

Name:

Date:

Class:

Magnets and Magnetic Fields Worksheet

Instructions: Working in groups, rotate through the four activity stations to observe, test, and experiment with magnets and magnetic fields. At each station, draw and write a brief description of your observations to help deepen your understanding of magnetism.

Station 1: Parts 1a and 1b: Visualizing Magnetic Fields

In the space below, draw and label images representing magnetic field shapes for a) a single magnet and ferrofluid interactions, and b) two magnets and ferrofluid interactions.

Station 1: Part 2: Material Magnetic Interactions Experiment

In the space below, draw and label images showing how the different materials provided interact with magnets.

Station 2: Magnetic Field Treasure Hunt

In the space below, draw and label images identifying which objects you were able to separate using magnets to differentiate which objects are magnetic and which are non-magnetic.

Station 3: Magnetic Field Strength Curling Game

In the space below, draw and label an image showing your gameboard results of where the small disk magnets are located after “launching” them using a larger disk magnet.

Station 4: Magnet and Paperclip Play

In the space below, draw and label images explaining your observations.

Wireless EV Charging “Air Gap” Design Challenge

Wireless charging of an electric vehicle (EV) works because changing magnetic fields can move energy from one place to another without wires.

Magnetism makes wireless charging possible because magnetic fields can transfer energy across space, even when nothing is physically touching.

Here are the basics of how wireless charging works:

1. A coil in the ground (charging pad) has electricity flowing through it.
2. This creates a changing magnetic field around the coil.
3. The vehicle has a second coil underneath it.
4. The magnetic field from the ground coil passes through the vehicle's coil.
5. This moving magnetic field induces (creates) an electric current in the vehicle's coil.
6. That electric current is then used to charge the vehicle's battery.

Instructions: Using what you have learned about magnets and magnetic fields, **design a way to charge an EV using magnetism:**

1. Draw, label, and explain your design.
2. Show how the magnetic field moves energy from the ground coil to the vehicle coil.
3. Explain how your **design keeps the magnetic field focused between the coils** to improve charging speed and efficiency by reducing the “**air gap**” **problem** (the space between the coils where the magnetic field expands, causing massive energy loss).

Hint: Think about how magnetic and non-magnetic materials affect magnetic fields

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