

The **rate** at which any electrical device uses electricity is called a **WATT**. This is measured in Joules/sec. (A Joule is a measure of energy, don't worry too much about that right now...). All electrical devices have a watt rating that indicates how much energy they use per unit of time. For example an electric shaver is rated at about 15 watts. It uses electricity more slowly than an air conditioner, which can be rated as high as 1500 watts or more..

Watts are actually very small units, so generally when your electricity company measures electricity it uses **KILOWATTS**, abbreviated as kW. 1 kilowatt = 1000 watts.

1. How many kW are equivalent to 1 watt?
2. How many kW are equivalent to 100 watts?
3. Explain in words how to convert watts to kilowatts

To find out the amount of electricity any electrical device uses for a certain amount of time, multiply the wattage of the appliance (energy per unit of time) by the amount of time it is used. The standard units for this are kilowatts and hours, so the **basic formula is:**

$$\text{electricity used} = \text{kilowatts} \times \text{hours.}$$

These units (energy used) are called **kilowatt-hours, abbreviated by kWh.**

4. If you use a 120 watt coffee maker for 80 hours, how much electricity would you use?

Your electric company sells electricity by charging a certain amount of money per kWh that you use.

5. If your power company charges you \$.20/kWh for electricity and you use 800 kWh of electricity in a month, what would your electric bill be for that month?

**To determine the total cost of using any electrical device for a certain period of time:**

- a) Determine the Kilowatt rating of the device. (you will need to convert the watt rating of the device to kilowatts)
  - b) Multiply the kilowatt rating by the number of hours the device is used.
  - c) Multiply this by the cost per kWh that your utility is charging
6. Write a formula for **total cost** using **W** for watts, **h** for hours used, and **p** for the cost per kWh. (Note: Your formula will have to include conversion of watts to kilowatts).

$$\text{TOTAL COST} =$$

*For the problems below assume an electricity rate of \$ .20/kWh. This is the "p" value in the equation.*

1. How much would it cost to use a single 100 watt incandescent light bulb for 300 hours?
2. How much would it cost to use a single 25 watt compact fluorescent bulb for 300 hours? (Note: A 25 watt compact fluorescent bulb puts out the same amount of light as a 100 watt incandescent bulb.)
3. What is the dollar savings over 300 hours of use of changing one incandescent bulb to compact fluorescent?
4. If you replaced eight 100 watt incandescent light bulbs in your house with 25 watt compact fluorescent bulbs (compact fluorescents put out the same amount of light as incandescent bulbs) , how much money would you save in a month, if each bulb was on for approximately 3 hours per day?
5. If you use a 1100 watt air conditioner for 10 hours a day, what is it costing you each month?
6. How much does this air conditioner cost to use per hour?
7. Suppose you use a 1100 watt air conditioner daily in your home. How many hours would you have to reduce your usage by each day to save \$15 per month?
8. **Practice Project:** You have done an audit of your home and made the following changes:
  - a) Replaced ten 100 watt bulbs with 25 watt bulbs. (each bulb is used an average of 6 hours per day)
  - b) Reduced the time your computer is on from 6 hours a day to 3 hours per day. (assume a 150 watt computer)
  - c) Reduced the amount of time your TV is left on from 6 hours to 3 hours per day. (assume your TV is 200 watts, a typical solid state TV.)
  - d) Raised the thermostat on your air conditioner so that it is on only 4 hours a day instead of 8 hours per day. (assume a typical 1100watt window air conditioner).

**How much money would you save each month?**