ScienceCube

Making magnets with needles

Learning Objectives

You can observe the phenomenon of "magnetization," where a needle acquires magnetic properties when rubbed with a magnet.

Should I think about it?

When you rub a needle with a magnet, what pole will the needle exhibit?

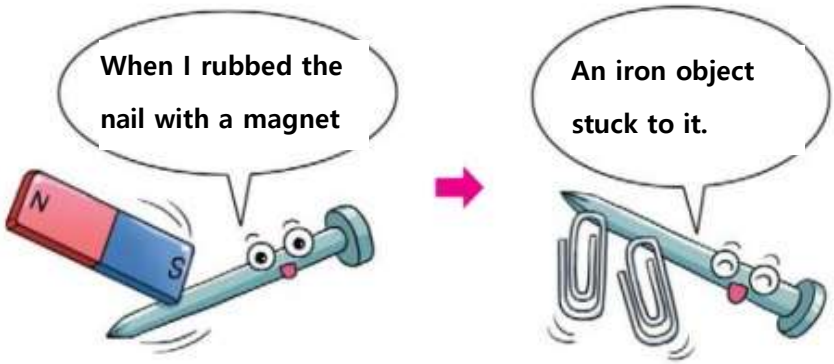
Learning Content

1. Magnetization

1) What is magnetization?

- When an object made of iron is rubbed with a magnet, it acquires the properties of a magnet. This process, where a non-magnetic object gains magnetic properties, is called 'magnetization.'

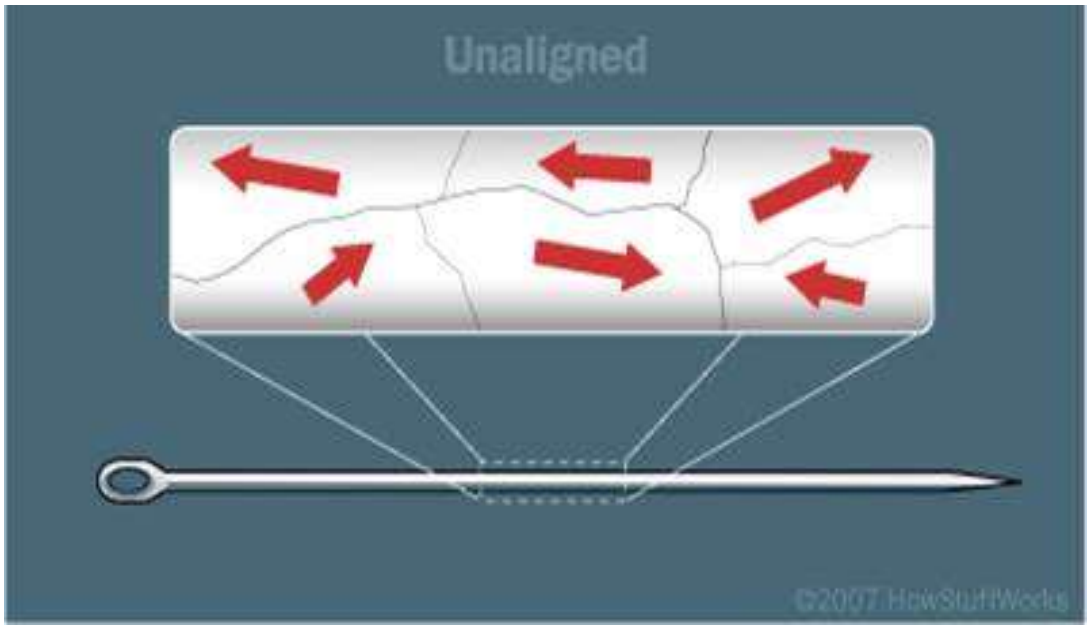
- When an object is magnetized, both the North (N) and South (S) poles are created simultaneously.

