

Exhibit Exploration Guide

Grade
7

Learning World Key

Energy Factory = EF

Water Works = WW

Grow U = GU

Idea Lab = IL

Mind Zone = MZ



Ohio's Learning Standards for Science

7.ESS.1: The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere and atmosphere. Thermal energy is transferred as water changes state throughout the cycle. The cycling of water in the atmosphere is an important part of weather patterns on Earth. The rate at which water flows through soil and rock is dependent upon the porosity and permeability of the soil or rock. **WW, GU**

7.ESS.5: The relative positions of Earth and the sun cause patterns we call seasons. Earth's axis is tilted at an angle of 23.5°. This tilt, along with Earth's revolution around the sun, affects the amount of direct sunlight that the earth receives in a single day and throughout the year. The average daily temperature is related to the amount of direct sunlight received. **WW**

7.PS.1: Elements can be organized by properties. Elements can be classified as metals, non-metals and metalloids, and can be organized by similar properties such as color, solubility, hardness, density, conductivity, melting point and boiling point, viscosity, and malleability. **EF, MZ**

7.PS.3: Energy can be transformed or transferred but is never lost. When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. When energy is transformed from one form to another, the total amount of energy remains the same. **EF**

7.PS.4: Energy can be transferred through a variety of ways. Mechanical energy can be transferred when objects push or pull on each other over a distance. Mechanical and electromagnetic waves transfer energy when they interact with matter. Thermal energy can be transferred through radiation, convection and conduction. An electrical circuit transfers energy from a source to a device. **EF, IL**



Exhibit Exploration Guide



Grow U

Water Drainage Wheel

1. Circle the sand, cross out the clay
2. Sand
3. Clay
4. Sample answer: If a soil has greater porosity, water will drain through it faster.
5. Clay

Water Works

Clouds

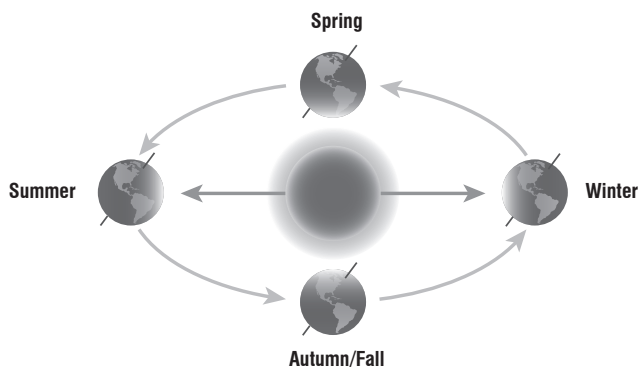
1. Evaporation
2. Orographic cloud
3. Convection

Pier 19 Weather Station

- Answer varies by chosen season

Spring: min: 12 hrs 7 min max: 15 hrs 11 min
Summer: min: 12 hrs 11 min max: 15 hrs 11 min
Autumn/Fall: min: 9 hrs 8 min max: 12 hrs 11 min
Winter: min: 9 hrs 8 min max: 12 hrs 7 min

- Answer varies by chosen season:



Energy Factory

Converting Energy

1. Answers will vary, including:
 - They both changed color, they were both in the shape of a hand.
2. Answers will vary, including:
 - The handprint that was left through the paper is not as bright as the other handprint.
 - The handprint that was left through the paper faded more quickly than the other handprint.

3. Answers will vary, including:
 - More heat was transferred to the film without the paper on it.
 - The paper is a poor conductor of heat so less heat was transferred through the paper.
4. Answers will vary, including:
 - The color stayed longer when the hand was on the square for longer.
 - More heat was transferred when the hand was on the square for longer.

Energy Vs. Power

1. No written answer needed
2. Answers will vary, up to 12. Sample answer: 9 volts
3. Answers may vary. Sample answer: Mechanical or Kinetic Energy • Electrical Energy • Light/Electromagnetic/Heat Energy

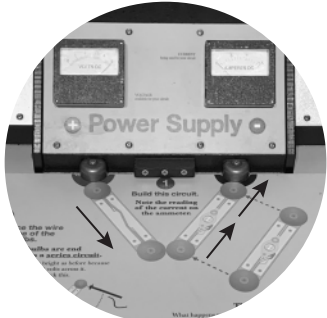
Mind Zone

Heat Grid

1. Because copper is a good conductor of heat
2. Answers will vary, including:
 - No, because plastic doesn't transfer heat as easily as metals such as copper.

Idea Lab

Circuit table

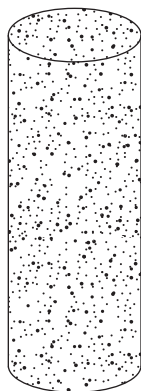
1. 
2. Answers will vary.
- 3a. one
- 3b. two
4. Answers will vary based on question 2.



