Academic Alignment Standards

Exhibit Exploration Guide

Grade 4

Learning World Key
Energy Factory = EF
Water Works = WW
Idea Lab = IL

Ohio's Learning Standards for Science

4.ESS.1: Earth's surface has specific characteristics and landforms that can be identified. About 70 percent of the Earth's surface is covered with water and most of that is the ocean. Only a small portion of the Earth's water is freshwater, which is found in rivers, lakes, groundwater and glaciers. Earth's surface can change due to erosion and deposition of soil, rock or sediment. Catastrophic events such as flooding, volcanoes and earthquakes can create landforms. **WW**

4.ESS.3: The surface of Earth changes due to erosion and deposition. Liquid water, wind and ice physically remove and carry rock, soil and sediment (erosion) and deposit the material in a new location (deposition). Gravitational force affects movements of water, rock and soil. **WW**

4.PS.2: Energy can be transferred from one location to another or can be transformed from one form to another. Energy transfers from hot objects to cold objects as heat, resulting in a temperature change. Electric circuits require a complete loop of conducting materials through which electrical energy can be transferred. Electrical energy in circuits can be transformed to other forms of energy, including light, heat, sound and motion. Electricity and magnetism are closely related. **EF, IL**

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Answer Key

Exhibit Exploration Guide

Grade 4

Energy Factory

Converting Energy

1. The material changed color and an image of a handprint was left behind.
2. The material changed color because it absorbed heat energy.
3. The heat came from the hand/person/body.
4. The image fades away and the material goes back to black/loses color.
5. The results would be different if you wore gloves because the gloves would insulate your hand and less thermal energy would be able to transfer to the material.

Energy vs Power

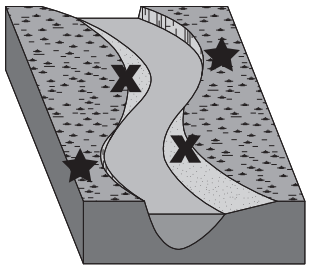
1. The source of the energy to light the lightbulb was the person turning the crank.
2. Turning the crank
   Flowing through the wires
   Given off by the lightbulb
   *Note: The person turning the crank is supplying **mechanical energy**. **Electrical energy** flows through the wires, and **light** and **heat** energy are given off by the lightbulb.*

Ring Launcher

1. The ring jumps into the air and quickly moves up the track before falling back down. The aluminum ring moves away from the copper coil and jumps in the air when an electrical current flows through the wires.
2. The aluminum ring only gets repelled when you hit the button because the magnetic field only exists when the electrical current is flowing.

Water Works

Erosion and Deposition

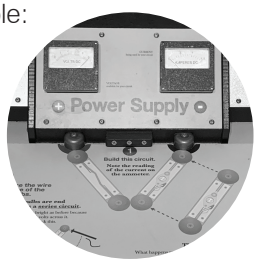
1. Answers will vary
2. 

Idea Lab

Musical Bench

1. In order to get the musical bench to make a sound, a person must touch the metal plates on each armrest, and then have people also touch each other to create a closed circuit.

Circuit Table

1. Answers will vary depending on the choice of circuit blocks. All circuits should include a lightbulb and form a completed loop to make a closed circuit.
   Example:
   

2. Answers will vary.
3. Answers will vary.

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Student Data Recording

Exhibit Exploration Guide

Grade 4

Energy Factory

Converting Energy (4.PS.2)

Place your hand on the material's surface.

1. What happened?

2. Why do you think the surface changed?

3. The material in this exhibit will change color as thermal (heat) energy is added to the material. Where was the heat transferred from?

4. What happens to the surface after you wait 15 seconds without touching it?

5. Do you think the results of this experiment would be different if you were wearing gloves? Why or why not?

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Exhibit Exploration Guide

Grade 4

Energy Factory

Energy vs Power (4.PS.2)

Follow the directions at the exhibit to light up one of the light bulbs.

1. What was the source of the energy to light the bulb?

2. What was the path of the energy from your body to the lightbulb?
   Write the steps or draw a picture.

Ring Launcher (4.PS.2)

Look at the copper coils at the base of the Ring Launcher. Push the red button to send an electrical current through the copper coils.

1. What happens to the aluminum ring when the electrical current flows through the wires?

2. The aluminum ring was repelled by a magnetic field created in the copper coils.
   Why do you think the aluminum ring only gets repelled when you hit the button?

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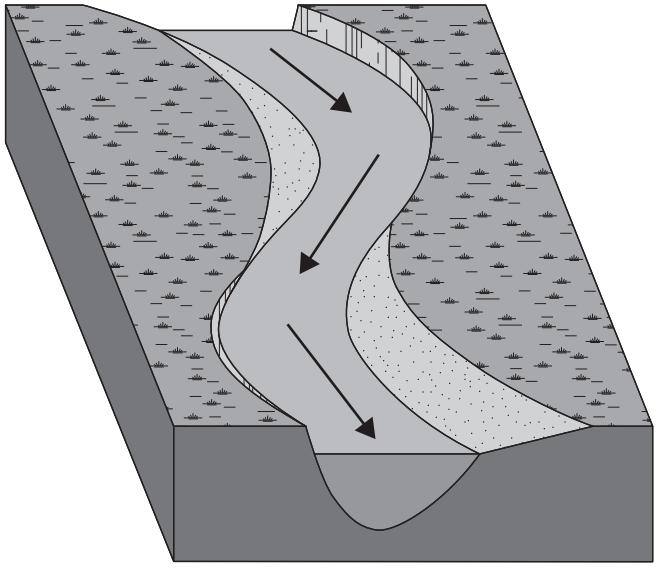
Water Works

Erosion and Deposition (4.ESS.1 and 4.ESS.3)

1. With the water source turned off, dig a winding channel through the sand from the water source to the catch basin. Then turn the water on. Draw what it looks like before and after you turn the water on.

Before the water flows	**After** the water flows

2. Fast moving water can erode, or pick up and move soil and sediment. Slow moving water will deposit, or lay the sediment back down. Look at the diagram below and **star** where you think **fast** water erodes the sediment **away** from the river bank. Mark with an **X** where you think **slow** water deposited sediment back **down** on the river bank.



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Idea Lab

Musical Bench (4.PS.2)

You will need a partner to make this work!

1. With your partner, figure out where to touch the musical bench to get it to make a sound. What did you have to do? Write your answer or draw a picture below.

Circuit Table (4.PS.2)

1. Build a circuit that turns on a lightbulb using the lightbulb and one other piece. Draw your circuit below. Remember to include the power source in your drawing!

2. Add more pieces to your circuit and draw it below.

3. How did your circuit change when you added the pieces?

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