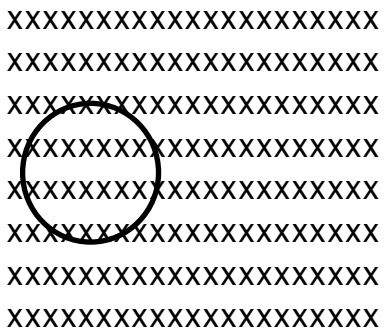

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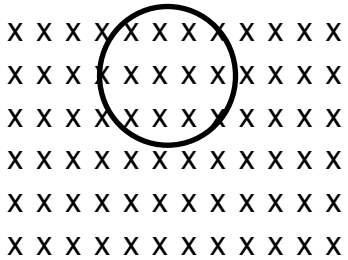

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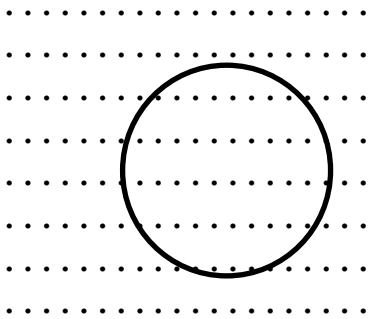

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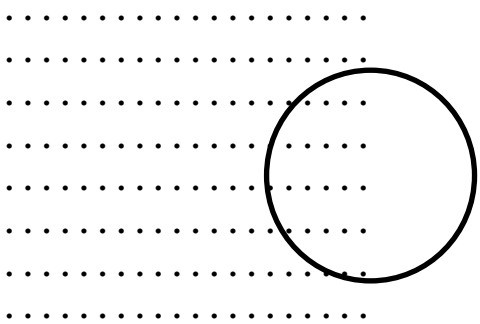

ANSWERS.

34	0.00314 v
35	0.0272 v
36	0.0124 m
37	0.504 v v
38	0.000729 m
39	0.0129 s
40	
41	3 coils
42	0.50 m/s
43	15.15 individual coils