

INTRO TO ENERGY

ACTIVITY 1A: ENERGY TRANSFERS

Students will experiment with Energy transfer examples at stations set up around the room.

Location: Classroom

Time: One class period

Materials:

- » Worksheets
- » Baking soda
- » Calcium chloride (de-icer available at hardware stores)
- » Small motor
- » Small bulb and socket
- » Alligator clips
- » Lemon
- » Copper (or pennies) zinc
- » Pin wheel or construction paper
- » Rubber bands and tacks
- » Quart-sized sealable plastic bags
- » 2 volt solar panel (can be purchased from kelvin.com or pitsco.com)

Prep:

Set up stations, warm light bulb with lamp, rubber bands, fan attachment for motor

Instructions:

There are two options for performing this activity:

In the first option, students will rotate through stations (see instructions below), exploring a different energy form at each station and recording their observations on worksheets provided.

In the second option, students will use the materials to develop their own energy transfers. Demonstrate one of the energy transfers for the class, then distribute the materials and challenge students to create as many energy transfers as possible.

Station 1

Materials: Heat source (warm light bulb or small votive candle) Windmill (build a simple one using paper, a thumbtack, and a pencil with eraser) For simple instructions on how to build a paper windmill look here: <http://www.wikihow.com/Make-a-Pinwheel>.

As an alternative to building a pinwheel, you may use a radiometer, which can be purchased for \$10–\$15 on Amazon or any science education store website.

Instructions: Using tongs or a clamp and stand, hold the pinwheel over the heat source (use a votive candle or warm light bulb for the heat). **Caution:** Do not let students get pin wheel too close to open flame. Observe and record what happens.

Station 2

Materials: Baking soda and calcium chloride, baggies.

Instructions: In a quart sized baggie, add 2 tablespoons of calcium chloride and 1 tablespoon of sodium bicarbonate (baking soda) Squeeze the bag and mix the two powders and add a small amount of water. Seal the bag tightly and continue to mix. (**Caution:** the powders are skin irritants and care should be taken to avoid contact with skin.) Observe and record what happens. **NOTE:** Bag can be very hot. Instruct students to be careful.

Station 3

Materials: Small solar panel and light bulb with socket and leads (or alligator clips).

Instructions: Attach the solar panel to the light bulb using the leads or alligator clips. Hold the panel in front of a sunny window or under a strong light. Observe and record what happens.

Station 4

Materials: Small motor with fan attachment, or another object that can be placed on the shaft of the small motor which will allow you to manually turn the motor, small light bulb.

Instructions: Using the leads, attach the motor to the light bulb. Manually turn the motor very quickly. Observe and record what happens.

Station 5

Materials: Lemon with slits 2 inches apart, penny, zinc strips, alligator clips, multi-meter.

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Instructions: Make two small slices into either side of the lemon. Carefully insert the penny into one of the slits in the lemon and the zinc into the other. Attach the clips, one from the penny and one from the zinc to either side of the multi-meter. Observe and record what happens.

Station 6

Materials: Rubber band stretched between two thumb tacks.

Instructions: Strum the rubber band carefully. Observe and record what happens.

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STATION 1 - ENERGY TRANSFERS

Materials: Heat Lamp and Radiometer

Instructions: Carefully turn on and hold the heat lamp over the radiometer. Observe what happens and record the types of energy transfers taking place.

STATION 2 - ENERGY TRANSFERS

Materials: Baking soda and calcium chloride, baggies.

Instructions: In a quart sized baggie, add 2 tablespoons of calcium chloride and 1 tablespoon of sodium bicarbonate (baking soda). Squeeze the bag and mix the two powders and add a small amount of water. Seal the bag tightly and continue to mix. (**Caution:** the powders are skin irritants and care should be taken to avoid contact with skin.) Observe what happens and record the types of energy transfers taking place.

STATION 3 - ENERGY TRANSFERS

Materials: Small solar panel and light bulb with socket and leads (or alligator clips).

Instructions: Attach the solar panel to the light bulb using the leads or alligator clips. Hold the panel in front of a sunny window or under a strong light. Observe what happens and record the types of energy transfers taking place.

STATION 4 - ENERGY TRANSFERS

Materials: Small motor with fan attachment, or another object that can be placed on the shaft of the small motor which will allow you to manually turn the motor.

Instructions: Using the leads, attach the motor to the light bulb. Manually turn the motor very quickly. Observe what happens and record the types of energy transfers taking place.

STATION 5 - ENERGY TRANSFERS

Materials: Lemon with slits 2 inches apart, penny, zinc strips, alligator clips, multimeter.

Instructions: Make two small slits into either side of the lemon. Carefully insert the penny into one of the slits in the lemon and the zinc into the other. Attach the clips, one from the penny and one from the zinc to either side of the multimeter. Observe what happens and record the types of energy transfers taking place.

STATION 6 - ENERGY TRANSFERS

Materials: Rubber band stretched between two thumb tacks.

Instructions: Strum the rubber band carefully. Observe what happens and record the types of energy transfers taking place.

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NAME:

Answer the following questions based on your experiments:

1 » List the energy transfers taking place:

Station 1:

Station 2:

Station 3:

Station 4:

Station 5:

Station 6:

2 » How do these experiments reinforce the concept of energy transfer?

3 » Based on the experiments, define energy.

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4 » How do these experiments relate to the 1st and 2nd laws of thermodynamics?

5 » List the types of energy that are being used in the classroom.

* » **Challenge:** Create an energy transfer device that uses a minimum of four different transfers to complete a task. Watch the following video for ideas: <http://www.youtube.com/watch?v=TXfTrZ7n00Q>