



# Crowd Puller





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## Overview

Electrical energy can be changed to become magnetic or work like a magnet. The ability to attract metallic objects can be switched on and off because of electricity. It is called an electromagnet. It is made up of soft iron coil and a nail. Here, the nail is surrounded by a coil of wire through which an electric current passes. Electricity flows through the wire with an iron bar (nail) inside it when connected to the battery. The iron bar turns into a magnet and picks objects made of iron and steel such as pins, staple wires and bare paper clips. When the wires are disconnected, the iron bar loses its magnetic ability. The objects fall off. Can you tell why?

This learning material contains activity on how electromagnets work in which pupils are exposed to different scientific skills and methods to make science meaningful to them and have the capacity to investigate.

### I. Objectives:

- A. Describe how electromagnets work;
- B. Construct a model of electromagnet; and
- C. Show appreciation on the importance of electromagnets in common electrical devices and appliances.

### II. Subject Matter:

Topic: How Electromagnets Work

References:

PELC V.5, p.4

Cyber Science 5, Valencia, et.al, pp. 229-233

Headways in Science and Health Today 5 Txt., Fallaria,et.al, pp.172-173

Headways in Science and Health Today 5 TM, Fallaria, et.al, pp. 84-85

Science and Health 5, Natividad Alegre-Del Prado and Rowena Del Rosario, p. 205

[www.ehow.com](http://www.ehow.com)

Materials: a 3-inch long iron nail  
20 pieces bare paper clips  
a 100-cm long coated electrical wire (100 cm long)  
pliers  
2 pieces 1.5 volt dry cells  
cardboard  
masking tape  
electrical tape

Duration: 60 minutes

### III. Procedure:

#### A. Motivation

Have you ever played a magnet? (*Yes. I have played a magnet.*)  
Do you know that magnets can be produced by electricity? (*Yes. Magnets can be produced by electricity.*)  
How does a magnet work?  
Can you make a magnet?  
Let's investigate.

#### B. Activity (Refer to Activity Sheet)

##### Teaching Hints

- Divide the class into groups of 5 to 6 members with mixed abilities. Each group will choose their leader, recorder and reporter.
- Set norms of standard when needed in doing the activity.
- Instruct pupils that they will work on the activity card.
- Distribute the activity card to each group.
- Set the time frame for each undertaking:

Activity	10 minutes (activity card)
Publishing	2 minutes (for all the groups)
Reporting	2 minutes (for each group reporter)

- Monitor each group while they are performing the activity.
- Tell the pupils that the time allotted for each undertaking should be followed strictly to make sure that the activity will be finished on time.
- Publishing of outputs
- Reporting by group
- Process the responses of the different groups

### C. Analysis

1. When did the nail become a temporary magnet?  
*(The nail became a temporary magnet when the electric current flows through it.)*
2. When one end of the wire was detached from the dry cell, what happened to the nail?  
*(The nail was no longer a magnet or lost its ability to attract objects made of iron.)*
3. How can you increase the strength of the electromagnet?  
*(The strength of the electromagnet is increased by raising the voltage of the dry cell, which is done by adding more dry cells connected to the wire. It can also be done by increasing the number of coils around the nail.)*

### D. Abstraction

1. What is an electromagnet?  
*(Electromagnet is a magnet that is made by flowing electricity through a coil of wire wound around an iron nail or bar.)*
2. How do electromagnets work?  
*(Electromagnets work by having an electric current pass through a coil of wire around an iron nail.)*
3. What are some uses of electromagnet?  
*(Electromagnets are used in communications, in industry, and at home.)*
4. What are some devices and appliances that use electromagnets?  
*(Let pupils enumerate devices and appliances according to each use of electromagnet)*
5. Are they useful to us? Why?  
*(Yes. Electrical appliances and devices are useful to us because they make our work easier and faster.)*

### E. Application

Mang Dioning and Aling Dorothy have doorbell, electric fan, television, eggbeater, VCD, refrigerator and other devices and appliances at home that use electromagnet.

1. What should they do with their devices and appliances to have them last longer? How?

2. How can you conserve electricity when using these electrical devices and appliances at home?
3. Why is conserving electricity very important to everybody's life?

#### **IV. Assessment:**

Directions: Circle the letter of the correct answer.

1. Why is the wire used in an electromagnet coiled?
  - A. It has more force.
  - B. It controls the field of attraction.
  - C. It controls the flow of electricity.
  - D. It makes the electromagnet stronger.
2. Which of the following can make an electromagnet stronger?
  - A. by adding more dry cells
  - B. by using a core with a bigger diameter
  - C. by increasing the number of turns in the coil of wire
  - D. all of the above
3. Which of the following devices makes use of electromagnets?
  - A. telephone
  - B. electric bell
  - C. electric buzzer
  - D. all of the given responses
4. Which one of the following is not a part of an electromagnet?
  - A. the coiled wire
  - B. the nail as the core
  - C. the pins attracted by the electromagnet
  - D. the dry cell as the source of electricity
5. What happens when a part of an electromagnet is disconnected?
  - A. It loses its magnetism.
  - B. Electricity continues to flow through it.
  - C. The electromagnet becomes a permanent magnet.
  - D. There is an increase in the number of materials attracted

## **V. Assignment:**

Make a poster which shows the importance of using electrical devices and appliances properly.