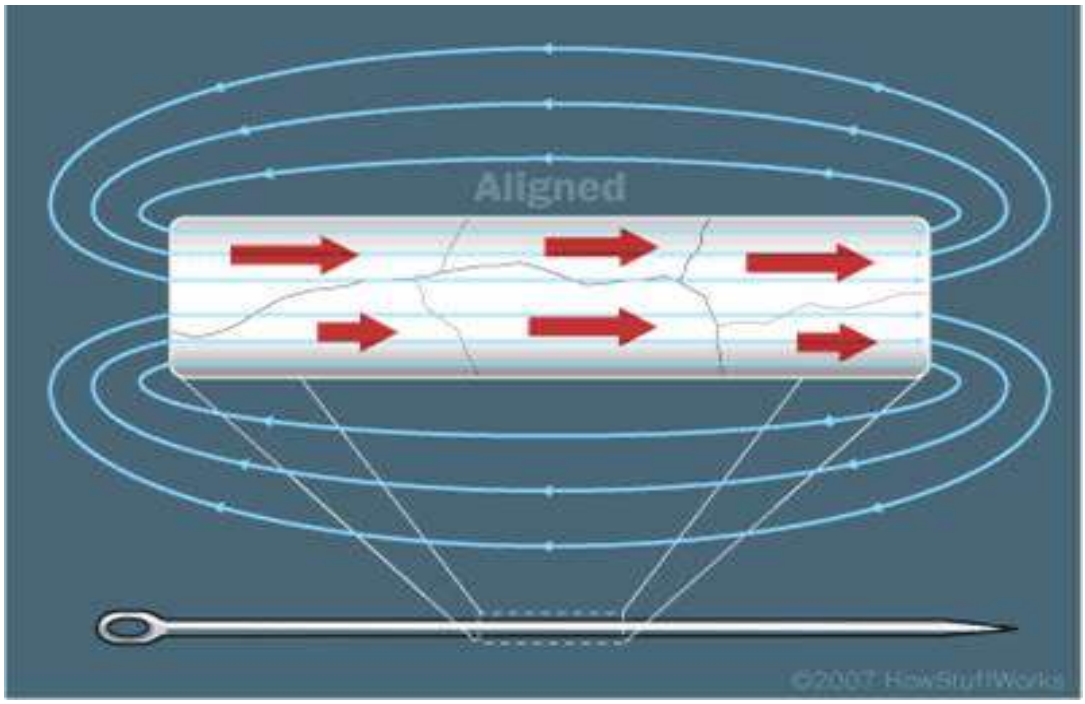


2) Why does magnetization occur?

- Nails, paperclips, and needles contain numerous tiny magnets. Normally, these tiny magnets are oriented in various directions, so the object as a whole does not exhibit magnetic properties.

- When rubbed with a magnet, these tiny magnets align in one direction, giving the object magnetic properties. However, over time or if subjected to shock or heat, these tiny magnets return to their original state, and the object loses its magnetic properties..

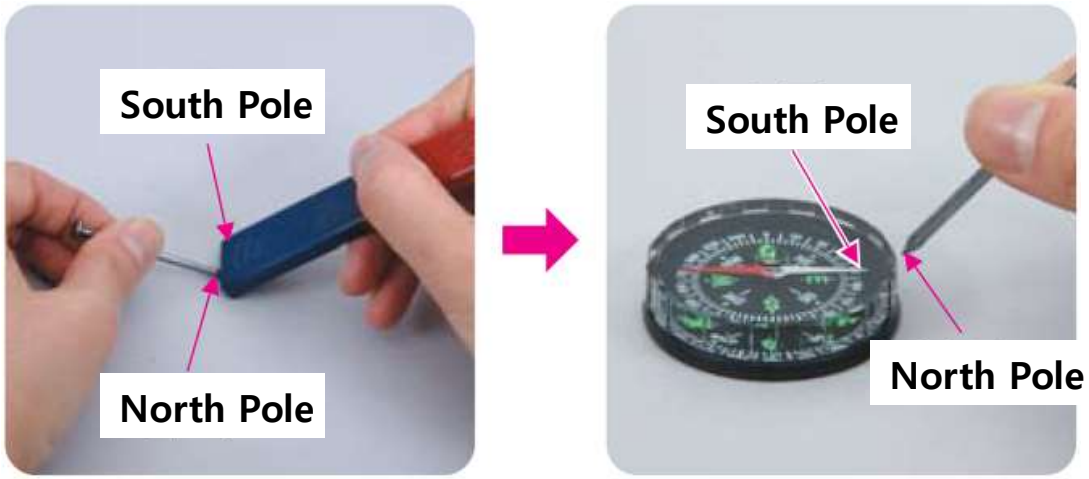




2. Poles of a Magnetized Object

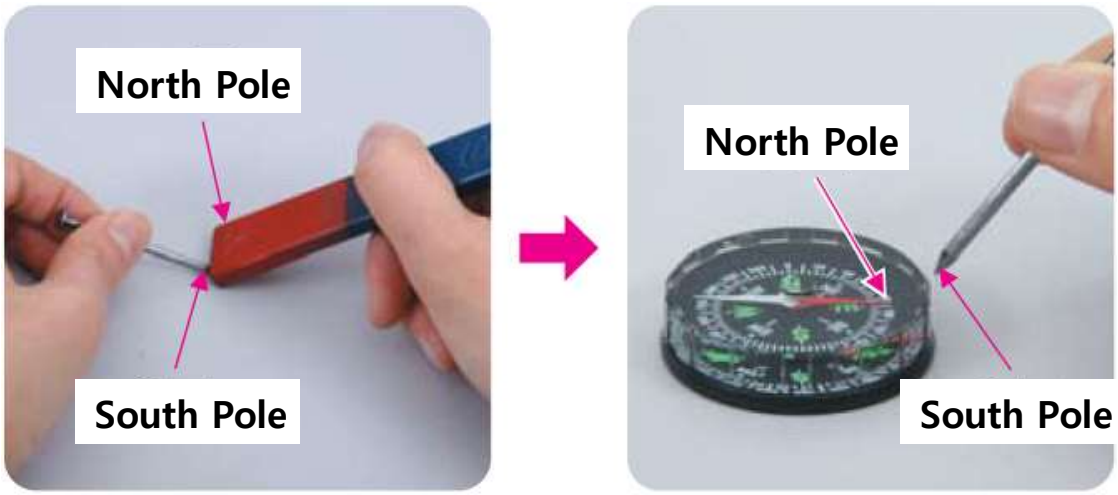
1) What happens when rubbed with the South pole of a magnet?

