Solar Energy

Name: _____

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Standards

I understand that energy can be transferred from place to place by sound, light, heat, and electric currents.

I can provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

I can apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

I can define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

I can generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

I can plan and carry our fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Energy cannot be created or destroyed, it can only change forms.

VOCABULARY LIST

Energy: The ability to do work.

Kinetic Energy: The energy of motion.

Potential Energy: Stored energy.

Forms of Potential Energy: chemical, nuclear, elastic, gravitational, electric potential energy

Forms of Kinetic Energy: heat, light, sound, motion, electrical kinetic energy

Sources of Energy: oil, natural gas, coal, wind, sun, water, food, chemicals

Fossil Fuels: Fuels that come from dead things that have been buried for millions of years.

Non-Renewable Energy Sources: Fuels that cannot be quickly or easily made. (fossil fuels)

Renewable Energy Sources: Fuels that can quickly or easily be made again. (wind, hydropower, solar)

Pollution: Things that humans put into Earth's land, water and soil that are bad for it.

Global Warming: The increase in Earth's temperate due to air pollution created by humans, mostly from the burning of fossil fuels.

Energy Efficiency: Doing the same amount of desirable work as something else, but using less energy.

Watt: A way to measure how much electrical power something uses.

Lumens: The amount of visible light something produces.

Solar Energy: Energy from the sun.

Hydropower: Energy from moving water.

Wind Energy: Energy from the wind.

Solar Panel: A panel designed to absorb the sun's energy.

Insulation: Material added to something to stop heat, electricity or sound from going into or out of it.

Heat Conduction: the transfer of heat

Hypothesis: An educated guess.

Prototype: The first model.

What is Energy? Where Does it Come From?

Directions: First, write down what you think energy is. Then, copy the definition that the Energy Kids website gives. Last, look around your classroom for things that are doing work.

I think that energy is _____

Energy Kids Definition of Energy

Things in Our Classroom That are Doing Work
(draw or write words)

Forms and Sources of Energy

Directions: Work with your teacher to fill out this page.

Forms of Energy	Sources of Energy

_____ is a source of energy , but

_____ is a form of energy.

Non-Renewable Energy/Global Warming/Pollution

Directions: Use pages 6-7 in Your Renewable Energy World to help you fill out this page.

Non-Renewable Energy	Renewable Energy

_____ is a non-renewable form of because

_____, but

_____ is a renewable form of energy because

_____

Most of the energy we use is _____.
(non-renewable, renewable)

This is a problem because _____

_____

_____

The Greenhouse Effect

Directions: Create a drawing that helps you understand the Greenhouse Effect.
A: accurate B: big C: colorful D: detailed

Light Bulbs

type of bulb and sketch	lumens	temp. after _____ min.	watts

What does it mean for something to be energy efficient and why does it matter?

If something is energy efficient, it means that _____

_____

_____

_____

_____

_____

_____

It matters because _____

_____

_____

_____

_____

Renewable Energy

Directions: At each station, write down things that you notice or wonder.

Station	NOTES
Solar Car	
Hydropower Turbine	
Wind Turbine	

Directions: Use page 2 in Your Renewable Energy World to help you answer these questions.

What is renewable energy and how does it help the Earth?

Renewable energy is _____

It helps the Earth because _____

Solar Energy

Directions: After using the battery powered motor and the solar powered motor, answer these questions. Add to your list during the class discussion.

Advantages	Disadvantages

What are the advantages and disadvantages of using solar energy?

NOTE: Use commas to separate your points. (Bob, Fred and Tom went to the store.)

The advantages of using solar energy are _____

The disadvantages of using solar energy are _____

Lerato Cooks Up a Plan

Directions: As the teacher reads aloud to you, do a Graffiti Read on this sheet of paper. Your graffiti might include **words**, quick **sketches** or **symbols**. Your goal is to better understand the story.

