ELECTRICAL POWER

*Teacher Guide*



# Power Consumption of Common Household Items

Source: <https://www.consumerreports.org/cro/resources/images/video/wattage_calculator/wattage_calclulator.html>

## Electrical Units

* Power is measured in WATTS (W) or KILOWATTS (kW)
* Current is measured in AMPS (A)
* Voltage is measured in VOLTS (V)

|  |  |
| --- | --- |
| **Item** | **Power (W)** |
| Central Air Conditioning | 5000 |
| Single Room Air Conditioning | 1000 |
| Clock | 10 |
| Clothes Washer | 425 |
| Clothes Dryer | 3400 |
| Dishwasher | 1800 |
| Central Heating | 1125 |
| Light Bulb | 100 |
| Microwave | 925 |
| Computer | 125 |
| Oven | 4500 |
| Refrigerator | 725 |
| TV | 340 |
| Toaster | 1100 |
| Water Heater | 1000 |

# Calculating Power Requirements Worksheet

To power an electrical device, it must be in an electrical circuit with a power source. In the U.S., power outlets supply 120 volts, and the plug on any device connects the power source to the circuit contained within the device. Use the equation for power to calculate the power requirements of a few devices that are not included in the “Power Consumption of Household Items” handout. Bonus: find the current required for another device not listed and calculate its power requirement.

|  |  |  |
| --- | --- | --- |
| **Item** | **Current (Amps)** | **Power** |
| Cell Phone Charger | 0.083 | ***9.960*** |
| XBOX | 2.33 | ***279.60*** |
|  |  |  |

# Energy Label Worksheet

All electrical devices are labeled with their electrical requirements. Not all labels are the same. The image shown below is a label from a toaster. The energy requirements are circled in red.



Read the energy label for a sewing machine below. What is the voltage, current, and power required by the device?



Volts: 120V

Current: 0.5Amps

Power = 60W

# Power Conversion Worksheet

All of the power requirements you’ve calculated so far are in watts; however, it’s more common to see power requirements expressed in kilowatts. Use the equation below to convert the power requirements of common devices from watts to kilowatts.

|  |  |  |
| --- | --- | --- |
| **Item** | **Power (W)** | **Power (kW)** |
| Central Air Conditioning | 5000 | ***5*** |
| Single Room Air Conditioning | 1000 | ***1*** |
| Clock | 10 | ***0.010*** |
| Clothes Washer | 425 | ***0.425*** |
| Clothes Dryer | 3400 | ***3.4*** |
| Dishwasher | 1800 | ***1.8*** |
| Central Heating | 1125 | ***1.125*** |
| Light Bulb | 100 | ***0.1*** |
| Microwave | 925 | ***0.925*** |
| Computer | 125 | ***0.125*** |
| Oven | 4500 | ***4.5*** |
| Refrigerator | 725 | ***0.725*** |
| TV | 340 | ***0.340*** |
| Toaster | 1100 | ***1.1*** |
| Water Heater | 1000 | ***1*** |
| Cell Phone Charger |  |  |
| XBOX |  |  |
|  |  |  |

# Total Electrical Load of a House Worksheet

The total power requirement of a house is referred to as its electrical load. Every house has a different electrical load depending on the electrical devices that the residents are using. The total need of the house also depends on how long each device is being used. Therefore, the electrical load is measured in kilowatt hours (kWh). The devices being used in an example house for one day are listed below. Use the equations below to calculate the total electrical load of the house.

# Example House Electricity Usage for 1 Day

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Power (kW)** | **Time (hr)** | **Electrical Load (kWh)** |
| Clock | 0.01 | 24 | ***0.24*** |
| Light Bulb – Living Room | 0.1 | 4 | ***0.4*** |
| Light Bulb – Bedroom | 0.1 | 2 | ***0.2*** |
| Light Bulb - Kitchen | 0.1 | 2 | ***0.2*** |
| Microwave | 0.925 | 0.05 | ***0.04625*** |
| Computer | 0.125 | 2 | ***0.250*** |
| Refrigerator | 0.725 | 24 | ***17.400*** |
| TV | 0.34 | 1 | ***0.34*** |
| Toaster | 1.1 | 0.05 | ***0.055*** |
| **Total Electrical Load** |  |  | ***19.13125*** |

# Cost of Power Worksheet

Most existing houses do not generate their own electricity. Instead, the residents of the house purchase electricity from a power company. The power company installs an electric meter that measures the electric load of the house and charges the residents for how much electricity they use.

Puget Sound Energy, a local electric company, charges $0.089/kWh for the first 600 kWh and $0.11/kWh for the remaining kWh. For the example house in the previous worksheet, calculate the cost of electricity per day.

Bonus: Assuming that the house uses approximately the same electrical load per day, how much would it cost to power the house for one 30-day month?

***(Answers rounded to the nearest hundredth)***

***19.13125 \* 0.089 = $1.70***

***19.13125 \* 30 = 573.9375 kWh***

***Since 573 < 600, the rate is $0.089/kWh.***

***19.13125 \* 0.089 \* 30 = $51. 08***