ScienceCube

Find the Treasure Underground!

Use a magnetic field sensor to measure and explain the poles and strength of a magnet.

Fundamental Concept

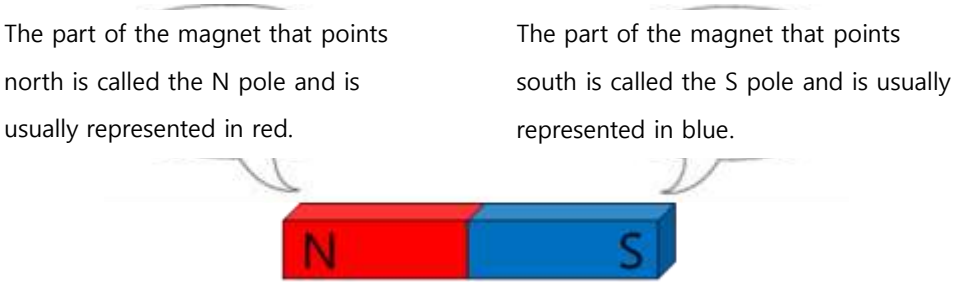
1. Magnetite and Magnets

The property of attracting iron pieces or affecting electric currents is called magnetism, and objects that possess this property are called magnets.

Historically, magnetite, a naturally occurring magnetic mineral, was known as a natural magnet in ancient Greece and China. By the 12th century, records show that magnetite was used to make compass needles for navigation due to its magnetic properties. Magnetite is a black mineral containing iron with a metallic luster and is also called lodestone.

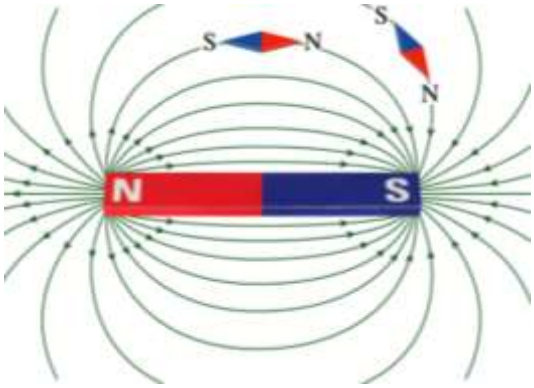
2. Properties of Magnets

(1) Magnetic Poles: Magnets have N and S poles. In bar magnets and horseshoe magnets, the blue end indicates the S pole, and the red end indicates the N pole. However, everyday magnets like neodymium magnets typically do not have their poles marked.



(2) Finding Magnetic Poles: A magnetic field sensor indicates the S pole as (-) and the N pole as (+). Besides using a sensor, poles can be identified using another magnet, a compass, or iron filings. With iron filings, the pattern of magnetic field lines reveals the pole locations, while with a magnet and a compass, poles are identified by repelling or attracting forces.

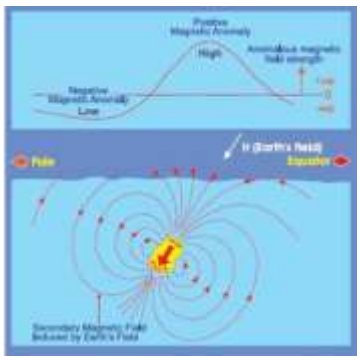
(3) Magnetic Field Strength: The magnetic field is strongest at the poles of the magnet and decreases with distance from the magnet. Combining multiple magnets increases the overall magnetic strength.



3. Mineral Resource Exploration – Magnetic Survey

To locate mineral deposits or oil-bearing structures, geophysicists use magnetic surveys, which involve measuring the strength of the magnetic field. Occasionally, magnetic inclination, dip, and declination (the deviation from true north) are measured at several points. Aerial surveys detect magnetic anomalies, which are then investigated further through ground surveys.





