

Station 1: Magnetic field lines

Materials:

- bar magnet
- iron filings
- sheet of paper
- horseshoe magnet
- 3-d magnet and filings

Directions:

Place a sheet of paper on top of the bar magnet. Gently sprinkle iron filings on the paper so that they are spread evenly over the sheet of paper. As you sprinkle the filings, watch where they land. You should see them trace out the magnetic field lines from one pole of the magnet to the other. When you have finished with the bar magnet, you may experiment with the horseshoe magnet and filings, and the 3-d magnet. Return the iron filings to the container when you are finished.

Question:

Is there potential energy in this system? Where?

Station 2: Circuits

Materials:

- light bulb
- AA battery
- single wire (ends stripped, ~6" long)

Directions:

Using only the materials provided, get the bulb to light up.

Questions:

What is required for energy to be able to flow from the battery? Why (where would the energy go otherwise)?

Station 3: Electromagnetism

Materials:

- 10' of 22 gauge copper wire (ends stripped)
- 6" iron nail
- D-cell battery
- metal paper clips

Directions:

Leaving several inches of wire free at each end, wrap the wire tightly around the nail. Then, connect one free end of the wire to one end of the battery, and the other free end of the wire to the other end of the battery. After a minute or so, bring the nail near the paper clips. If there is time, you may then experiment with the number of coils around the nail, how closely they are spaced, or other variables you can think of. Unwrap the wire from the nail and leave the materials neatly on the table when you are finished.

Questions:

What happens when you bring the nail near the paper clips? How does energy change forms in this experiment?

Station 4: Solar cells

Materials:

- Solar cell
- Voltmeter

Directions:

Place the solar cell on a sunny windowsill, facing outside. Turn on the voltmeter. Read the number of volts being generated by the solar cell. Then move the solar cell away from the windowsill, or turn it so it faces into the room.

Questions:

How does the voltage generated by the solar cell change as you move the solar cell? How does energy change forms in this experiment?

Station 5: Wave motion

Materials:

- Slinky
- 4' length of rope

Directions:

Hold the slinky with one end in each hand. Keeping one hand still, move the other hand towards and away from the still hand (so that the slinky stretches and contracts). Now, have one person hold one end of the rope while another person shakes the other end of the rope up and down.

Questions:

How does energy change forms in this experiment? Can you see where the energy goes in this system?

Station 6: Flashlights

Materials:

- crank-powered emergency flashlight
- shake-powered LED flashlights

Directions:

Turn the flashlight switch to "On", see if it lights, then turn the switch back to "Off". Turn the crank on the yellow flashlight 10 times, then turn the flashlight switch to "On". While the light is on, turn the crank some more. Experiment with the speed you crank, and the number of turns you crank, to see how it effects the light.

Turn on one of the LED flashlights to see if it lights. Then, shake the flashlight and see if it lights. Experiment with the number of shakes and shaking it softly or vigorously to see if how it effects the light.

Questions:

Where is the energy coming from to power these flashlights? Why are these known as "emergency" flashlights?

Station 7: Race car

Materials:

- Spring-powered race car

Directions:

Position the race car on one end of the room. Depress and lock the spring. Be sure the car has a clear path across the room, then press the button to unlock the spring. When you are finished, return the car to its station, leaving the spring unlocked.

Question:

How does energy change forms in this experiment? Is there potential energy stored in this system? If so, where?

Station 8: Heating and Melting

Materials:

- "Hot Hands" packet
- Rock salt
- Cup containing one ice cube

Directions:

Get a cup and place one ice cube inside it. Sprinkle a pinch of rock salt into the cup, on top of the ice. Watch what happens. When you are finished, please throw away your cup and ice cube.

WITHOUT SHAKING IT, hold the "Hot Hands" packet labeled DO NOT SHAKE between your hands. Then, put down the DO NOT SHAKE packet and pick up the "Hot Hands" packet labeled SHAKEN. You may shake the SHAKEN packet if you wish.

Questions:

What happens to the ice when you sprinkle the rock salt on it? How does this show energy changing from one form to another?

What happens to the "Hot Hands" packet once it is shaken? How does this show energy changing from one form to another?

Station 9: Shaking the Shot (Science & Sustainability Activity 4.4)

Materials:

- shot shaker containing metal shot
- cap with attached thermometer
- regular cap

Directions:

Place the cap with the attached thermometer on the shot shaker. The thermometer bulb should be surrounded by metal shot. Record the temperature of the shot. Then, take off the thermometer cap, put on the regular cap, and shake the shot shaker. Now, take off the regular cap, put on the thermometer cap again, and record the temperature again.

Questions:

What happens to the temperature of the shot after you shake it? How does this show energy changing forms?

Station 10: Heat and the Laws of Thermodynamics (Science & Sustainability Activity 3.3 a)

Materials:

- 1 cup of hot water
- 1 cup of cold water
- 1 cup of room-temperature water

Directions:

Put one of your index fingers in the hot water and one of your index fingers in the cold water for 30 seconds. Then, move both of your index fingers into the room-temperature water. Write a few words describing what each finger feels like, focusing on the similarities and differences between the two.

Put both of your index fingers in the hot water for 30 seconds. Then, move one of your index fingers into the room-temperature water and the other into the cold water. Write a few words describing what each finger feels like, focusing on the similarities and differences between the two.

Put both of your index fingers in the cold water for 30 seconds. Then, move one of your index fingers into the room-temperature water and the other into the hot water. Write a few words describing what each finger feels like, focusing on similarities and differences between the two.

Questions:

Explain why you think these similarities and differences occur. Give as many details as you can. How does this experiment demonstrate the flow of energy?