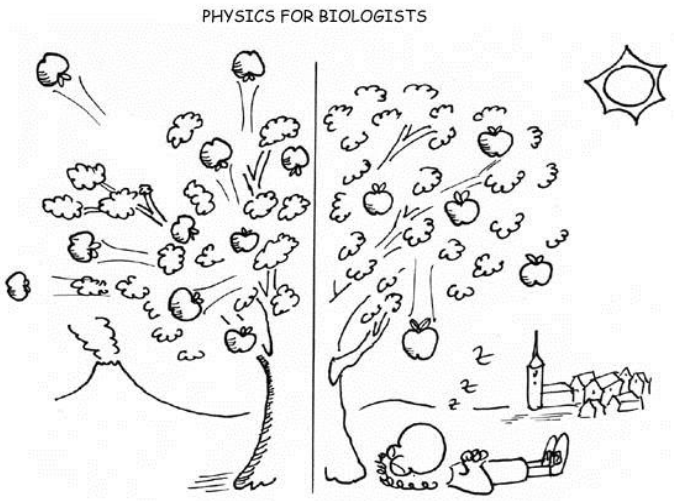
Name: _____ **Per.** _____

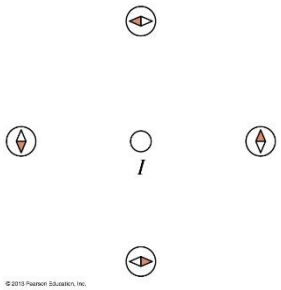


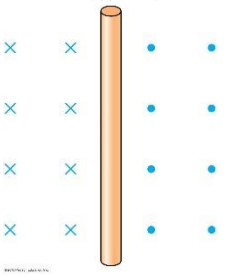
A long time ago the apple trees used to shoot the apples in all directions. Only those that did it downward got reproduced. Then, after millions years of natural selection and evolution, gravity was finally discovered.

Magnetism: Worksheet 2

We can summarize electricity, magnetism and gravity into equations one inch long, and that's the power of field theory. And so I said to myself: I will create a field theory of strings. And when I did it one day, it was incredible, realizing that on a sheet of paper I can write down an equation which summarized almost all physical knowledge.—Michio Kaku

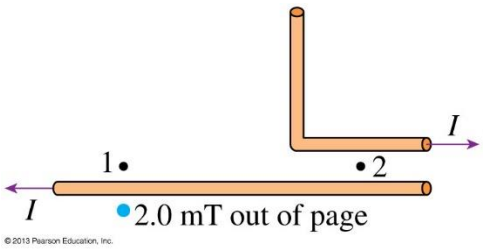
1. What is the current direction in the wire of the figure? Explain.

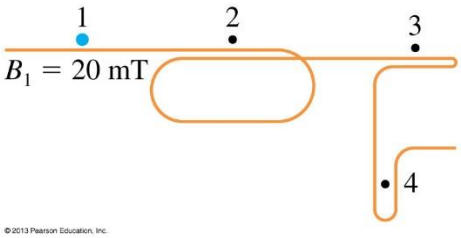




2. What is the current direction in the wire on the left? Explain.

3. Points 1 and 2 in the figure are the same distance from the wires as the point where B = 2.0 mT. What are the strength and direction of B at points 1 and 2?

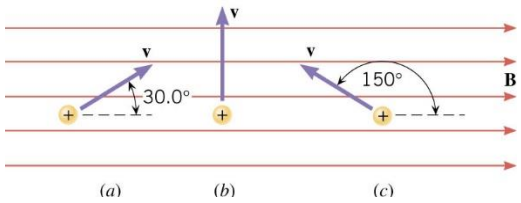




4. What is the magnetic field strength at points 2 to 4 in the figure? Assume that the wires overlap closely and that points 1 to 4 are equally distant from the wires.

5. At a certain location, the horizontal component of the earth's magnetic field is 2.5×10^{-5} T, due north. A proton moves eastward with just the right speed, so the magnetic force on it balances its weight. Find the speed of the proton.

6. A particle with a charge of +8.4 μC and a speed of 45 m/s enters a uniform magnetic field whose magnitude is 0.30 T. For each of the cases in the drawing, find the magnitude and direction of the magnetic force on the particle.



7. In New England, the horizontal component of the earth's magnetic field has a magnitude of 1.6×10^{-5} T. An electron is shot vertically straight up from the ground with a speed of 2.1×10^{6} m/s. What is the magnitude of the acceleration caused by the magnetic force? Ignore the gravitational force acting on the electron.

8. A magnetic field has a magnitude of 1.2×10^{-3} T, and an electric field has a magnitude of 4.6×10^{3} N/C. Both fields point in the same direction. A positive 18-μC charge moves at a speed of 3.1×10^{6} m/s in a direction that is perpendicular to both fields. Determine the magnitude of the net force that acts on the charge.

9. A straight wire 50 cm long conducts a 6.0 A current directed up out of the page. If the wire experiences a force of 0.24 N to the right due to a magnetic field perpendicular to its length, what is the magnitude and direction of the magnetic field?

10. A horizontal magnetic field of 2.0×10^{-3} T forms a 30˚ angle with a 0.75 m length of wire carrying a 15.0 A current. What is the force acting on the wire?