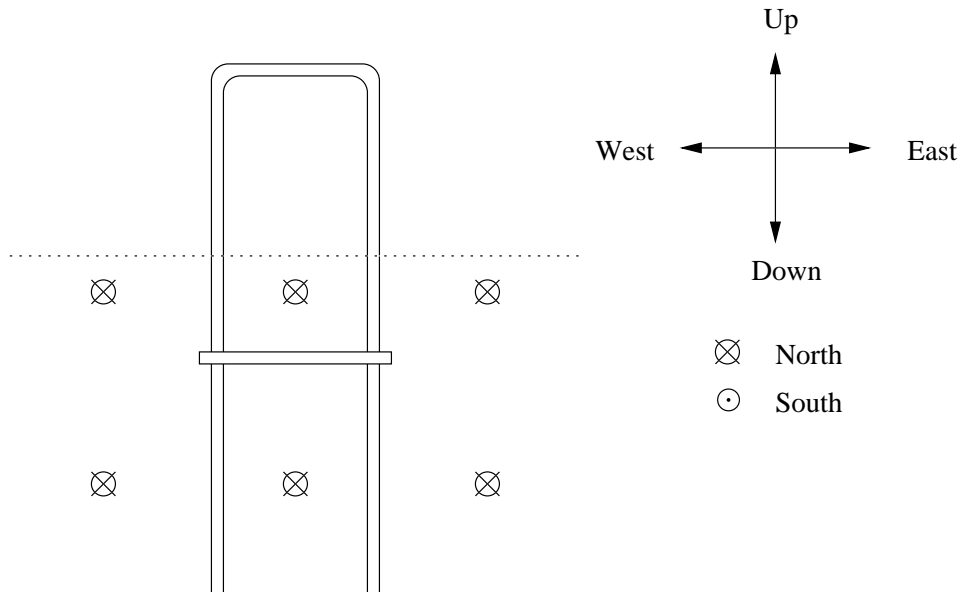




3. (4 points) Suppose you are interested in the effects of magnetic fields on fruitflies. Your sample of fruitflies is contained in a cell smaller than one cubic centimeter. Your experiment requires that the magnetic field point east at the place where the fruitflies are. Explain how you could produce a magnetic field pointing east in the laboratory.
  
  
  
  
  
  
  
  
  
  
4. (4 points) Student 1 and Student 2 both agree that a charged particle will go in a circle in a magnetic field. However, they disagree about what happens if the magnetic field is increased. Student 1 thinks that the radius of the circle will increase and Student 2 thinks the radius will decrease. Who is right and why?

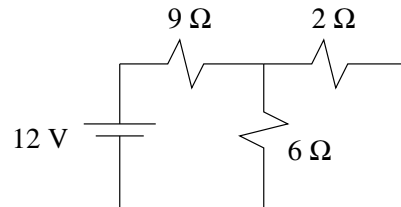
5. (4 points) Draw a loop of wire in the plane of the page. Imagine that a magnetic field is coming out of the page, but decreasing. In what direction is the induced magnetic flux? In what direction is the induced emf?

6. (4 points) A horizontal metal bar rides on a metal loop as shown in the figure. A magnetic field points north (into the page) in the region below the dotted line. The rails of the metal loop are fixed, but the horizontal metal bar is free to move on the rails. Gravity acts on the metal bar. Once the bar starts sliding downward, is there a magnetic force on the bar? If so, in what direction does it act? Will the acceleration of the bar be less than  $9.8 \text{ m/s}^2$ , equal to  $9.8 \text{ m/s}^2$ , or greater than  $9.8 \text{ m/s}^2$ ? How do you know?



## Problems

1. (8 points) Analyze the circuit below. Give the voltage across each resistor and the current through each resistor in the box provided.



	Voltage across	with high potential on which side? (left, right, top, bottom)	Current through	with current flowing toward what direction? (left, right, up,down)
9 Ω				
2 Ω				
6 Ω				

2. (8 points) Copper wire with a diameter of 1 mm is used to make a coil of 20 turns. The coil is circular and has diameter 10 cm. A magnetic field perpendicular to the plane of the coil points away from an observer. The magnetic field changes from 1 T to 0.5 T over a period of 5 s. Find the magnitude and direction of the induced emf.

3. (8 points) Three wires carry current. Each carries the same current of 2 A. The first and third wires carry current out of the page. The second wire carries current into the page. What is the magnitude and direction of the magnetic field at point A?

