

CHANGING FORMS OF ENERGY (MODIFIED FOR ADEED)



Science Concept:

Energy can be transformed.

Objectives:

The student will:

- identify and explain common energy transformations;
- record observations; and
- write one or two paragraphs describing observed energy transformations.

GLEs Addressed:

Science

[8] SB2.1 The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by identifying the initial source and resulting change in forms of energy in common phenomena (e.g., sun to tree to wood to stove to cabin heat).

[8] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Writing

[8] W3.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms (e.g., letter, report, biography, and/or autobiography) to inform, describe, persuade.

Vocabulary:

chemical energy – energy released from chemical reactions

electric energy – energy provided by electron movement

energy – the capacity for work

heat energy – energy released by increasing temperature

light energy – energy from a light source

magnetic energy – energy in a magnetic field

mechanical energy – the energy of movement

original – the form of energy that the object begins with

Materials:

- Wooden pencil
- Electric pencil sharpener
- Battery powered fan or model airplane, with batteries
- Flashlight with batteries
- LED flashlight with batteries
- Wind-up flashlight
- Nine volt battery
- One large nail
- 2 feet bare copper wire
- Paper clips
- Portable (battery-powered) radio
- 6 hand-warmers, chemical
- 6 light-sticks
- Timer
- STUDENT WORKSHEET: "Energy Transformations"

CHANGING FORMS OF ENERGY



Activity Preparation:

Set out the following items in stations for student exploration: hand warmer; light-stick; regular flashlight; LED flashlight; wind up flashlight; battery, nail, paper clips, and wire; battery-powered fan or model airplane, with batteries; and a portable (battery-powered) radio.

Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear Up

Process Skills: observing, communicating, and questioning

1. Break the tip off of a pencil in front of the class. Ask students how it can be repaired. Students may suggest a pencil sharper. Try to sharpen the pencil using an electric pencil sharper that is not plugged in. Explain that the pencil sharper is not working and ask students how it can be fixed. Students should suggest that the pencil sharper be plugged in.
2. Discuss the fact that energy is required to make the pencil sharpener work. Ask students where the electrical energy originates. Sharpen the pencil, then lead a discussion about energy transformation. Point out that in this particular system electricity goes in; motion, sound and heat go out. Discuss the vocabulary words, emphasizing all types of energy. Write the words on the board for future reference.

Teacher's Note: Energy that produces sound is mechanical since it involves moving air.

Explore

Process Skills: observing, collecting data, describing, and investigating

3. Distribute the STUDENT WORKSHEET: "Energy Transformations." Instruct students to move from station to station (as set up during the Activity Preparation) and use various implements that operate using electrical and chemical energy. Students should observe and record how these objects, when used, convert energy from one form to another. As they explore, ask students to fill in the chart on the worksheet. Use the timer to time rotations, allowing students two minutes at each station.
4. After students have explored all stations, ask them the following questions and discuss as a class:
 - a. What form is the energy in when you begin using the object at each station?
 - b. When you use the object what other forms does the energy change into?
 - c. What is the intended form of energy produced by this object?
 - d. What types of secondary energy are produced?
5. Ask students to complete their worksheets, or assign the rest of the worksheet as homework.

Generalize

Process Skills: inferring, communicating, describing, and classifying

6. Ask the class the following questions:
 - a. What are some forms of energy?
 - b. What is electrical energy?
 - c. What is heat energy?
 - d. What is light energy?
 - e. What were some original types of energy used by the objects you studied today?
 - f. What is secondary energy?
 - g. What was the most common type of secondary energy produced?
 - h. Where does this secondary energy go?
 - i. In what ways did the energy change?
 - j. How did you know the energy form changed?
 - k. How many types of energy did these objects produce?
 - l. What type of energy is least useful?
 - m. How do we use magnetic energy?
 - n. How does our use of these forms of energy affect climate change?

CHANGING FORMS OF ENERGY

Apply

Process Skills: observing, collecting data, inferring, and describing

7. List ten objects in your home that use energy to operate. For each item, write down what type of energy the object begins with, what type of energy it is intended to produce, and what kind of secondary or wasted energy it produces. For example:
 - a. Wood stove: chemical energy of wood changes to heat energy, and produces light energy as a secondary energy.
 - b. Hand-operated can opener: chemical energy of human body changes to mechanical energy with a small amount of heat as secondary energy.

Answers:

1.	Station Name	Original Energy Form	Output Energy Form(s)
	handwarmer	chemical energy	heat energy*
	light stick	chemical energy	light energy*
	regular flashlight	chemical energy (also accept electrical energy)	light energy,* heat energy
	LED flashlight	chemical energy (also accept electrical energy)	light energy*
	wind up flashlight	chemical energy of human body (also accept mechanical energy)	electrical energy converted to Light energy,* heat energy
	battery, nail, wire	chemical energy (also accept electrical energy)	magnetic energy*
	fan or airplane	chemical energy (also accept electrical energy)	mechanical energy,* heat energy
	radio	chemical energy (also accept electrical energy)	mechanical energy*(as sound waves), heat energy
		<i>batteries create electricity through a chemical reaction</i>	<i>*intended energy produced</i>

2. Answers will vary, but should agree with data in the chart above.

CHANGING FORMS OF ENERGY

RUBRIC

Assessment Task

Students will analyze their observations from the student worksheet completed during the Explore activity. The student must correctly identify at least three common energy transformations by filling in correct data on the worksheet. In at least one or two paragraphs, students must document their observations of the observed energy transformations by responding to questions provided on the student worksheet.

Rubric

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student identifies and explains common energy transformations.	[8] SB2.1	The student identifies, but does not explain, two or fewer common energy transformations.	The student identifies, but does not explain, three or more common energy transformations.	The student identifies and explains three or more common energy transformations. The student may also provide examples.
The student records observations.	[8] SA1.1	The student does not record observations of any energy transformations presented in the Explore.	The student records observations of some of the energy transformations presented in the Explore.	The student records observations of each energy transformation presented in the Explore.
The student writes one or two paragraphs describing energy transformations.	[8] W3.2.2	The student does not write at least one paragraph describing observed energy transformations by responding to questions on the student worksheet.	The student writes one or two paragraphs describing observed energy transformations by responding to questions on the student worksheet.	The student writes more than two paragraphs describing observed energy transformations by responding to questions on the student worksheet. The student may also provide additional observations not targeted by worksheet questions.



NAME: _____

ENERGY TRANSFORMATIONS

Directions: Go to each station and determine the featured object’s original form of energy and the form(s) of energy it produces or releases. List this information in the chart below. If more than one form of energy applies, list all applicable forms of energy. You will have two minutes to spend at each station.

1. Record the original form of energy and secondary energy form(s) produced for each object listed in the chart below.

Station Name	Original Energy Form	Output Energy Form(s)
Handwarmer		
Light Stick		
Regular Flashlight		
LED Flashlight		
Wind Up Flashlight		
Battery, Nail, Wire		
Fan or Airplane		
Radio		

2. In at least one or two paragraphs document the energy transformations you observed. Answer the following questions:
 - What were the original or initial sources of energy used at all of the stations?
 - What new forms of energy were intended to be produced?
 - What forms of secondary or unintended energy were produced?
