

3.4) HOUSEHOLD ENERGY CONSUMPTION

Objective: In this laboratory exercise you will take real measurements from household appliances using a plug-in wattmeter to estimate their contributions to your energy bill.

Introduction: Electricity has done more by far to transform our lives than any other form of energy. Unfortunately, coal-burning plants currently produce nearly half of the electricity in the United States. One strategy for maintaining a reasonable quality of life without disproportionately burdening the environment is to improve the efficiency of the electrical appliances we use. Consumers trying to save on utility payments often look at the amount of watts an appliance consumes because electric companies charge according to the amount of "kilowatt-hours" consumed. Some of these appliances cost more initially, but eventually pay for themselves in savings on electricity bills.

Procedure

- 1) Plug the wattmeter into an electrical outlet and plug the appliance into the outlet provided by the meter (Fig. 1). Note the starting time.
- 2) After one hour, read the meter. If the reading is at least 0.010 kilowatt-hours (10 watt-hours), then you may remove the wattmeter (after having recorded this) and move on to another appliance. If the wattmeter reads less than 0.010
- 3) Repeat this step for at least two other items.



Fig. 1

- 4) Obtain a copy of a recent electric bill and note the cost per kilowatt-hour. Then carry out the following calculations:

$$\boxed{(\text{Total kWh}) \div (\text{Total hours}) = \text{Average kW}}$$

$$\boxed{(\text{Average kW}) \times (\text{Cost per kWh}) \times (\text{Hours per year}) = \text{Cost per year}}$$

Insert your data and your calculations into a spreadsheet using the following arrangement:

◇	A	B	C	D	E	F	G
1	Item	Total kWh	Total hours	Average kW	Cost per kWh	Hours per year	Cost per year
2							
3							
4							
5							
6							

Questions:

1. Given that $\text{Joules} = \text{Watts} \times \text{total seconds}$, how many Joules are in one watt-hour? *Hint: How many seconds are in an hour?*
2. Given that $\text{Watts} = \text{Amps} \times \text{Volts}$, how many amps are consumed by a plug-in appliance that uses 36 watts?
3. Over the course of a year, which item is the most expensive to run?
4. What item in your house probably consumes the most electricity over the course of the year?
5. Given what you recently learned using the wattmeter, describe at least one way you might change the way you use electricity:
6. List at least one item that cannot be evaluated by use of a plug-in wattmeter.
7. How might you estimate the amount of electricity used by this item?

Assignment Checklist:

1. Did you completely answer all the questions?
2. Did you fill out the table?