

The Cost of Lighting

Introduction

How much does it cost to provide electricity for lighting? Are some types of lighting more cost-effective than others? To answer these questions, you will calculate electricity costs for some of the lights you use in your home and school. Then you will compare the cost of using incandescent and compact fluorescent bulbs to see which is the better buy.

Instructions

Use the table below to calculate the cost of lighting for a light bulb (or a fixture with more than one light bulb) in your home or school. An example of the calculations needed has been provided in the first column.

Before you do the calculations, find out how much a kilowatt-hour of electricity costs in your area. This information can be found on your family's utility bill or by calling your local electric utility, or it may be provided by your teacher. Write your answer below.

If you cannot find the cost of electricity in your area, use these average electricity costs for a home or school:

Home (residential rate): \$0.07 per kilowatt-hour (kWh)

School (commercial rate): \$0.06 per kilowatt-hour (kWh)

1. Light bulb or fixture (and watts per bulb)	EXAMPLE: Lights in kitchen 4, 60-watt bulbs	Your light bulb:
2. Watts # Watts used when on	= 240 watts (4 bulbs x 60 watts)	
3. Hours / day Average # of hours/day that light bulb is on	2 hours/day	
4. Is it left on when no one is using it?	Yes	
5. Amount of time item is on in a month Hours/day (Row 3) x 30 days	60 hrs (2 hrs/day x 30 days)	
6. Watt-hours used when on Watts (Row 2) x time item is on (Row 5)	14,400 watt-hrs (240 watts x 60 hrs)	
7. Total kilowatt-hours for month Watt-hours (Row 6) divided by 1,000 watts	14.4 kWh/month (14,400 watt-hrs / 1,000 watts)	
8. Cost of using light fixture for one month Total kilowatt hours for month x cost of electricity	\$1.00 (14.4 kWh x \$0.07 per kWh)	
9. Cost for lighting bulb for one year Cost per month x 12 months	\$12.00 (\$1/month x 12 months)	

Comparing the Cost of Incandescent & Compact Fluorescent Bulbs

In this section, you will compare the cost of using incandescent bulbs with the cost of using compact fluorescent light (CFL) bulbs to find out which is the better buy.

Answer this question before you complete the rest of this section

Suppose you need a new bulb for a fixture that is lit for at least four hours per day. A 60-watt incandescent light bulb costs \$0.42. A 17-watt CFL bulb that provides nearly the same amount of light costs \$3.00. Which bulb would you buy and why?

Use the information provided in the **Lighting Information** table to complete the following steps in order to compare the cost of buying and using incandescent and CFL bulbs.

Lighting Information

Information Listed on Packaging	Incandescent Bulb	CFL Bulb
Light Output	840 Lumens	750 Lumens
Bulb Wattage	60 Watts	17 Watts
Bulb Life	1,000 Hours	10,000 Hours
Cost of each bulb (including tax)	\$.42	\$3.00

NOTE: You can also get this information in the lighting section of a hardware or discount store. Read the packaging the bulbs come in. Make sure you compare incandescent and CFL bulbs with an identical or nearly identical number of lumens so you are comparing different types of bulbs that put out the same amount of light.

Steps

1. Divide the bulb life of a CFL by the bulb life of an incandescent bulb. Round your answer to the nearest whole number. The answer you get is equal to the number of incandescent bulbs that will need to be replaced to equal the bulb life of one CFL bulb. Write your answer in the space below.

2. Determine the total energy used by both bulbs over the bulb life of one CFL in kilowatt-hours.

Formula: Wattage of bulb $\times \frac{1 \text{ kilowatt}}{1,000 \text{ watts}}$ \times bulb life of a CFL in hours

Incandescent _____ CFL _____

3. Write down the electric rate in your area in dollars per kilowatt-hour (\$/kWh). If you cannot find out what your family pays for electricity, use the average residential rate of \$0.07 per kilowatt-hour (kWh).

4. Find the total cost of the electricity used by the bulbs over the bulb life of one CFL in dollars (\$). Multiply your answer to Step 2 by your answer to Step 3 for each type of bulb.

Incandescent _____ CFL _____

5. Calculate the total cost of the bulbs. For incandescent bulbs, multiply the bulb cost from the **Lighting Information** table by the number of incandescent bulbs needed to equal the life of one CFL (see your answer to Step 1).

Incandescent _____ CFL _____

6. Find the total cost of buying and using incandescent and CFL bulbs. Add your answers from Step 4 to your answers from Step 5.

