  Graphical Analysis 27

Mapping a Magnetic Field

The region around a magnet where magnetic force acts is called a magnetic field. In this experiment, you will map the magnetic field at one-centimeter intervals along a bar magnet.

OBJECTIVES

* Measure and graph magnetic field strength at points along a bar magnet.
* Analyze data.
* Make conclusions about the magnetic field at various points on a bar magnet.

MATERIALS

Chromebook, computer, or mobile device

Graphical Analysis 4 app

Go Direct 3-Axis Magnetic Field

bar magnet

tape

ruler



Figure 1

PROCEDURE

1. Tape a meter stick to the table top with pieces of tape at about 50 cm and 95 cm.
2. Launch Graphical Analysis. Connect the Magnetic Field Sensor to your Chromebook, computer, or mobile device.
3. Set up the data collection mode.
   1. Click or tap Mode to open Data Collection Settings. Change Mode to Event Based.
   2. Enter Position as the Event Name and cm as the Units. Click or tap Done.
4. Click or tap Collect to start data collection.
5. Collect data at the 0 cm distance.
   1. Ensure the Magnetic Field Sensor is positioned so the Sensor Location dot is at the 0 cm mark (see Figure 1).
   2. Position the bar magnet beside the ruler with the S-pole end of the magnet at the 3 cm mark. Tape the magnet to the table top. If the poles are not marked, orient the magnet so that you get positive magnetic field readings.
   3. When the reading has stabilized, click or tap Keep.
   4. Enter 0 (for 0 cm) and click or tap Keep Point to save this data pair.
6. Move the sensor and repeat the Step 5 procedure at 1 cm intervals until you have reached a point 3 cm beyond the N-pole end of the bar magnet. Important: Keep the probe parallel to the magnet throughout data collection (see Figure 2).

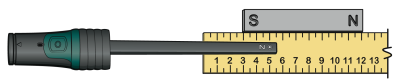


Figure 2

1. When you have finished, click or tap Stop to stop data collection.
2. To examine the data pairs on the displayed graph, click or tap any data point. As you tap each data point, the magnetic field strength and position values of each data point are displayed. Record the magnetic field strength values. Note: You can also adjust the Examine line by dragging the line.
3. Sketch, export, download, or print the graph as directed by your teacher.

DATA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Position (cm) | Magnetic field (mT) | Position (cm) | Magnetic field (mT) | Position (cm) | Magnetic field (mT) |
| 0 |  | 6 |  | 12 |  |
| 1 |  | 7 |  | 13 |  |
| 2 |  | 8 |  | 14 |  |
| 3 |  | 9 |  | 15 |  |
| 4 |  | 10 |  | 16 |  |
| 5 |  | 11 |  | 17 |  |

PROCESSING THE DATA

1. At what position beside the bar magnet was the largest positive magnetic field strength reading observed?
2. At what position beside the bar magnet was the most negative magnetic field strength reading observed?
3. At what position does your graph have a zero value magnetic field strength value? At what location is this on the bar magnet?
4. Why does the graph have both positive and negative magnetic field strength values?

EXTENSION

Test the strengths of different magnet types at the same distance from the sensor. Which magnet types are strongest? Weakest?