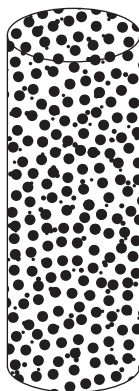
Grow U

Water Drainage (7.ESS.1)

1. Different kinds of soils have different properties. One property is porosity, or the amount of space in between soil particles. Look at the drawing below and compare it with the Water Drainage exhibit. Then circle the particle type with the greatest porosity (most space in between particles) and cross out the particle type with the least porosity (least space between particles).



Clay



Silt



Sand

2. Turn the Water Drainage wheel and circle which type of soil particle lets the water drain through it **most quickly**:

Sand

Silt

Clay

3. Circle which type of soil particle lets the water drain through it the **most slowly**:

Sand

Silt

Clay

4. How is porosity related to the rate of water drainage?

5. Based on the observations you recorded above, which soil particle type would be the best for building a pond, where you want to trap water and keep it from draining out?

Water Works

Clouds Sign (7.ESS.1)

1. What process takes liquid water from oceans, lakes, and other bodies of water and transforms it into gaseous water (water vapor) in the atmosphere? _____
2. Which type of cloud is created because of a landform? _____
3. Thermal energy radiating from the land contributes to the formation of _____ clouds.

Pier 19 Weather Station (7.ESS.5)

Select a season by circling one below. Use that season to answer the questions.

spring

summer

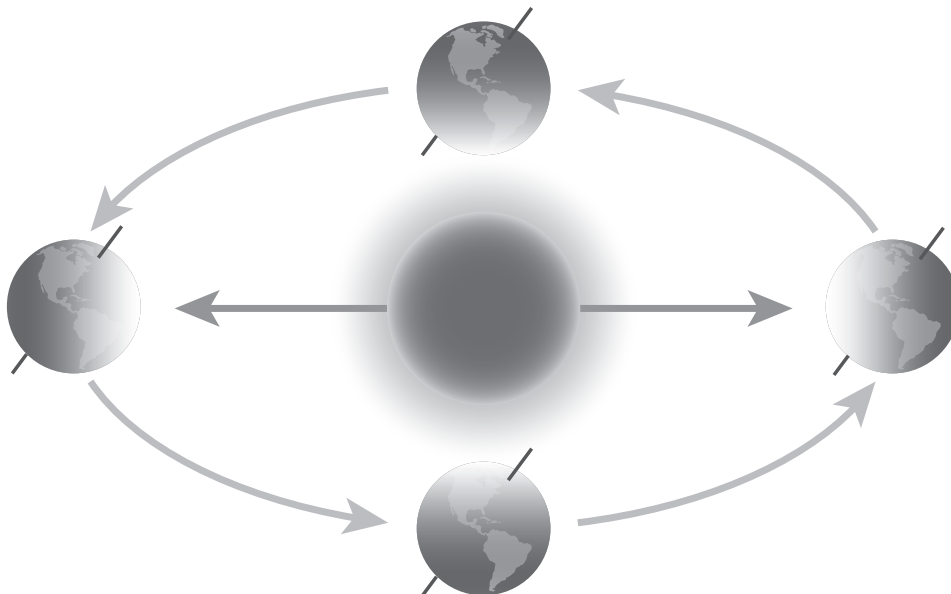
autumn/fall

winter

1. What is the minimum and maximum amount of daylight hours received during this season (in Toledo, Ohio)?

minimum: _____ maximum: _____

2. Circle the model below that represents Earth's position during your chosen season in the Northern Hemisphere.
Tip: Pay attention to the tilt of Earth on its axis.



Energy Factory

Converting Energy (7.PS.1, 7.PS.4)

This film helps visualize the transfer of thermal (heat) energy. Start with two black squares of the film. Place your paper over one of the squares and leave the other square uncovered. Then place your hands, palms down, on the squares for the same amount of time. **Draw** what you see in the space below.

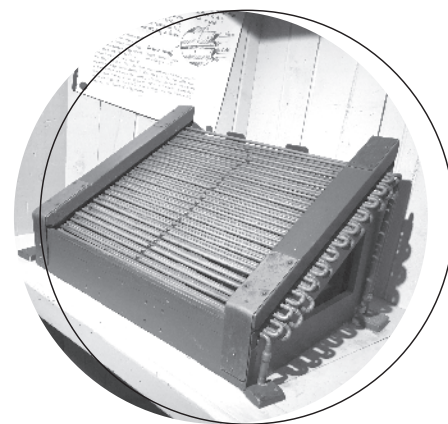
1. How did the images look similar?
2. How did the images look different?
3. Why do you think the images looked different?
4. Place one hand on a black square for a short amount of time (about 5 seconds), and place another hand on a black square for a longer amount of time (about 20 seconds). How are the images different?



