

# ENERGY FROM THE SUN

NAME \_\_\_\_\_ SCHOOL \_\_\_\_\_

DATE STARTED \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_

## TO THE SUPERVISOR

Please ensure the student understands the data below in language appropriate for the student.

**PREREQUISITE:** None.

**HOW TO DO THIS COURSE:** Do the steps one at a time, in order. When you finish a step, put your initials and the date on the sign-off line on the right. A split line means to get a pass (and an initial) from another student (or your supervisor if it says that). A \* means to get a checkout. All written work (including drawings) is turned in to the supervisor.

**PURPOSE:** Learn about energy from the sun and how it can be used to heat buildings.

**ESTIMATED TIME:** 5 hours.

## MATERIALS NEEDED FOR THIS COURSE

Access to a boiler, a steam radiator, a car with a radiator and a fireplace; a ball, a Bunsen burner or gas stove, an electric stove or hot plate, wooden matches, a sauce pan, two potted plants, a cardboard box, a lamp with a bulb in it.

Heron study booklet with these Data Sheets:

3451      3452      3453      3454      3455      3456      3457      3458      3459

Exam: 3460

## A. ENERGY FROM THE SUN

- \*1. READ: Data Sheet #3451 What is Energy. \_\_\_\_\_
2. DEMONSTRATE: Get a ball. Throw it up and then catch it. Feel that the ball wants to keep going when you catch it. What you feel is the energy in the ball. Throw the ball again and catch it. Feel the energy in the moving ball. \_\_\_\_\_
3. DEMONSTRATE: If there is a wind outside, go out and stand in it. Feel the wind trying to push you. What you feel is the energy in the moving air. \_\_\_\_\_
4. DEMONSTRATE: If the sun is out, go to a place where the sun is shining on you. See the light energy from the sun. Feel the heat energy from the sun. \_\_\_\_\_
5. DEMONSTRATE: Find a lamp with a light bulb in it. Turn it on. See the light energy coming from the light bulb. Put your hand near the bulb. Feel the heat energy coming from the light bulb. \_\_\_\_\_

6. DEMONSTRATE: Have your supervisor start a car engine. See the place where gasoline is put into the car. Feel the exhaust coming out of the car. Feel that it is warm. What you feel is heat energy from the gasoline. The energy of gasoline also makes the car move. \_\_\_\_\_
7. DEMONSTRATE: Have your supervisor burn a piece of paper. See the heat energy and light energy from the fire. (Paper is made from trees.) \_\_\_\_\_
8. DEMONSTRATE: Have your supervisor burn a small piece of wood. See the light energy and heat energy of the fire. (Wood comes from trees.) Remember that the light and heat energy of fire comes from the thing that is burning. \_\_\_\_\_
9. DEMONSTRATE: Jump up and down three times. See that your body has energy. Your body gets energy from food. \_\_\_\_\_
10. DEMONSTRATE (with whatever objects you wish to use): energy. **Supervisor pass.** \_\_\_\_\_
11. READ: Data Sheet #3452 The Sun's Energy. \_\_\_\_\_
12. DEMONSTRATE: Look outside and see how bright it is. All of this light comes from the sun. At night the sun is not out to give light energy. \_\_\_\_\_
13. DEMONSTRATE: Notice that it is warmer during the day than it is at night. This is because the sun gives heat energy during the day. \_\_\_\_\_
14. DEMONSTRATE: Get two potted plants that are about the same. Put them both where the sunlight can hit them. Cover one with a box so no sunlight can get to it. Give them both water every day. Look at them both every day. See that the one that gets sunshine grows much better. \_\_\_\_\_
15. DEMONSTRATE:
  - a) Go outside and look at the leaves of different trees and plants. The leaves are where the energy from the sun is first stored. \_\_\_\_\_
  - b) Find some dry leaves and bring them back to the courseroom. Save them for later. \_\_\_\_\_

