NAME: _____

Student Worksheet

Activity One

Writing a Short Report

Reading Energy Meters and Energy Bills

Your household very likely has an electric meter that measures the amount of electricity being used at any time. You will also have a gas meter if that is one of your sources of energy. For each of these, you will receive monthly bills for the amount of energy you use.

1. Find the energy bills for an entire year. Compare the amount of each kind of energy you use in different seasons. Make graphs showing energy use versus month of the year.
2. You may also be able to find average temperatures for each month of the year. Add temperature to the graphs and compare trends in energy use to trends in temperature.
3. Look at the electric and gas meters and watch the little dials spin around. Each dial represents a different digit (1s, 10s, 100s, etc). Figure out how to read the meters.
4. Turn off everything that is using gas and electricity and see how much gas and electricity you use per hour. You will still be using some gas because of pilot lights. You will probably still be using some electricity because of little lights that are always glowing on electronic devices.
5. Turn on just one 100-Watt light bulb. Read the electric meter, and then read it again one hour later. Find the difference in kilowatt-hours (kWh). Subtract the amount from step 4. That should be the energy used by the light bulb. It should be 0.1 kWh. (100 W × 1.0 hr. × 1.0 kW/1000 W)
6. You may also want to measure the energy used by some of your other electrical appliances.
7. You can use the same procedure to measure the energy used by gas appliances.

NAME: _____

Student Worksheet

Activity Two

Make a Solar Hot Water Heater

Solar hot water heaters are very simple. They are basically just water inside a black plastic container lying in the sunlight. You can use any black plastic container for this experiment.

1. You can buy "camping showers" at a large outdoor store. They are black plastic bags with a hose and shower head attached. The idea is to leave the bag filled with water in the sun all day and then hang it up in the late afternoon and take a shower.
2. If you can't find a camping shower, make your own with a black plastic trash bag or a length of black plastic irrigation hose.
3. Position your shower in the sun so that sunlight strikes the surface of the bag as directly as possible.
4. Measure the temperature of the water that you put in the bag, and measure it again several times during the day. Did it get hot enough to take a shower?
5. Try it again during a cloudy day. You may be surprised how much the temperature rises even when it is not very warm outside.

NAME: _____

Activity Three

Visit a Farmers' Market

Find the nearest farmers' market. Before you visit, think of the questions you want to ask and prepare a notebook with questions and spaces for answers. Visit stalls selling several kinds of produce. Look for fruits, vegetables, nuts, flowers, honey, eggs, and dairy products. Remember you will probably be talking directly to the farmers. They will probably be eager to tell you everything they know about their products.

These are some of the questions you can ask. See if you can think of some questions of your own to add to the list.

1. Is your food organic?
2. How far away is your farm?
3. How do you fertilize?
4. How do you control pests and weeds?
5. What machinery do you use?
6. Do you use any sources of "green" energy, such as wind or solar?
7. Also, make notes on the amount of packaging compared to food in a supermarket.

NAME: _____

Student Worksheet

Activity Four

Compare Motor Vehicles

Learn about hybrid cars and either buses or trains. Visit an auto dealership that sells hybrid cars and a public transit company that has buses, trains, or subways. Make a list of questions to ask before you go. Here are some to get you started.

Hybrid car dealer

1. First tell a salesperson you are trying to convince an adult to buy a hybrid and you need some talking points for your argument.
2. Ask how many miles per gallon hybrid cars get around town and on the highway.
3. Ask to see the engine and ask for an explanation of how it works.
4. Ask to see the dashboard dials and readouts and ask what information they tell you.
5. Ask if the gasoline part of the engine can run on biofuels.
6. Ask if you can also plug it in to an electrical outlet or if it only generates its own electricity.

Bus or Train Company

1. Visit the offices of a bus or train company. If you can't find anyone who knows about the energy statistics of the vehicles, ask for some literature.
2. Ask for statistics:
    a. Miles per gallon
    b. Average number of passengers
    c. miles per gallon per passenger
    d. Pounds of CO_2 emissions per passenger-mile
3. Ask if any of the vehicles run on alternative fuels or if there are plans to purchase such vehicles.
4. If any of the vehicles are electric, ask if any of the electricity is generated by alternative power sources.

NAME: _____

Student Worksheet

Activity Five

Calculate the Carbon Footprint of a Bicycle

Of course, a bicycle has a very small carbon footprint, but it is not zero. The footprint comes from three places: Energy used to manufacture the bicycle, the footprint related to the extra food you have to eat to make up for the extra calories you burn, and the CO_2 you exhale. You will have to do a little guesswork, but you can calculate all of these. The result will be the footprint of commuting to school on your bike.

1. **Manufacturing the bicycle:** Multiply the cost of the bicycle when it was new times 0.50 and divide by what you think will be the total life of the bicycle in years. Multiply this by the fraction of the bike's use that would be for travel to school. The answer will be pounds of CO_2.
2. **Extra food you have to eat:**
    a. Assume you have the diet of the average American your age of about 2100 kilocalories (kcal) per day. Multiply this by 365 days in the year.
    b. Riding a bicycle burns about 28 kcal per mile. Multiply this by the round-trip distance to school and then by the number of days in the school year.
    c. Divide the result in b. by the result in a. and multiply by 100. This is the percent increase in your food footprint.
    d. Find the number you calculated for your food footprint when you used the footprint calculator. Use the percent increase from part c. to find your yearly increase.
3. **CO_2 Exhaled:** This will be the least accurate part.
    a. Assume that the added exertion of riding a bicycle causes you to exhale an extra 0.0035 pounds (lbs.) of CO_2 per minute.
    b. Multiply this by 60 min./hr. and divide by 10 mi./hr to get pounds per mile.
    c. Multiply the answer in part b. by the round-trip distance to school and then by the number of days in the school year. This is the pounds of CO_2 you exhale per year riding your bike to school.
4. Add parts 1. 2. and 3. and compare to the footprint for transportation by car as calculated using the footprint calculator.

NAME: _____

Student Worksheet

Activity Six

Visit a Recycling Plant

If you live in a city, you are probably not far from a recycling facility. Many public landfills also have a recycling facility at the same location. Before you go, think of some questions to ask and prepare a list in a notebook with space to write the answers. Here are some suggestions to get you started:

1. Which materials do you recycle?
    a. Glass?
    b. Aluminum?
    c. Plastic?
    d. Paper?
    e. Steel?
    f. Organic waste, such as lawn trimmings and wood chips?
    g. Any automotive materials, such as motor oil or batteries?
2. How much separating of materials do you do and how much do people at home do?
3. For each of the materials that are recycled, what is the process and what are the products?
4. In each case, how much energy is saved?
5. How much CO_2 reduction comes from recycling each material?
6. Does the whole recycling process actually make a profit?