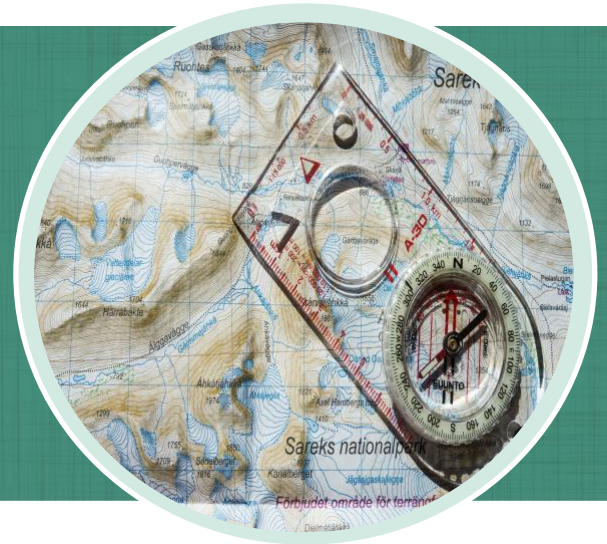


Building a Simple Ammeter

Electricity All Around Us
Activity
Grade Level: 5-8



Main Objectives

In this activity, learners will build their own simple ammeter using a compass and a magnet wire. By doing the work themselves, they will be able to observe directly the effect electricity has on magnetic fields and, correspondingly, on the behaviour of magnetic materials such as a compass. This is an important step in understanding how electromagnets work and how they can be used in everyday life.

Learning Outcomes

By the end of this activity, learners will:

- compare the different currents (1.5 volt – AA, and 9 volt battery) and the strength of the magnetic field.
- understand the correlation between the electrical current, magnetic fields and the direction of the compass needle.
- identify when the ammeter is used in the home.
- understand what happens when the connections are reversed between the ammeter and the battery.

Length of Activity

1.5 hours

Materials List

Internet-enabled device
 Building a Simple Ammeter Learner Worksheet
 2 metres of enamelled magnet wire (22 gage to 28 gage)

Scissors

Tape

Orienteering compass (with clear rectangular base)

1.5 volt (AA) battery

9 volt battery

Background

By passing a current through a multi-loop coil, you are able to intensify the strength of the magnetic field that develops around a conductor. A ferrous metal object placed within that field will itself become magnetized. If that metal object happens to be magnetized, it will want to align itself so that its own north and south poles align with those of the electromagnet.

Procedure

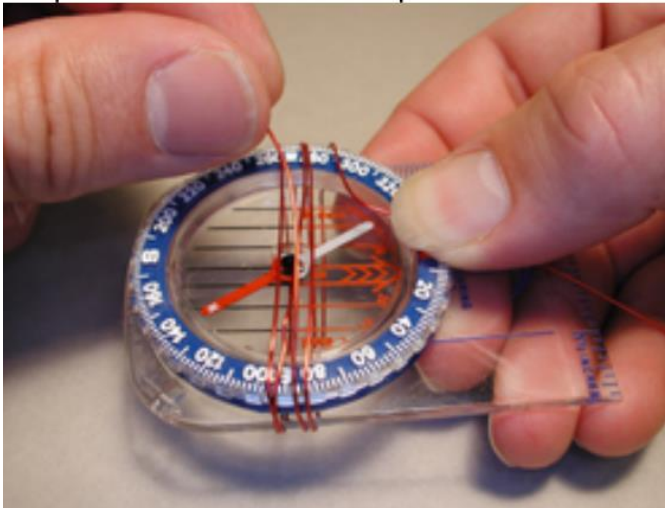
Step 1: Preparation

- Explain to the learners that they will construct an ammeter. The ammeter will help them to detect the flow of the electrical current and the magnetic field. An ammeter is made up of a compass, wire and a battery.
- As a class or in groups, discuss how a compass works. Why does the needle turn? What would happen if you added a magnetic field? What would happen to the compass?
- Explain that the experiment will test how increased current and increased magnetic field affect the compass.
- Pass out the materials to student groups. Be sure each learner gets a worksheet.

- e. Have learners read through the instructions and discuss the procedure of construction and the worksheet.

Step 2: Building the ammeter

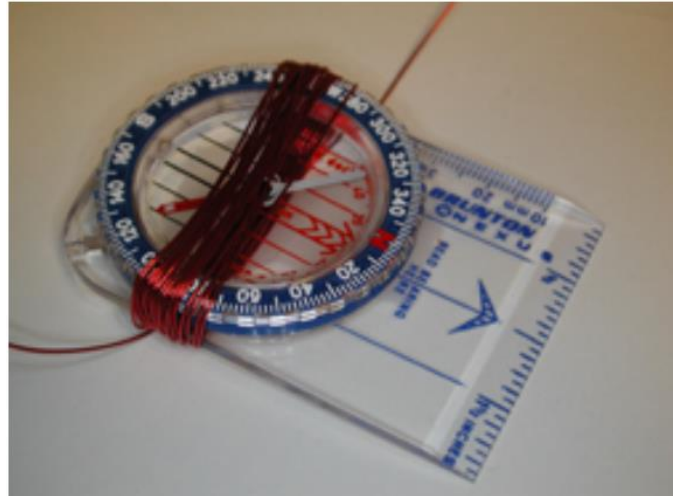
- a. Wrap the wire around the compass as shown in the photo below. Use 20 turns of the wire, leaving the ends long.



- b. Apply the tape on the edges of the compass to prevent the wire from slipping off. (Use some tape to secure the wire on the compass)
- c. Use the sand paper to remove the enamel insulation from the wire ends. (Hint: A candle or match can be used to burn off the insulation quickly)



Your ammeter should look like this:



Tips and Extensions

- Use a match or candle to burn the enamel insulation from the ends of the magnet wire. This makes stripping the insulation using sand paper much easier.
- Give learners two 1.5-volt batteries. Have them test their ammeters using batteries that are connected series and parallel. The parallel connection will increase the number of electrons (current) in the circuit and should cause the compass needle to deflect further than just one battery.
- If you do not have enough materials, you can perform this activity as a demonstration using the overhead projector. The clear base of the compass allows learners to see the behaviour of the compass needle. They can fill in their observation sheet based on what they see on the OHP screen.

Comprehension

- How do we change the direction of the compass?
- What happened when more coils were added?
- How do different currents (1.5 volt, 9 volt batteries) affect the magnetic field?
- What happened when there was no electrical current, 1.5 volt current and 9 volts current?
- How does the electrical current, magnetic field affect the compass needle?
- After having built electromagnets, what would you expect to happen if you substituted regular metal for the compass inside the coil?
- Where is an ammeter used in the home?