

Activity 4-2

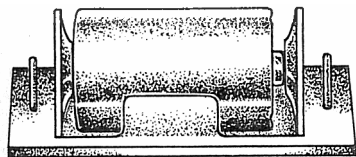
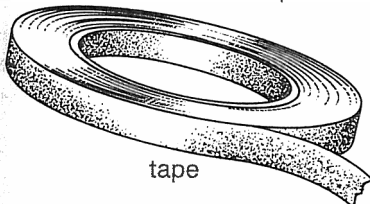
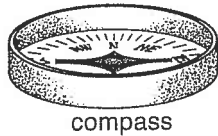
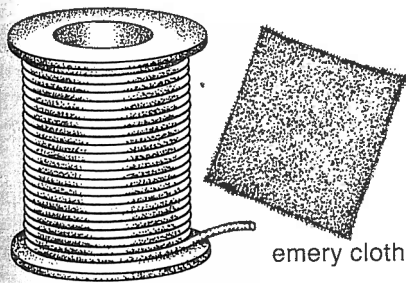
Making a Current Detector

Problem

How can you make a device that will detect and compare currents?

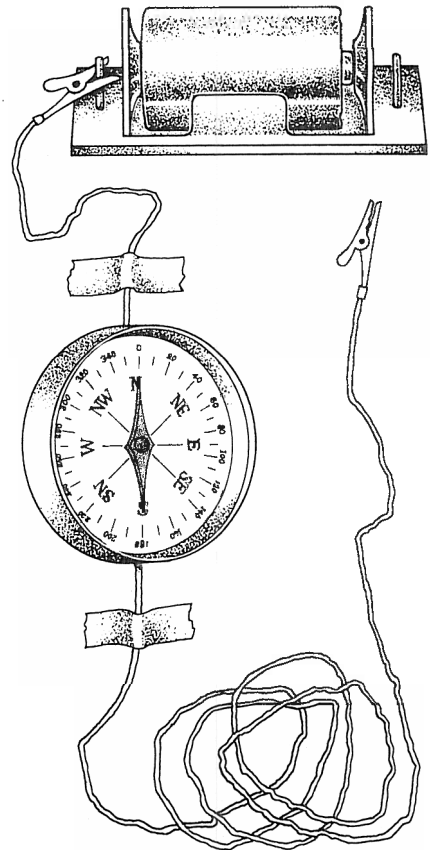
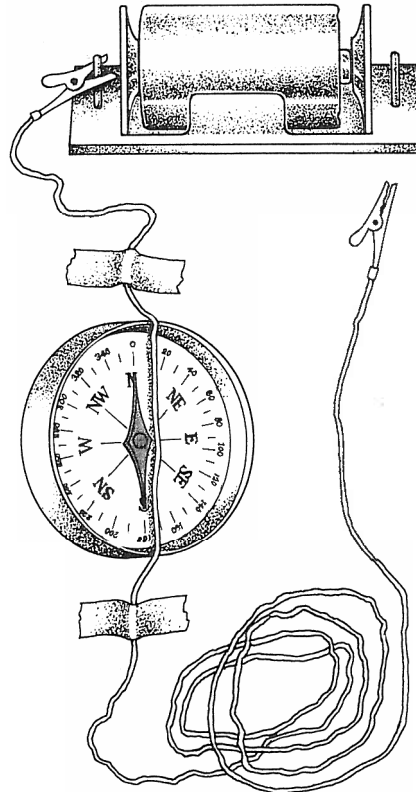
Materials

compass
2 m of insulated copper wire
(approximately 26 gauge)
piece of emery cloth (5 cm x
5 cm)
tape
D-size cell in holder
small lamp with 3 V bulb
2 connecting clips

