UNIT: circuitry game

FIELD EFFECTS- MAGNETIC INTERACTION MINI-CHALLENGE

Your Mission:

Explore how **magnetic fields** can cause **motion or signals**—without even touching anything! You’ll use a magnet and a coil of wire (or speaker) to **detect invisible forces** and see how they might trigger part of a puzzle in a game circuit.

Focus: Magnetic Fields, Motion, and Energy Transfer Without Direct Contact

Materials:

* Strong magnet (neodymium recommended)
* Copper wire coil or DIY earpiece speaker
* Compass (optional)
* Small LED or buzzer (if available)
* Wires with clips or copper tape
* Cardboard, paperclip, foam (for building magnetic triggers)

STUDENT DIRECTIONS:

**STEP1: Test Magnetic Effects**

* Gently move a magnet close to a coil of copper wire or small speaker.
* Try moving the magnet back and forth quickly near the coil.
* If using a speaker setup, listen carefully for tiny *clicks* or *buzzing.*
* Observe a compass needle when you bring the magnet near. What changes?

**STEP 2: Magnet vs. Motion**

* Experiment with placing a metal object inside a coil and moving a magnet nearby.
* Try switching directions and speed of movement.
* Optional: Use the coil + LED/buzzer to test if any electrical signal is created by motion.

**STEP 3: Mini-Challenge: Add to Your Game!**

* Design a “magnetic switch” for your escape game puzzle!  
  Examples:
  + Magnet + Paperclip Trigger – when aligned, they complete a circuit.
  + Reed Switch Activation – use a hidden magnet to turn on light or buzzer.
  + Magnetic Maze – move a metal object using a magnet from underneath.

**Record Your Observations:**

What happened when the magnet moved near the wire or speaker coil?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What happened to the compass needle near the magnet?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How can magnetic force be used to move or activate something *without touching it*?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How could you use a magnet as a trigger in your game puzzle?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ENERGY INSIGHT:**

Magnetic fields can transfer **energy through space**—no contact needed! This is how motors, generators, and even some wireless chargers work.

**Wrap-Up: Final Build + Escape Test:**

**Task:** Now combine **at least 2 of your circuit components** into one final **escape challenge board** for classmates to solve.  
Example: Press the foil pressure plate AND complete the circuit with a conductor to light the escape beacon!

**Reflection Prompts:**

* What forms of energy were involved in your circuit?
* How did your materials impact how well your circuit worked?
* What was challenging about converting energy in your circuit?

Standards Alignment

NGSS: HS-PS3-5 STEL: STEL 1H, STEL 4J, STEL 5H, STEL 7G, STEL 8H CCSS: CCSS.MATH.CONTENT.HSN.Q.A.1, CCSS.MATH.CONTENT.HSF-IF.C.7, CCSS.MATH.CONTENT. HSS-IC.B.6, CCSS.MATH.CONTENT. HSG-MG.A.3