

Name _____

Date: _____

Focus on Energy

Student Notebook



Electrical Energy

The Energy Tracking Lens

Part 1. Describe what you observe.

Part 2. Tell the energy story.

- System components?
- Form(s) of energy?
- Energy gains and losses?
- Energy transfers?
- Energy transformations?
- Where does the energy come from and where does the energy go?

Use observations to support your energy story.

Where do you think the energy comes from?

One hot summer day, you plug an electric fan into the wall socket and watch the blade begin to turn. The fan gains motion energy. The energy must have come from somewhere!

Where did the energy come from?

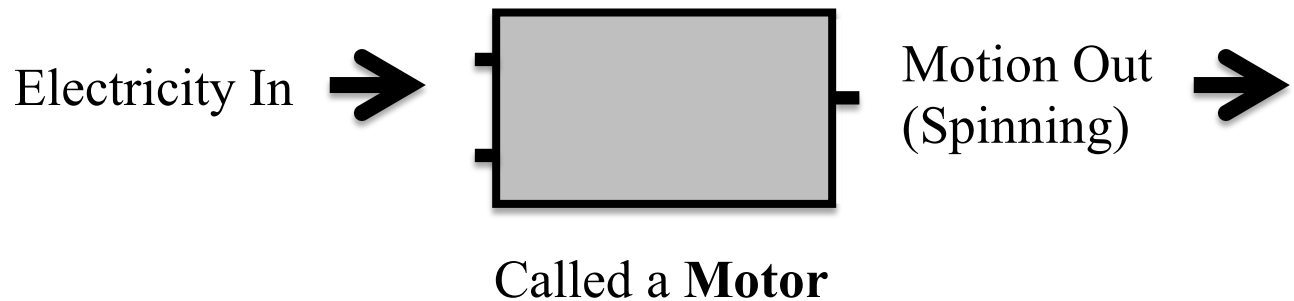
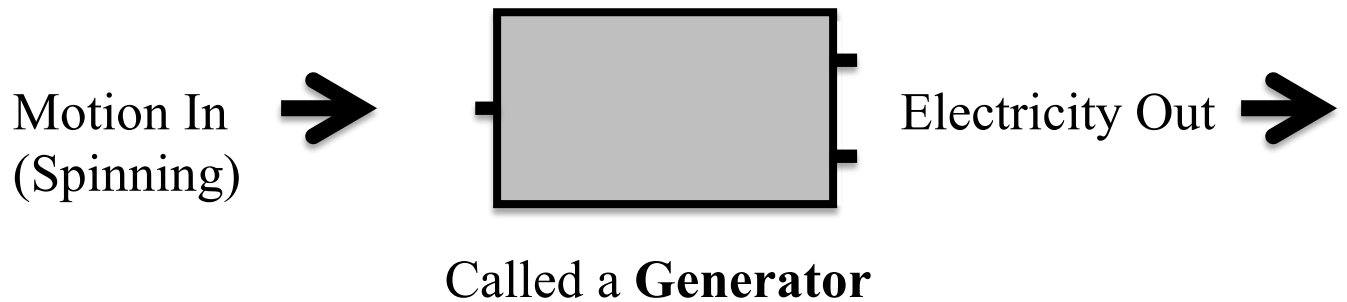
Take a few minutes to write down some of your ideas in the space below. Keep asking yourself “where did THAT energy come from?” and track the energy back as far as you can.

Motors and Generators

Generators transform motion energy into electrical energy. Motors transform electrical energy into motion energy.

Both are the same inside: wires spinning past magnets.

A generator can function as a motor, and vice versa. Test this by connecting two hand crank generators and turning first one and then the other.



What is the flow of energy when the propeller spins?

1. Draw

- Make a simple drawing to show the components of the system and how they are connected (hand crank generator, wires, motor, propeller).
- Add labels.
- Add arrows to track the flow of energy.

2. Put an * by any component in your drawing where there is an energy transformation (one kind of energy changes to another kind of energy).

3. What's the evidence that the wires carry electrical energy in this system?

What if there's no wind? Can we store energy?