Incandescent _____ CFL _____

7. Based on the calculations you completed, which light bulb (the incandescent or the CFL) would you buy and why?

Comparing the Cost of Buying and Operating Refrigerators

Introduction

Is the refrigerator with the lowest sticker price always the best buy? Answer this question by performing the following analysis comparing the costs of purchasing and operating different refrigerators.

1. Find out what your family pays for electricity. This information can be found on your family's utility bill or by calling your local electric utility, or it may be provided by your teacher. Write your answer below.

If you cannot find out what your family pays for electricity, use the average residential rate of \$0.07 per kilowatt-hour (kWh).

2. Answer this question before you complete the rest of this sheet:

The retail price for five refrigerators is shown in the **Refrigerator Data** table that follows. Which refrigerator would you buy and why?

Refrigerator Data

Refrigerator	Average Retail Price	Average Energy Use Per year (kWh/Year)	Energy Cost Per Year (\$/Year)
A	\$870	660	\$46.20
B	\$850	665	
C	\$750	830	
D	\$860	818	
E	\$915	915	

3. Calculate how much it would cost to operate each of the refrigerators for a year by using the average energy use per year information and the cost of electricity from Step 1. Record your answers in the "Energy Cost Per Year" column of the **Refrigerator Data** table. Use the formula below to do this calculation. The energy cost per year for Refrigerator A has already been calculated.

$$\text{Average energy use (kWh) per year} \times \text{electricity cost per kWh (from Step 1)} = \text{energy cost per year}$$

4. Circle the refrigerator listed in the **Refrigerator Data** table that has the lowest energy cost per year.

5. Is the refrigerator with the lowest energy cost per year the most efficient refrigerator?

6. Assume that the refrigerators will last 15 years. Calculate the life cycle cost for each refrigerator using the formula below. The life cycle cost per year for Refrigerator A has already been calculated.

$$\text{Average retail price} + (\text{energy cost per year} \times 15 \text{ years}) = \text{life cycle cost}$$

Record your answers in the “Life Cycle Cost over 15 Years” column of the **Refrigerator Life Cycle Costs** table.

Refrigerator Life Cycle Costs

Refrigerator	Average Retail Price	Energy Cost Per Year (\$/Year)	Energy Cost Per Year (\$/Year)
A	\$870	\$46.20	\$1563.00
B	\$850		
C	\$750		
D	\$860		
E	\$915		

7. Circle the refrigerator listed in the **Refrigerator Life Cycle Costs** table that has the lowest life cycle cost.

8. Is the refrigerator with the lowest life cycle cost the most efficient refrigerator?

9. Based on the answers you calculated for each of the tables and your answers to the above questions, choose the refrigerator you think would be the best buy overall and discuss the reasons for your choice. Indicate whether the efficiency of the refrigerator influenced your decision.

The Cost of Operating Small- and Medium-Sized Appliances & Equipment

Introduction

How much does it cost to provide electricity for small- and medium-sized electrical appliances and equipment? Are some types of appliances and equipment cheaper to run than others? To answer these questions, you will calculate electricity costs for some of the small- and medium-sized electrical appliances and equipment you use in your home and school.

What You Will Need

- **Appliance Survey Sheet** (Ask your teacher for this table.)
- **Cost Calculation** Table
- Kilowatt-hour of electricity costs in your area. This information can be found on your family's utility bill or by calling your local electric utility, or it may be provided by your teacher. If you cannot find the cost of electricity in your area, use the average electricity costs of \$0.07 per kilowatt-hour (kWh) for home (residential rate).

Instructions

You need to complete the **Appliance Survey Sheet**. Ask your teacher for directions. Transfer the results (Total Kilowatt Hours for Month) for each appliance you looked at to the **Cost Calculation** Table.

Questions

1. Compare the electrical home appliance or school equipment rankings for wattage and for kilowatt-hours (kWh) per day. Do appliances or equipment with the highest wattages use the most energy per day? Explain your answer below by comparing two or more of the appliances or pieces of equipment listed.

2. Suppose you wish to conserve energy and save money by reducing the use of electrical appliances or equipment, or by reducing waste (for example, turning off the television when no one is watching). Pick two appliances or pieces of equipment that you could use less. Then estimate how much less time you would use the appliance or equipment each day (for example, you might reduce the time the television is on from four hours per day to three hours per day).

3. Calculate how much energy and money you would save by reducing the use of the electrical appliances or equipment you chose in Question 2. Do you think reducing the use of these appliances or pieces of equipment every day is a good idea? Explain.