Energy Factory

Energy Vs. Power (7.PS.3)

1. A capacitor is a device that can store a small amount of electricity and release it later. You can store electrical energy in a capacitor by connecting it to a power source to let it accumulate a charge. **Charge** the capacitor by turning the copper switch to the left and turning the crank.
2. Look at the voltmeter to measure the energy stored in the capacitor. How much energy were you able to store?
_____ volts
3. Turn the copper switch to the right and press one of the black buttons to release the energy you stored. What types of energy transformations occurred when you charged the capacitor and lit the bulb?



Mind Zone

Heat Grid (7.PS.1)

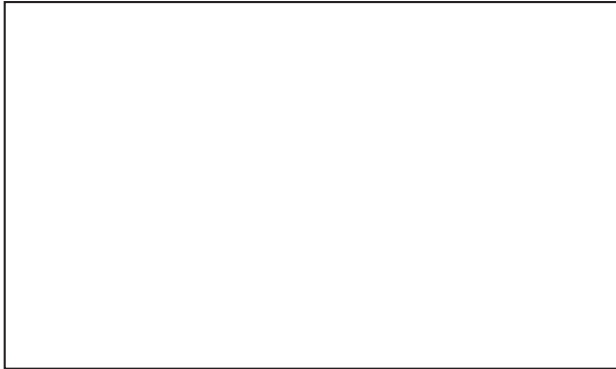
Experiment with the heat grid. Touch the tubes separately and at the same time to experience different effects.

1. Why is copper tubing used for this exhibit?
2. Do you think this exhibit would work just as well if plastic tubes were used? Why or why not?

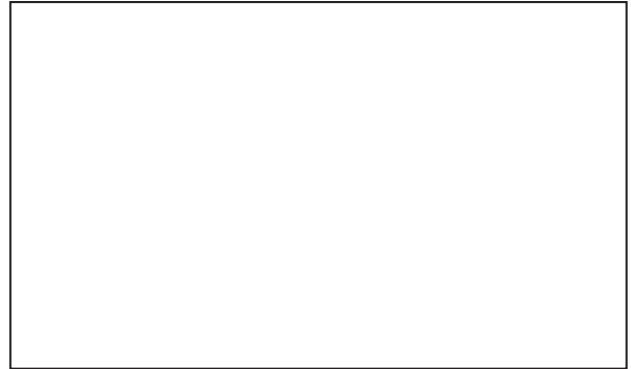
Idea Lab

Circuit Table (7.PS.4)

1. **Create** a simple circuit using the power supply, copper wire and a lightbulb. **Draw** what it looks like below. **Trace** the path of electricity through the circuit

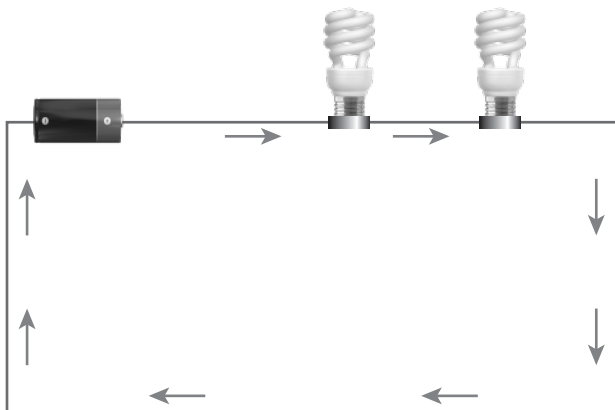


2. **Add** a second lightbulb to your circuit. **Draw** what it looks like below. **Trace** the path or paths of electricity through the circuit.

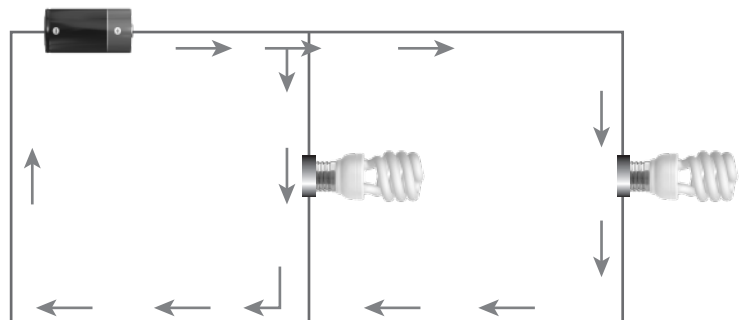


3. The picture below shows two kinds of circuits: a series circuit and a parallel circuit.

- How many paths can the electricity take through the series circuit?
- How many paths can the electricity take through the parallel circuit?



Series Circuit



Parallel Circuit

4. Look at your drawing in question #2. What kind of circuit did you build?