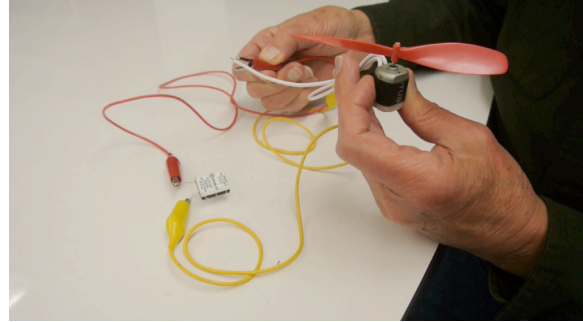
As you investigate a hand crank generator, a capacitor and a motor connected to a propeller, think about these questions.

1. What evidence convinced you that the capacitor has electrical energy?

2. Where does the energy stored in the capacitor come from?

Quick Check: Capacitor Energy

Jim has a capacitor and a motor with a propeller on his desk. As soon as he connects the wires to the motor, the propeller begins to spin. The propeller spins for about 6 seconds and slows down to a stop. Watch a video of this investigation and answer the following questions.

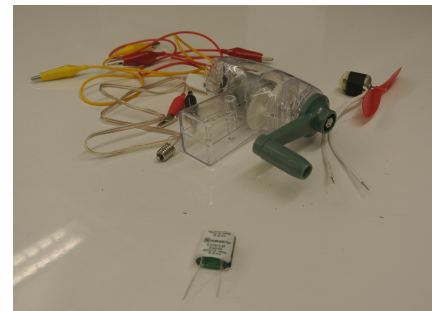


When does the capacitor have the most energy?

- Just before Jim connects the wires to the capacitor.
- Just after Jim connects the wires and the propeller starts spinning.
- When the propeller is spinning the fastest.
- Just after the propeller stops spinning.
- The capacitor has the most energy the whole time the propeller is spinning.
- Some other time.

The statement I chose makes sense to me because _____

Ben finds a capacitor in the classroom. He is not sure if it has any energy. Which of the following statements makes the most sense to you?



- All capacitors have energy
- The capacitor cannot have energy if it is not connected to something
- Ben could observe the capacitor carefully to see if it has energy
- Ben could do an investigation with the capacitor to see if it has energy
- There is no way to tell if the capacitor has energy

The statement I chose makes sense to me because _____

Solar Panels

Where does the energy come from and where does the energy go?



Where does the energy come from and where does the energy go?

Question: Does light carry energy?

Yes, I think light carries energy.

No, I do not think light carries energy.

The answer I chose makes sense to me because

Solar panels: where does the energy come from and where does the energy go?

Using the solar panel to charge the capacitor

Part 1. Describe changes you *observed*

Use drawings, words, and/or arrows.

Part 2. Tell the energy story.

Use drawings, words, and/or arrows.

Use observations to support your energy story.

- System components?
- Form(s) of energy?
- Energy gains and losses?
- Energy transfers?
- Energy transformations?
- Where does the energy come from and where does the energy go?

Solar panels: where does the energy come from and where does the energy go?

Using the capacitor to make the propeller spin

Part 1. Describe changes you *observed*

Use drawings, words, and/or arrows.

Part 2. Tell the energy story.

Use drawings, words, and/or arrows.

Use observations to support your energy story.