Explore Various Careers

'Exploration Technologist'

Job Overview

Develop and research exploration methods using geophysical and geochemical principles to locate underground resources more effectively. Depending on the research field, titles include petroleum exploration researcher (research and development), marine resource exploration researcher (research and development), etc.

Job Duties

Develop data processing and interpretation techniques using geophysical methods like seismic, gravity, magnetic, and radiometric surveys.

Improve exploration equipment.

Research geochemical exploration methods, including reagent use and mineral detection.

Develop techniques for dating rocks and minerals.

Study the distribution, movement, and accumulation of major elements, trace elements, rare earth elements, and stable isotopes in rocks, soil, and natural water for geothermal, environmental, and mineral exploration.

Required Aptitude/Skills

Curiosity and keen observation skills are essential..

Education/Qualifications

A degree in geology from university.

Job Outlook

As exploration gradually becomes a declining industry, its prospects are expected to follow a downward trend.

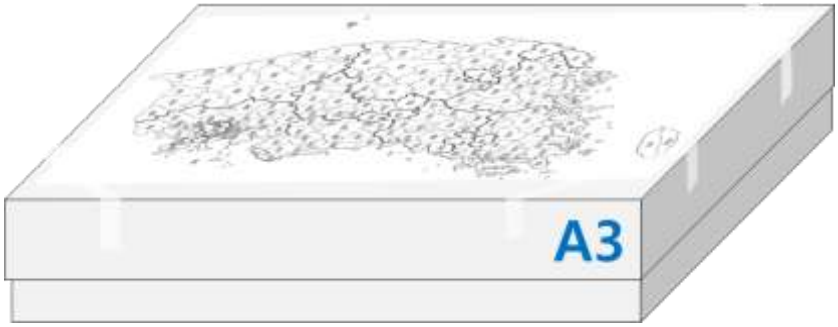
Experiment

Materials Needed

Interface, Science# Program, magnetic field sensor, A3 box, A3-sized printed map of South Korea, transparent tape, double-sided tape, stickers (10), bar magnet, neodymium magnets (5-10) (10Φ*10mm), Velcro tape (2), scissors, name pen

Preparation of Experimental Apparatus

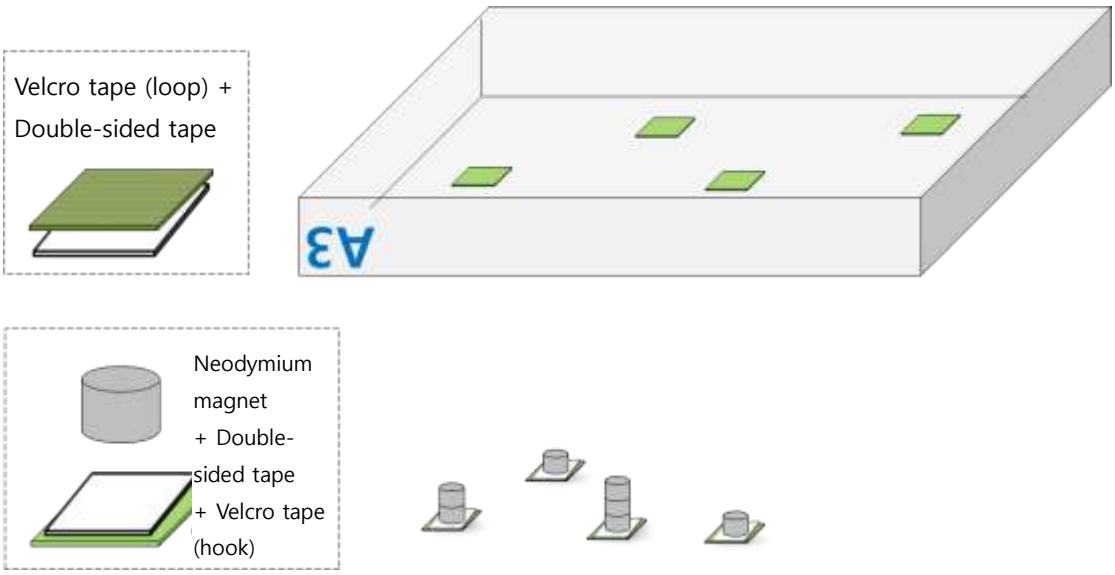
1. Attach the A3-sized map of South Korea to the lid of the A3 box and secure it with tape.



