

# Activity: Watt meters to measure energy consumption

## Image 1

**ADA Description:** Cartoon of an electrical plug going into a wall socket

**Caption:** none

**Image file name:** Electricaloutletandplug.jpg

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## Background and Purpose

We use electricity in our lives everyday. Electrical appliances require varying amounts of power to operate. Power (watts) is a measure of the instantaneous energy usage. Measuring the power use of an appliance and the time it is used can be used to calculate the total electrical energy consumed

$$\text{Energy} = \text{Power} \times \text{time}$$

$$(\text{kWh} = \text{watts}/1000 \times \text{hours})$$

Watt meters provide a convenient way to measure power consumption. Power consumption can also be determined through the appliance rating stamped on the appliance. For example, light bulbs are rated as “75 W” or “100 W” to indicate that they use more or less power and, therefore, produce more or less light.

The purpose of this activity is to test the power consumed and estimate the energy consumed by several household appliances.

## Supplies

1. Watt meter for each group of 3 students
2. 6-8 electrical appliances (examples could include: hair dryer, microwave, hot pot, radio, small TV, computer, cell phone or battery recharger, toaster, lamp with light bulb; string of LED or standard holiday lights, etc.)

## Procedure

1. Break into groups of 3 students and get a watt meter
2. Starting at the first station you are assigned,
  - a. Plug the watt meter into the wall and the appliance into the watt meter.
  - b. Play with the watt meter to find the setting that reports “power,”
  - c. Record the watt reading and name of the appliance on the data sheet.

- d. Explore the potential impact of various settings on the power consumption (for example, low versus high setting on the hair dryer, or on and off). Record the power consumed.
  - e. Estimate the time you use this appliance at home, record that time on the data sheet.
3. Rotate among other stations at the direction of your teacher and repeat step 2 for the other appliances
  4. Calculate the energy consumed for each appliance on the data sheet
  5. Answer the discussion questions.
  6. If time permits, complete the extension activity (following the discussion questions).

## Watt meter Data Sheet

Enter information for each appliance in one row of this table. If there are multiple settings tested for the appliance, you can use multiple rows.

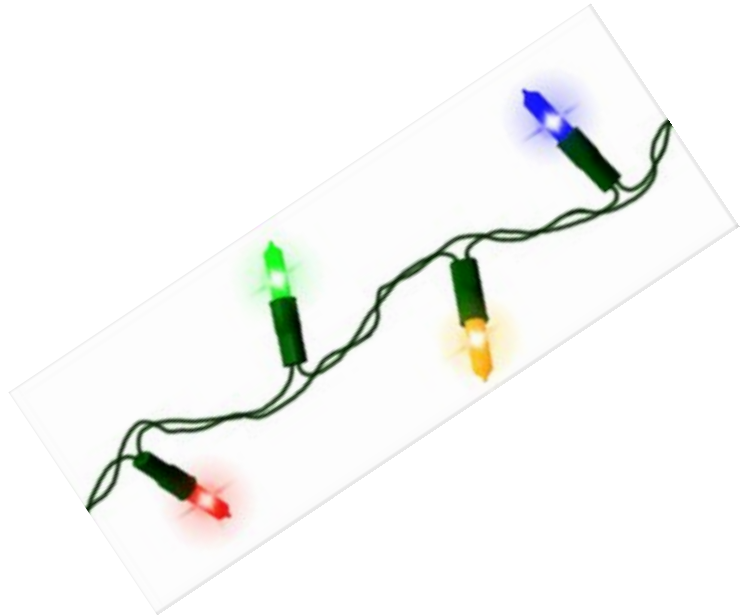
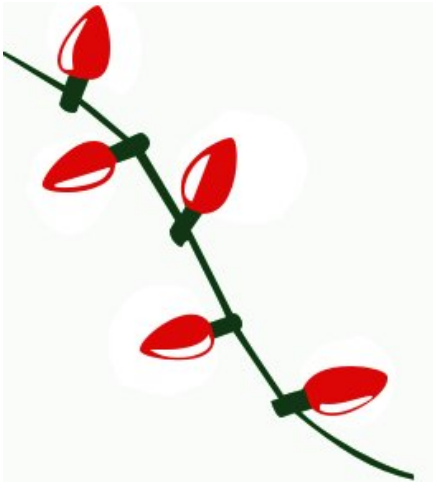
Appliance name	Setting / comments	Power or current specified on appliance	Power (W) (measured)	Estimated time used daily (h)	Energy consumed daily (kWh)*

\* energy (kWh) = power (W)/1000 X time (h)

## Discussion questions

1. Which of the appliances had a known power rating or current (amps)? How did your measured power compare with the power specified on the appliance? Discuss any differences. (Note – if current (amps) was specified, power can be calculated as  $\text{Power} = \text{volts} \times \text{amps}$ ; the voltage of standard power outlets is 120 V)
2. Which appliance did you expect to use the most **power**? Why? Did you find this to be true?
3. Of the appliances tested, which one did you calculate to use the most **energy** in your home each day? Is this what you expected? Why?
4. Based on the measurements made in this activity, Can you suggest a way that you can conserve energy in your home?

5. Extension Activity: comparing holiday lights.



<p><b>Image 2</b> <b>ADA Description:</b> Cartoon of a string of big, incandescent holiday lights <b>Caption:</b> none <b>Image file name:</b> xmas_lights1.jpg <b>Source/Rights:</b> available freely from <a href="http://www.freeclipartnow.com">http://www.freeclipartnow.com</a></p>	<p><b>Image 3</b> <b>ADA Description:</b> Cartoon of a string of small LED holiday lights <b>Caption:</b> none <b>Image file name:</b> xmas_lights2.jpg <b>Source/Rights:</b> available freely from <a href="http://www.freeclipartnow.com">http://www.freeclipartnow.com</a></p>
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Measure and record the watts consumed by the regular and the led string of holiday lights (make sure they are about the same length)

Regular lights = \_\_\_\_\_ Watts

LED lights = \_\_\_\_\_ Watts

A regular string of lights that consumes 100 watts, left on for 4 hours a day for 2 months (60 days), would consume 24 kilowatt-hours (kWh) of electricity. Using the watts you measured for your 2 strings of lights, how long would you have to leave them on to consume 24 kWh of electricity?

Regular lights:

LED lights:

Based on your calculations, which string of lights do you think is better to buy? Why?