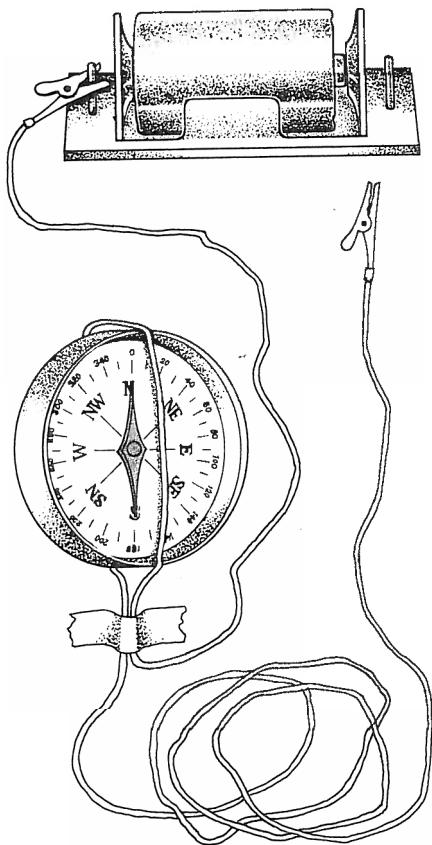


Procedure

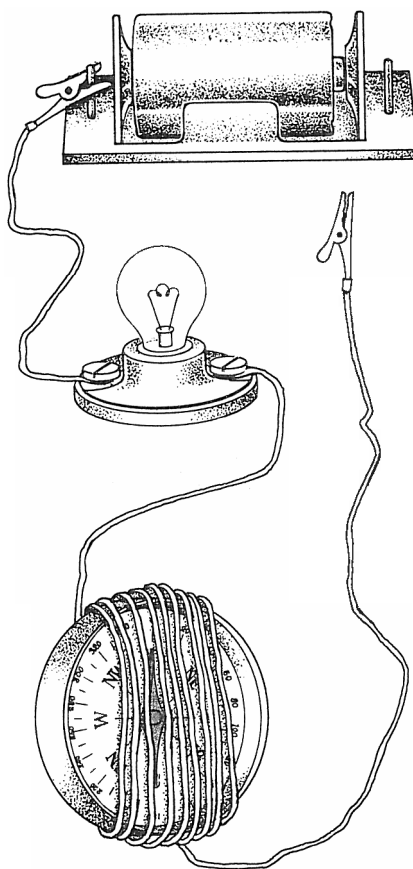
1. Using the emery cloth, remove about 2 cm of insulation from each end of the wire. Make a connecting wire by attaching a connecting clip to each end.
2. Place a section of the wire over the needle of the compass as shown below, so that both the wire and needle are aligned in a north-south direction. Tape the wire in place.
3. Briefly connect each end of the wire to a terminal of the cell until the needle comes to rest. Observe the position of the needle and then disconnect the wire from the cell.
4. Sketch or note how the wire and needle looked (a) before you connected the cell. (b) after you connected the cell.
5. Repeat Steps 3 and 4, reversing the connections of the ends of the wire to the cell.
6. Place the wire *under* the compass as shown below, but keep it aimed in a north-south direction. Repeat Steps 3 to 5, then continue with Step 7 on the next page.



7. Wrap a single turn of wire around the compass as shown below, lining up the coil of wire in a north-south direction.
8. Briefly connect the cell to the wire.
9. Sketch or note how much the needle is deflected from its original position.
10. Reverse the connections of the end of the wire to the cell and repeat Steps 8 and 9.



11. Wrapping first two, then five, then ten turns of wire around the compass, repeat Steps 8 and 9.
12. Cut the wire, bare the two new ends, and connect them as shown to a light bulb and a battery.



Analysis

1. What happened to the direction of the compass needle deflection when the wire was moved from over the compass to under it?
2. Did the deflection of the compass needle increase, decrease, or stay the same when
 - (a) more turns of wire were wrapped around the compass?
 - (b) a light bulb was inserted?

Further Analysis

3. What evidence suggests that current in a wire produces a magnetic effect around the wire?
4. How can this magnetic effect be increased?

Extension

5. Make a permanent version of your current detector.
6. How can you modify it to make it
 - (a) more sensitive, so you can detect weaker currents?
 - (b) less sensitive, so you can detect stronger currents?