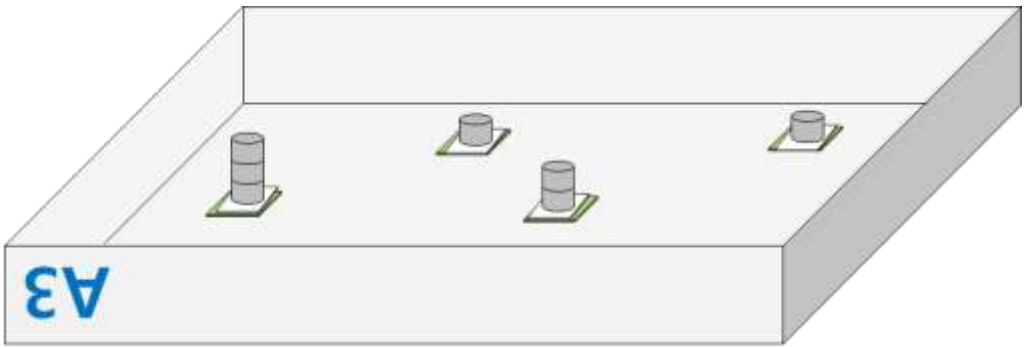
2. Cover the desired regions with stickers, label them A to J with a name pen.

3. Cover the back with Velcro tape. Attach Velcro tape to the neodymium magnets as well.

   Tip) You can use double-sided tape with Velcro tape provided by ScienceCube. The Velcro tape should match up with the hooks and loops

