

Energy Audit Activity

Teacher's Guide

Topic:

Electric Circuits

The following information is provided to the student:

Question:

How much electrical energy is used on a monthly basis in your home and what are the main sources of energy consumption?

Purpose:

To conduct an analysis of household energy use in your home in order to estimate the average monthly electrical energy use and to determine the main sources of energy consumption.

A complete lab write-up includes a Title, a Purpose, a Data section, and a Conclusion/Discussion of Results. The Data section should include the provided sheet - completed and taped in. All appliances - from the most frequently used to the least frequently used, from the largest to the smallest - should be included in the audit. The weekly log should be used to estimate a monthly cost. The Conclusion/Discussion should answer the *question* posed in the lab and identify the main sources of energy consumption in your home.

Materials Required:

Calculator.

Description of Procedure:

Students use the provided table to organize information about the average monthly time usage and energy consumption for all electrical appliances in their home. Upon collecting data and calculating costs, they draw conclusions regarding the types of appliances which are the biggest consumers of electrical energy.

Alternative Materials and Procedure:

Some teachers may find it to be a useful exercise to compare the computed monthly cost with the actual cost listed on a recent utility bill. It may also be instructive to pose a variety of *what if ...? questions* as a follow-up activity. For instance, what type of annual savings would be possible if the refrigerator/freezer was 20% more efficient? or what strategy would you use to cut your monthly costs of electrical usage if you needed to save an extra \$30 per month?

Safety Concern:

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

Suggestions, Precautions, Notes:

The Laboratory

1. This activity does not involve any equipment or manipulation of measuring tools. Nonetheless, there is a considerable amount of data which must be collected and processed.
2. Students may need some guidance in order to determine the power or the current of some devices. Instruct them to search for the Underwriters Laboratories (UL) label which is found on most all electrical appliances. Discuss how to find the power from the current; and discuss how to find the power if only the resistance is given.
3. Some devices will not have any power-related information (or it will be at a location that is not easily assessable). Many online sites can be of great usefulness in providing typical power outputs for a variety of electrical devices.
4. The cost of a kiloWatt•hour (below the provided data table) is left blank. Find a reasonable rate for your local area.

Auxiliary Materials:

The following page is provided to the student for completion and inclusion in the Data section of their lab notebook.

Electrical Device	Time* (h)	Power (W)	or Current (A)	Energy (kW•h)	Cost** (\$)

The Laboratory

* Estimated weekly time for the entire household

** Calculated based on the cost of \$_____/kW•h

Scoring Rubric:

C12. Energy Audit Activity	Score
<ul style="list-style-type: none"> ___ Included, labeled and organized all parts of the lab report. ___ Data section included provided sheets - completed and taped in. All rooms and appliances in house were included; no major omissions. Data is reasonable. Calculations are correct. ___ Conclusion/Discussion states an estimate of the total monthly cost of electricity. Main sources of electrical energy consumption are identified. 	___/___

Connections to The Physics Classroom Tutorial:

The following reading is a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/circuits/u9l2d.cfm>

<http://www.physicsclassroom.com/Class/circuits/u9l3d.cfm>

Connections to Minds on Physics Internet Modules:

Sublevel 6 of the Electric Circuits module is a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>