## **VI. Resource List**

Activity Sheet

Teacher's Guide

Background Information

## **Answer Key**

### ***Activity***

1. The nail will attract the paper clips.
2. The nail became magnetized.
3. The paper clips will fall off the nail.
4. The nail would lose its magnetism.
5. Increase the number of coils wound around the nail to make it a stronger magnet and raising the voltage of the dry cell which is done by adding more dry cells connected to the wire.
6. An electromagnet
7. Electromagnet works by having an electric current flow through a coil of wire wound around an iron nail.

### ***Assessment***

1. D
2. D
3. D
4. C
5. A

Activity  
**THE ATTRACTION**

**Time Frame:** 10 minutes

**Objectives:**

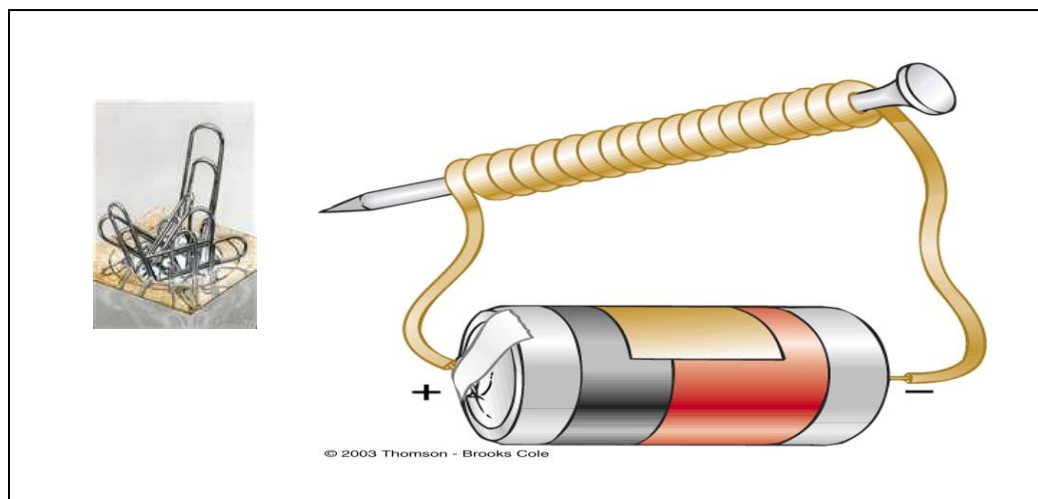
- A. Construct an electromagnet
- B. Describe how electromagnets work

**Materials:**

20 pieces paper clips	pliers
2 pieces 1.5 volt dry cells	cardboard
a 3-inch long iron nail	electrical tape
a 100-cm long coated electrical wire	masking tape

**Procedure:**

1. Get a long nail and a piece of wire about 100 cm long.
2. Wind the wire around the nail from end to end.
3. Attach the ends of the wire to the positive and negative ends of the dry cell.
4. Place some paper clips near the nail. Observe what happens.
5. Remove one end of the wire from the battery. Observe again what happens.
6. This time attach the ends of the wire to a dry cell. Place the nail near some paper clips. Observe.
7. Make a battery holder for the 2 dry cells. Connect the wires to the battery. Repeat step 4. Take note of any changes in the way paper clips behave.





**Questions:**

1. What did you observe when you touched the point of a nail to some paper clips?
2. Explain your answer in (1).
3. What will happen when you remove one end of the wire from the dry cell?
4. Explain your answer in (3)
5. Using the same dry cell, explain how you can make the nail attract more paper clips?
6. What type of magnet is made in the above activity?
7. How does it work?

## **Background Information for the Teacher**

An electromagnet is a type of magnet that works by having an electric current pass through a series of wires. The wires are usually tightly coiled and often wrapped around a core made of iron to enhance the magnetic effect. These devices are used for mechanisms where it is important to be able to turn the magnetic current on and off with the flip of a switch that, in turn, shuts off the electric current that creates the magnetic field.

The metal base, which can be as simple as a nail, is wrapped with a wire that is then connected to a power source. The electric source can be as basic as a simple battery, with each end of the wire connected to each end of the battery. The magnet can be turned on and off by connecting and disconnecting the one end of the wire from the battery. A switch can also be added along one side of the wire, which can be flipped on to activate the magnet.

Electromagnets can be increased in strength with a little tinkering. Because they function by sending an electric signal through coiled wire, more wire can be added to create a bigger coil and thus increase the power. The strength of the current sent through the wire can also be increased, which will also increase the magnet's power. Wrapping the metal coils around an iron core is also a way to increase the electromagnet power. If an iron core is already in use, a larger one could be inserted. ([www.ehow.com](http://www.ehow.com) by: Ryn Gargulinski, eHow Contributor). The strength of the electromagnets are also increased by raising the voltage of the dry cell which is done by adding more dry cells connected to the wire.

Electromagnets function only while the electricity is flowing through the coiled wire. Electromagnets are temporary.

Many of our home appliances use electromagnets. Some of these devices are: doorbell, buzzer, electric fan, radio cassette, tape recorder, betamax and VHS, refrigerator, air conditioner, egg beater, and blender. All electrical devices and instruments with a motor use the principle of electromagnetism.