**PhET Electromagnet Simulation**

**Learning Target:** I can explore the forces in nature by making quantitative and qualitative observations.

What affects **the strength of Electric and Magnetic Forces**?

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| Initial thoughts: |

What evidence is there that **fields exist between objects** even if those objects are not in contact?

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| Initial thoughts: |

Click on the tab titled: Bar Magnet. Spend a minute or 2 exploring the simulation.

**Qualitative observations**. (Qualitative means:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

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| Where is the magnetic field strongest? |  |
| What evidence shows you this? |  |
| As you change the strength of the magnet how does the readout change? |  |

**Quantitative observations.** (Quantitative means: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

Change strength of magnet to 50% then click the box titled “Show Field Meter”. Place the field meter (crosshairs) at the **edge** of the north end of the magnet.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| What is the reading of the Field Meter? |  | | | | | | | | | | |
| As you move the meter away from the magnet what happens? Record 3 data points. | **Distance** | **Meter Reading** | | **Distance** | | **Meter Reading** | | **Distance** | | **Meter Reading** | |
| Place the Field Meter about 4 cm from the magnet. Adjust the strength of the magnet. Record 3 data points. | **Magnet Strength** | | **Meter Reading** | | **Magnet Strength** | | **Meter Reading** | | **Magnet Strength** | | **Meter Reading** |

Click on the “Electromagnet” Tab. Spend a minute or 2 exploring the simulation.

Place the Field Meter near the electromagnet (*do not move it*). Record your data below:

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| --- | --- | --- |
| **Wraps** | **Volts** | **Magnetic Field (B)** |
| 1 | 10 |  |
| 2 | 10 |  |
| 3 | 10 |  |
| 4 | 10 |  |

|  |  |  |
| --- | --- | --- |
| **Wraps** | **Volts** | **Magnetic Field (B)** |
| 4 | 2 |  |
| 4 | 4 |  |
| 4 | 6 |  |
| 4 | 8 |  |
| 4 | 10 |  |

What affects the strength of Electric and Magnetic Forces?

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| Final thoughts and **evidence**: |

What evidence is there that fields exist between objects even if those objects are not in contact?

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| Final thoughts and **evidence**: |