- \*16. READ: Data Sheet #3453 Energy in Fire. \_\_\_\_\_
17. DEMONSTRATE: Have your supervisor burn the dry leaves that you saved. See that the leaves have energy. The energy in the burning leaves first came from the sun. \_\_\_\_\_
18. DEMONSTRATE: Have your supervisor burn a small piece of wood. Look closely at the flame. See the light energy from the flame. Feel the heat energy from the flame. \_\_\_\_\_
19. DEMONSTRATE:
- a) Pick some leaves off of the uncovered plant near the window and set them near the plant to dry. \_\_\_\_\_
- b) When the leaves are dry, have your supervisor burn one for you. Notice the energy of the fire. This energy came from the sun through the window. \_\_\_\_\_
20. READ: Data Sheet #3454 Energy in Wood. \_\_\_\_\_
21. DEMONSTRATE:
- a) Where wood comes from. \_\_\_\_\_
- b) Where the energy in wood comes from. \_\_\_\_\_
- c) What the energy in wood can be used for. \_\_\_\_\_
22. READ: Data Sheet #3455 Energy in Steam. \_\_\_\_\_
23. DEMONSTRATE: Have your supervisor help you. Put a small amount of water in a pan. Put the pan on a stove or burner. Turn it on to heat the water in the pan. Have your supervisor help you with this step. Watch the water in the pan boil until it is all turned to steam. \_\_\_\_\_
24. DEMONSTRATE (with objects): How heat energy goes from a fire to water to steam. \_\_\_\_\_
25. DEMONSTRATE: Draw a picture of water boiling over a fire of burning wood. Show where energy in the steam first came from. \_\_\_\_\_
26. READ: Data Sheet #3456 Radiators. \_\_\_\_\_

27. DEMONSTRATE:
- a) Have your supervisor start a car and warm it up. \_\_\_\_
  - b) Have him point out the car radiator under the hood. \_\_\_\_
  - c) Feel the warm air coming from the radiator. \_\_\_\_ \_\_\_\_\_
28. DEMONSTRATE: Ask your supervisor if the building you are in has radiators. If it does, go see one. If it is on, feel the heat coming from it. If the building does not have a radiator, go on to the next step. \_\_\_\_\_
29. DEMONSTRATE (with objects): What a radiator does. \_\_\_\_\_
30. READ: Data Sheet #3457 Steam to Heat Buildings. \_\_\_\_\_
31. DEMONSTRATE: If your building or a building nearby has a boiler, go to that boiler.
- a) See the boiler tank. \_\_\_\_
  - b) See the fire under it. \_\_\_\_
  - c) See the steam pipes. \_\_\_\_
  - d) See some of the fuel that makes the fire. \_\_\_\_
  - e) Go to a radiator in the building. Feel that heat coming from the radiator. \_\_\_\_ \_\_\_\_\_
32. DEMONSTRATE (with objects): How energy goes from wood to a fire, to a boiler, to steam, to a radiator, to the air. \_\_\_\_\_
33. READ: Data Sheet #3458 Energy from the Sun to a Boiler. \_\_\_\_\_
34. DEMONSTRATE (with objects): Where most of the energy on the Earth comes from. \_\_\_\_\_
35. DEMONSTRATE USING CLAY: How energy goes from the sun to trees, to wood, to a fire, to a boiler, to hot water, to steam, to a radiator, to the air. \_\_\_\_\_
36. READ: Data Sheet #3459 Energy from the Sun to the Fireplace. \_\_\_\_\_

- 37. DEMONSTRATE USING CLAY: How energy goes from the sun to trees, to wood, to a fire in a fireplace, to warm air in a room. \_\_\_\_\_
- 38. DEMONSTRATE (optional): Go to a house with a fireplace. See where the wood is burned to warm the house. \_\_\_\_\_
- 39. DEMONSTRATE: If you have not already seen a boiler, arrange with your supervisor to go to where you can see one. See the fire and the boiler tank and the steam pipes. \_\_\_\_\_

## B. PRACTICAL APPLICATION

- 1. PRACTICAL APPLICATION: Draw a large picture of how the energy gets to a boiler and where it goes after that. Show all the steps. \_\_\_\_\_

I have completed the steps of this course. I understand what I studied and can use it.

Student \_\_\_\_\_ Date \_\_\_\_\_

The student has completed the steps of this course and knows and can apply what was studied.

Supervisor \_\_\_\_\_ Date \_\_\_\_\_

This student has passed the exam for this course.

Examiner \_\_\_\_\_ Date \_\_\_\_\_

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