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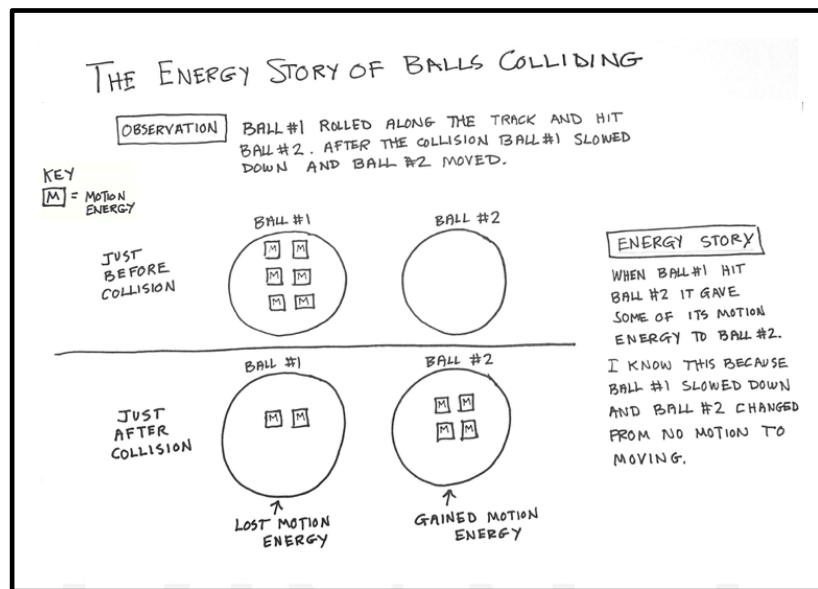
Energy Story Poster

An effective Energy Story poster has:

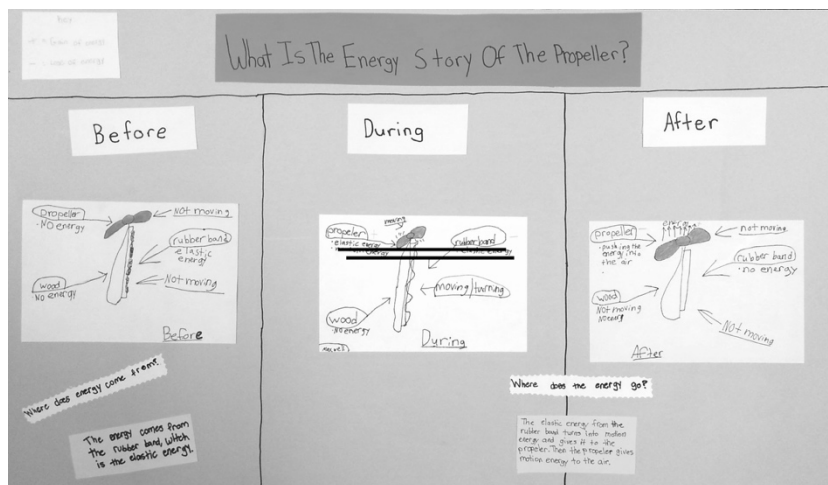
- * A title
- * A key
- * An observation
- * Answers the Energy Tracking Lens questions.
- * Drawings with notes

Poster can have many different designs. For example:

A poster can include Energy Cubes or Energy Bars.



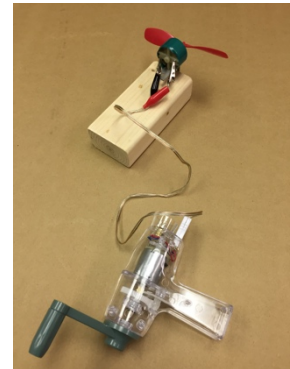
A poster can show different moments in time or snapshots in time.



Darwin wonders about the hand cranked generator and the red propeller



Darwin, the dog, watches Tomas explore electrical energy. Tomas turns the handle of a generator which is connected by wires to a motor and red propeller. Darwin sees that when Tomas turns the handle in one place the propeller is spinning in another place.



1. Think about the red propeller.

a. When Tomas begins to turn the handle of the generator, does the red propeller

- Gain energy?
- Lose energy?
- Neither gain nor lose energy?
- Both gain and lose energy?

The statement makes sense to me because:

b. Tomas keeps turning the handle and sees that the propeller spins in a steady way. While it is spinning, does the red propeller

- Gain energy?
- Lose energy?
- Neither gain nor lose energy?
- Both gain and lose energy?

This statement makes sense to me because:

2. Darwin sees that when Tomas turns the handle of the generator the propeller turns. But the wires that connect them don't move at all. He wonders how this is possible.



Explain how this is possible. (Use diagrams, words and/or the Energy Tracking Lens to tell the energy story).