The part rubbed with the magnet becomes the North pole, and the opposite end becomes the South pole.



2) What happens when rubbed with the North pole of a magnet?

The part rubbed with the magnet becomes the South pole, and the opposite end becomes the North pole.



3. Magnetic Field Sensor

- The sensor at the end of the rod measures the strength of the magnetic field.
- The sensor measures how strong the magnetic force is.
- A positive (+) value indicates the North pole of a magnet, while a negative (-) value indicates the South pole of a magnet.

Experimental Activities

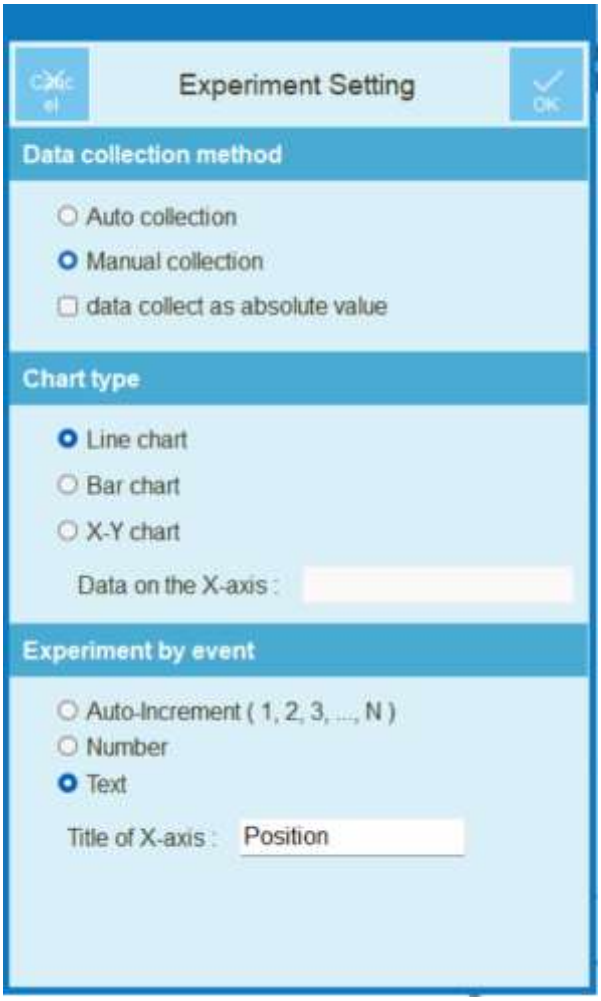
Materials Needed

Interface, Science# program (smart device), magnetic field sensor, bar magnet, 2 needles, name pen (red, blue), A4 paper, ruler, pencil, cellophane tape

Experiment Procedure:

Preparing the Setup

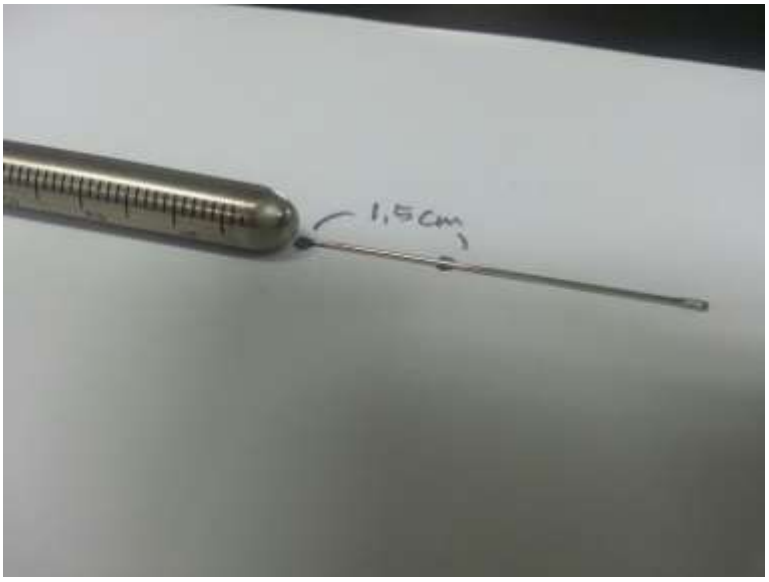
1. Run the Science# program on the smart device, and connect it to the powered-on interface via Bluetooth or cable.
2. Connect the magnetic field sensor to the interface.
3. Press the button  in Science# to automatically set the experiment environment as shown below.



