

**ISTITUTO COMPRENSIVO TRENTO 5**  
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**THE ELECTROMAGNET  
AND THE INVERSION  
OF THE POLES**

Progetto realizzato da

Enea Digregorio  
Mohammed Nesmy  
Mattia Stenico

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## **MATERIALS**

- iron nail
- magnet
- battery
- copper wire
- cork
- cello tape
- a bowl
- water
- red color

## **PURPOSE**

Understanding if an electromagnet has two poles like a magnet

## **QUESTION**

Does an electromagnet have two poles?

## **HYPOTHESIS**

We assume that if we invert the battery poles, then the poles on the nail are also inverted

## PROCEDURE

1. Scratch the needle 40 times on the magnet. Look where the needle is attracted. The side attracted to the South pole of the magnet is the north pole of the needle. Color it red.

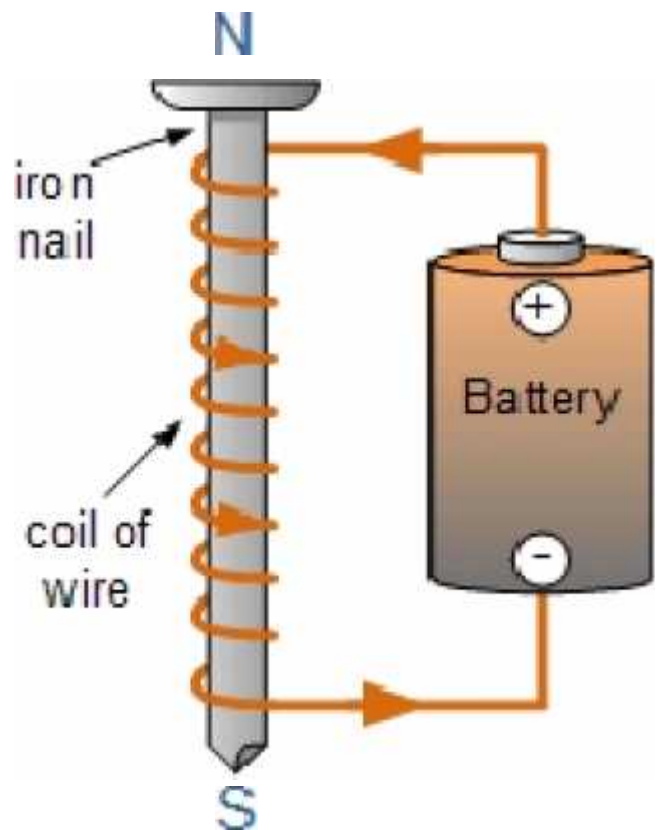
2. Fix the needle on the cork using cellotape. Fill the bowl with water and put the cork on the water surface.

3. Build an electromagnet:

wrap the wire around the nail

put the two copper ends on the battery poles.

4. Move the electromagnet near one needle end, and then to the other one.



## WHAT HAPPENS?

One extremity is attracted by the nail.

Is it the red one? In this case the nail is the south pole

Is it the non colored one? In this case the nail is the north pole.

Remove the copper wire from the battery and swap the poles.

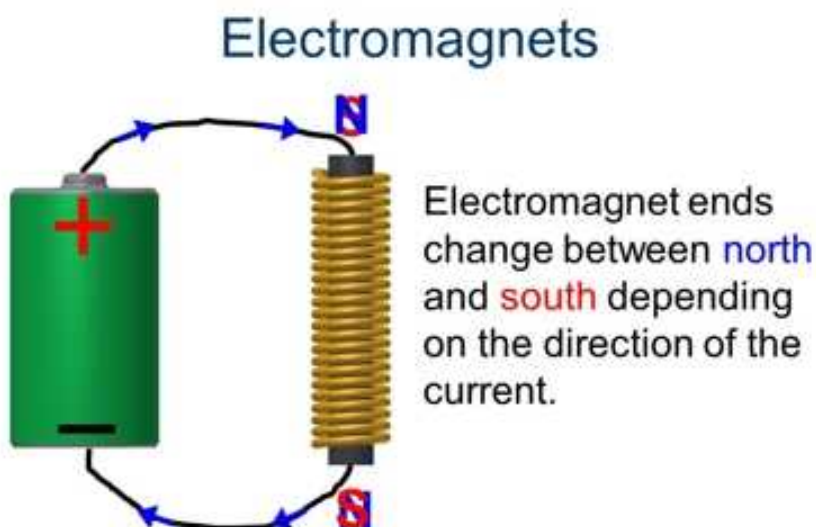
Move the nail close to the needle end that was attracted in the step number 4.

## WHAT HAPPENS?

The needle is pushed away.

## RESULTS

**The poles of an electromagnet can even be reversed by reversing the flow of electricity.**



## CONCLUSION

**IN AN ELECTROMAGNET THE ELECTRICITY'S DIRECTION DETERMINES THE DIRECTION OF THE MAGNETIC FIELD**

## Here is an other example: the homopolar motor

It 's built using a battery and some very strong magnets. The shape is made of copper wire.

If the copper wire touches one pole of the battery and the magnet, it spins (Lorentz force).

If we invert the battery poles, the wire spins in the other direction.



## WHAT IS A MAGNETIC FIELD?

The region surrounding a magnet in which the force of the magnet can be experienced is called its magnetic field.

**A magnet attracts objects made of nickel, iron, cobalt.**

A magnet has two poles: the north pole and the south pole.

Opposite poles of two magnet always attract each other.

Like poles repel each other.

