**E-Mag Lab**  Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_

**Objective: Using the provided materials and instructions, create and test an electromagnet.**

[Click here](https://rcschools.zoom.us/rec/share/8Rcq8bs552KcpmMx6GD851G3xyOqRCU7TGa5r-9JvarLJzsJxi3V-murRhqA2Rx7.T6tBri7joUp-5XC6?startTime=1601331451000) to watch a demonstration video.

**Before you begin:**

1. Try to pick up paper clips with the nail. Are any clips attracted to the nail? \_\_\_\_\_\_\_\_\_\_
2. What does this tell you about the nail?
3. How do you think the number of paper clips attracted to the magnet will change throughout the experiment?

**What to Do:**

1. Use the wire to wrap coils around ¼ of the nail. Leave at least 3 inches of straight wire hanging off the end of the nail. Count and record the number of coils.
2. Connect one end of the wire to the battery holder and the other end of the wire to the switch.
3. Turn the switch to the ON position and move the nail over the paper clips. Count the number of paper clips the nail picked up.
4. Turn your switch **OFF** and record your data in the chart below.
5. Use the wire to wrap coils around ½ of the nail. Leave at least 3 inches of straight wire hanging off the end of the nail. Count and record the number of coils.
6. Repeat steps 2-4. (Be sure to turn the switch OFF when not testing the electromagnet! This will save your battery and keep the wires from overheating.)
7. Use the wire to wrap coils around ¾ of the nail. Leave at least 3 inches of straight wire hanging off the end of the nail. Count and record the number of coils.
8. Repeat steps 2-4. (Be sure to turn the switch OFF when not testing the electromagnet! This will save your battery and keep the wires from overheating.)
9. Use the wire to wrap as many coils as possible around the nail. Leave at least 3 inches of straight wire hanging off the end of the nail.
10. Repeat steps 2-4. (Be sure to turn the switch OFF when not testing the electromagnet! This will save your battery and keep the wires from overheating.)

**Record your data in the chart below:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | # of Coils | # of Paper Clips Picked Up | Observations: (temp., strength, placement of clips, etc) |
| **¼** of the nail covered with wire | \_\_\_\_ coils |  |  |
| **½** of the nail covered with wire | \_\_\_\_ coils |  |  |
| **¾** of the nail covered with wire | \_\_\_\_ coils |  |  |
| As much of the nail as possible!! | \_\_\_\_ coils |  |  |

**Post Lab Questions:**

1. How did the number of coils affect the number of paper clips picked up?
2. Write a claim to answer the following: How does the number of coils affect the strength of the electromagnet’s magnetic field?
3. One way to make an electromagnet stronger is to increase the number of coils wrapped around the iron core. What do you think would happen if you repeated the experiment with two batteries?
4. Draw and label a diagram of your electromagnet. Be sure to include: battery, coil, nail, magnetic fields, north and south poles.
5. What does the magnetic field produced by the flowing electricity do the nail in order to magnetize it?
6. Why is an electromagnet stronger than a solenoid, if both create magnetic fields?
7. Predict what would happen to the nail if you left the switch on for an extended period of time. Explain how the nail would behave even after you take the electromagnet apart.