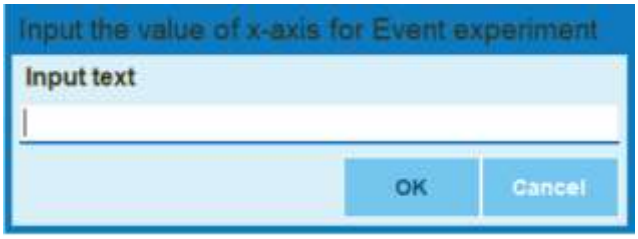
[Experiment 1] Making a Needle Magnet

1. Press the button  to zero the sensor. (At this time, keep magnets as far away from the sensor as possible.)

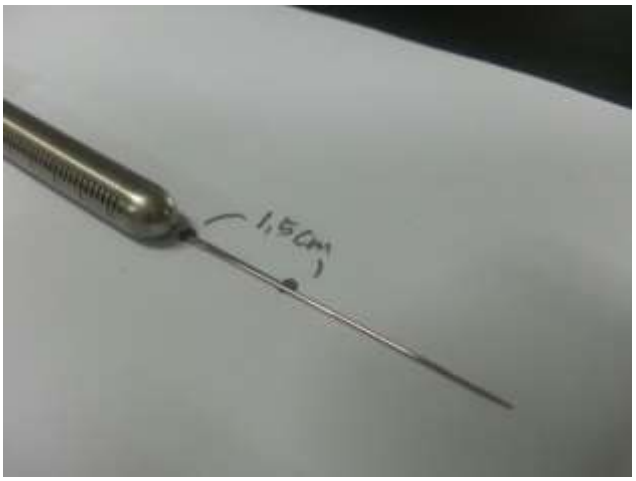
2. Fix the magnetic field sensor on A4 paper with cellophane tape, and align the needle tip close to the magnetic field sensor.



3. Press the button - to measure the magnetic force at the needle tip and record the position. Example: Needle tip.



4. Change the position of the needle to align the needle eye with the sensor and press the button to measure the force at the needle eye and record the position. Example: Needle eye



5. Press the button to end the experiment, then press to edit the chart title and enter a title. Example: Before rubbing with magnet.

6. Rub two needle tips with the magnet for 30 seconds. Rub all needles in the same direction, not back and forth.

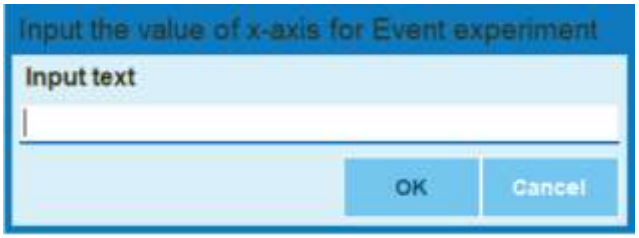
7. Bring one needle tip close to the other needle tip and needle eye to observe the results.

8. Based on the results, find the parts of the needle corresponding to the North and South poles, and mark the North pole with red and the South pole with blue.

[Experiment 2] Checking the Poles of the Needle Magnet with a Magnetic Field Sensor

1. Align the North pole of the bar magnet about 1.5 cm away from the magnetic field sensor on A4 paper.

2. Press the button - to measure the force of the North pole and record the position. Example: North pole..



3. Similarly, press the button to measure the force of the South pole and record the position. Example: South pole..

4. Remove the bar magnet and place the needle tip towards the sensor end.

5. Press the button to measure the force at the needle tip and record the position. Example: Needle tip

6. Similarly, press the button to measure the force at the needle eye and record the position. Example: Needle eye

7. Press the button to end the experiment, then press to edit the chart title and enter a title. Example: After rubbing with magnet

Experimental contents

1. Record the results of what happens when the two needles rubbed with a magnet are brought close to each other.

Category	When the needle tips are brought close	When the needle tip and eye are brought close
Experiment Results		

2. Compare the results of measuring the poles of the bar magnet and the needle magnet rubbed with the bar magnet using a magnetic field sensor, and represent them with bar graphs.

Experimental results

1. How did the needle change when rubbed with the bar magnet? Describe what this phenomenon is called.

2. Can you reverse the poles of the needle magnet based on the experimental results? Find out what methods exist.


Report
(For Teachers)
Report
(For Students)