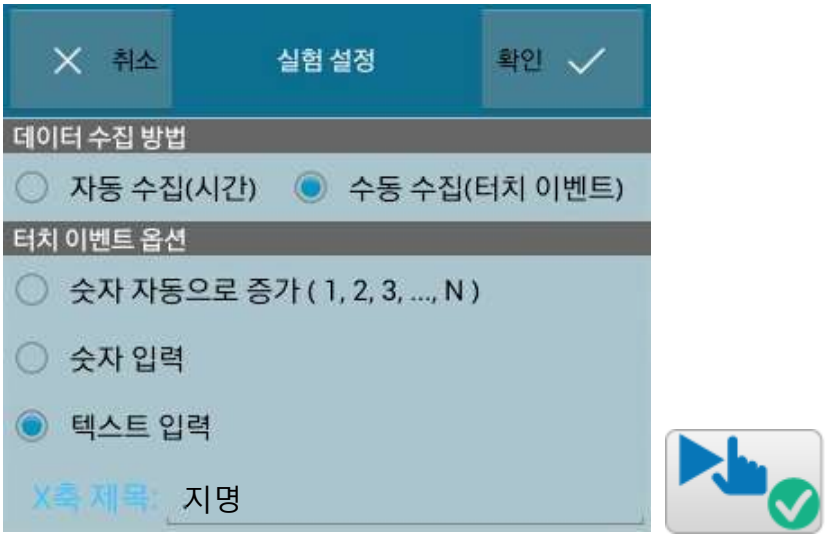


4. Adjust the number of neodymium magnets attached to the back as desired.



Interface Setup

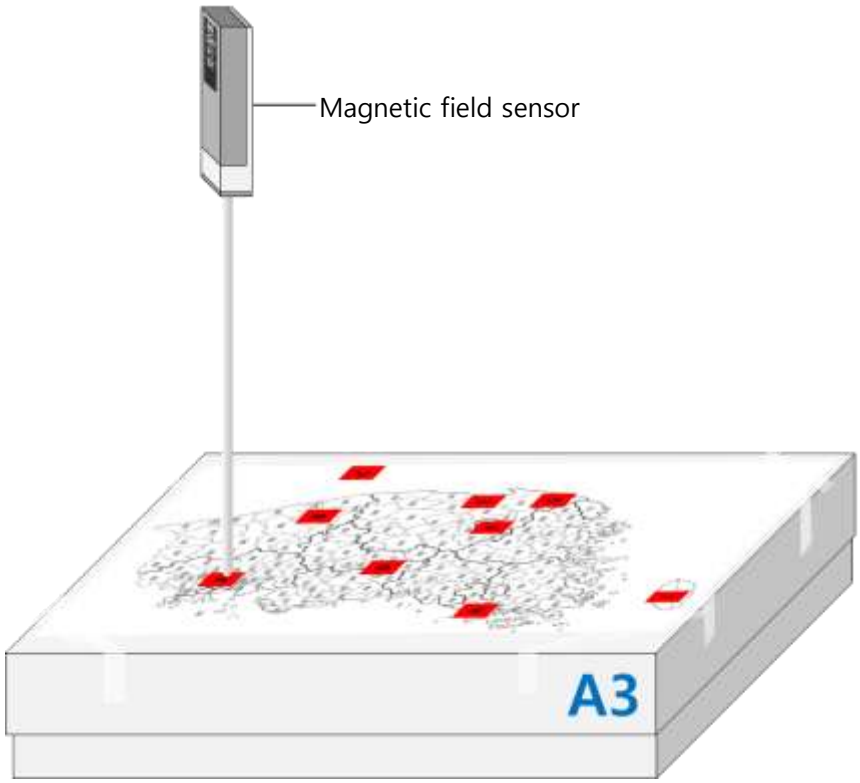
1. Run the Science# program.
2. Connect the magnetic field sensor to the interface.
3. Click to set up the experimental environment as shown below or click to automatically set up.



Data Collection

1. Measure the magnetic field value of a bar magnet to determine the polarity of the neodymium magnets.

2. Click  to start data collection.

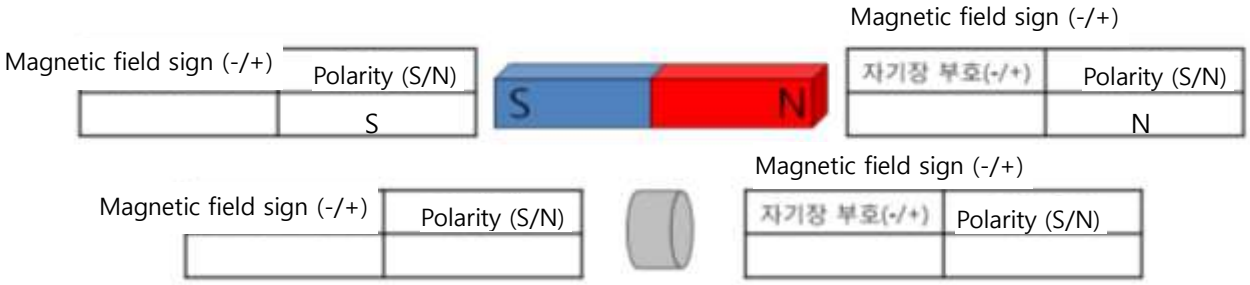


3. Stand the magnetic field sensor vertically over 'A' and click .
4. Enter the place name for 'A'.
5. Measure and compare the magnetic field strength for the remaining locations (B to J) in the same way.

Data Analysis

Recording Data

1. Measure the magnetic field value of the bar magnet and determine the polarity of the neodymium magnets.



2. Measure the magnetic field at each location and record the place name along with the magnetic field strength.

Data Application

1. Identify the region where the treasure (magnet) is hidden and explain why..

   - Treasure Location:
   - Reason:

2. Rank the regions by the number of hidden treasure (magnets) from most to least, and explain why..

   - Order of regions with the most treasure:
   - Reason: