

Lab 7 Electricity

Objectives

In this lab, students will apply what they learned in class about Electrical Energy and Power to estimate their monthly electricity bills.

Theory

Electric Power of a household appliance is the electrical energy consumed by an electrical appliance per unit of time:

$$Power = \frac{\Delta PE}{\Delta t}$$

The international standard unit of Power is watt. The above formula can be transformed into:

$$\Delta PE = Power \cdot \Delta t$$

Which means that given the Power of an electrical appliance, one can calculate the energy consumed by the appliance by multiplying the given Power and the time that the appliance has been in use.

Electrical efficiency of an electrical appliance is defined as the ratio of the useful energy output to the total electrical energy consumption (Input), which is:

$$Electrical\ Efficiency = \frac{Useful\ Energy\ Output}{Total\ Energy\ Consumption}$$

For a given amount of time, it can also be expressed as:

$$Electrical\ Efficiency = \frac{Useful\ Power\ Output}{Total\ Power\ Consumption}$$

Procedure

Study the following table and use it to answer the questions listed in the next part.

Consumption of power by different appliances in watts

Appliance	Rating
Immersion heater	3000W
Electric fire	2000-3000W
Oil-filled radiator	1500-2500W
Electric shower	7000-10,500W
Dishwasher	1050-1500W
Washing machine	1200-3000W
Tumble dryer	2000-4000W
Iron	1000-1800W
Vacuum cleaner	500-1200W
Towel rail	250W
Deep fryer	1200W
Toaster	800-1500W
Kettle	2200-3000W
Microwave	600-1500W
Oven	2000-2200W
Grill/hob	1000-2000W
Dehumidifier	300-700W
Extractor fan	1-36W

Appliance	Rating
Fridge	40-120W
Fridge-freezer	200-400W
Freeze	150W
Electric mower	500-1500W
Electric drill	900-1000W
Hairdryer	1000W
Heating blanket	130-200W
Plasma TV	280-450
LCD TV	125-200W
Video, DVD or CO	20-60W
TV box	30-40W
Games console	45-190W
Laptop	20-50W
Desktop computer	80-150W
Tablet (charge)	10W
Broadband router	7-10W
Smart phone (charge)	2.5-5W

Source: [A basic guide to electricity for filmmakers](#)

Questions and Problems

1. Using the above tables as a guide, think about the appliances you have at home, find them in the chart and list them below with their powers (Rating) included.

2. What does kWh measure? Power, Time or Energy? What is the corresponding international standard unit of this quantity? What is the relationship between 1kWh and the international standard unit?

3. Use the list you made in Question#1 and calculate the electricity bill you expect to get every month based on the appliances you have at home. Assume the electricity rate of charge is 8.5 cents/kWh.

4. If you change your light bulb from one 100-watt regular light bulb to a 20-watt energy-efficient light bulb, how much money would you save every month?

5. When we say “energy-efficient”, what do we mean? Do you get the same brightness from the 100-watt regular light bulb and the 20-watt energy-efficient bulb? Do they consume the same amount of energy for a given amount of time? How is energy/money saved by using “energy efficient” bulbs?

First and last name:

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