Sun Oven

A: accurate B: big C: colorful D: detailed

How do you think the Sun Oven is able to reach such a high temperature?

I think that the Sun Oven is able to reach such a high temperature because

Notes from solarcookers.org

INSULATION

Examples of Insulation

_____ helps keep _____ things hot and _____ things cold.

Draw a picture of one item that uses insulation and describe how it works.

Bob said, "My solar oven doesn't need to be insulated." Do you agree or disagree with Bob?

I _____ (agree, disagree, don't agree) **with Bob because**

_____

_____

_____

Heat Conduction

Directions: First, use your hand to touch items made of different materials to see how they feel to the touch. Then, use the IR temperature guns to test the temperature.

Ambient/air temperature: _____

Item	Temp.	How does it feel to the touch? + warmer than air temp. = equal to air temp. - colder than air temp.

Does the type of material that your food cooks on matter? Why?

_____ it _____ matter what type of material
(Yes, No) (does, does not)

that the food in a solar oven cooks on because _____

_____

Choosing Colors

Directions: Take turns covering the mercury of your thermometer with the different colors of paper. Wait 2 minutes and record the temperature.

Color	Temp. after 2 minutes

Does color matter when it comes to solar ovens? Why?

_____ color _____ matter when it comes to solar ovens
(Yes, No) (does, doesn't)

because _____

_____

_____

_____

_____

Reflecting Sunlight

Materials:
One timer
2 white paper plates
2 ice cubes
1 parabolic cooker covered in tin foil

Directions:
1. Place one ice-cube one on the white plate. This will be your control.
2. At the same time, place the other ice-cube on the white plate and in the solar cooker.

HYPOTHESIS: I predict that the reflectors _____(will/will not) make a significant difference.

Put an x in the box for the ice-cube that appears to be more melted. Put an = if they appear to be equal.

TIME	CONTROL	COOKER WITH REFLECTORS	Notes/sketches
1-minute			
2-minutes			
3-minutes			
4-minutes			
5-minutes			
6-minutes			
7-minutes			
8-minutes			
9-minutes			
10-minutes			

RESULTS: The reflectors _____ increase the melting time of the

(did/did not)

ice-cube. I _____ use reflectors on my solar oven.
(will/will not)

ENGINEERING DESIGN WORK SAMPLE

ASK 1 2 3 4 5 6

1. **What is the problem or need?**

2. **What already exists to solve the problem?**

3. **What do you already know that can help you solve the problem?**

4. **What are the constraints or limits?**

5. **HYPOTHESIS:**

Design Name: _____

Directions: Draw and label your design. Make at least 2 designs. You may use colored pencils and a ruler.

IMAGINE AND PLAN 1 2 3 4 5 6	

Design Name: _____

Materials Needed:

Directions: Draw and label your design. Make at least 2 designs. You may use colored pencils and a ruler.

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IMAGINE AND PLAN 1 2 3 4 5 6	

Materials Needed:

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IMAGINE AND PLAN 1 2 3 4 5 6	

Materials Needed:

CREATE 1 2 3 4 5 6

STEP 1: Choose one of your designs and build a prototype.

STEP 2: Write down any problems you had or changes you made during building.

STEP 3: Test your design and write down the results.

Notes:

GRAPH YOUR RESULTS HERE

STEP 4: Was your hypothesis supported?

IMPROVE 1 2 3 4 5 6

Don't worry, most experiments and designs fail the first time. Scientists persevere and keep trying new things. Answer these questions about what you would do next time.

1. Why do you think your designed worked or, why do you think it didn't work.

2. What would you change if you could to the experiment again?

3. How will you use what you learned in your daily life?

ENGINEERING DESIGN WORK SAMPLE

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GRAPH YOUR RESULTS HERE

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Final Assessment

1. List 5 different forms of energy:

    A.
    B.
    C.
    D.
    E.

2. Can energy be created? YES NO

3. Describe one way that energy is transferred:

4. Explain how solar ovens work: