



4-H Consumer Judging Guide

Light Bulbs



Why worry about buying light bulbs? Who cares? Light bulbs cost less than \$2 each, right? Wrong. The total cost of a light bulb is the purchase cost plus the cost of electricity it uses. This can be significant and varies greatly by type of bulb. Considering a house may have as many as 50 light bulbs, this can add up to big money. In addition, light bulbs have a large influence on the overall mood and safety of a house. Choosing the right type of light bulb for each room deserves some thought and planning. We must also remember that a home's lighting system is both a large user of electrical energy (lighting consists of about 10 percent of your home energy bill) and is a major source of internal heat. Increasing your lighting efficiency is one of the fastest ways to decrease your energy bills.

Terms to Know

Circuit Load – To calculate how many bulbs you can safely use on a single circuit, add up the wattage of the bulbs you would like to use and divide by the voltage. For example, 18 bulbs at 60 watts each would consume $18 \text{ bulbs} \times 60 \text{ watts per bulb} / 120 \text{ volts} = 9 \text{ amps}$. Therefore, 18 bulbs at 60 watts each could be carried on a 10-amp circuit.

Clear or Frosted Glass – Choosing clear rather than frosted glass will change how the light looks in a room. It's your personal choice.

Color Correlated Temperature (CCT) – This measures how "warm" or "cool" a light seems. A low CCT – below 3100 K – is a warm white light and varies across bulb by type and within types. A technical term of color temperature is used to describe the color. Low color temperatures (2700 degrees) are soft and warm. As the color temperature increases, the color becomes more of a pure white. This doesn't refer to the heat, just the way the color appears – a soft glow versus cool and sterile.

Color Rendering Index (CRI) – This measures the perceived color of objects under artificial light. The higher the number, the more natural and vibrant

colors will appear. Bulbs with a CRI of 80 or above are acceptable for everyday residential use.

Efficiency – Measured in light (lumens) per unit of electrical power (watt) and calculated by dividing lumens by watts. The higher the LPW, the more light received for the energy used. Before purchasing light bulbs, consider where they will be used, how frequently and for what kind of duration.

Heat – The amount of heat produced varies by type of bulb; heat can affect energy costs by causing air conditioning to come on more frequently.

Life – This describes the number of hours a light bulb will last. Make sure you check this before you buy – especially for light fittings in hard-to-reach places that you won't want to replace regularly.

***Lumens** – Measures light output.

Operating Costs – To figure out the cost of operating a bulb, multiply the watts times the kilowatt per hour charge from you utility and divide by 1,000 (to convert a kilowatt into a watt). For example, a 100-watt bulb $\times 15 \text{ cents} / 1,000 = 1.5 \text{ cents per hour}$.

Power – Typically measured in watts.

Voltage – This is the pressure that drives the electricity through the circuit and provides the power for an outlet or light fixture; can be 120 volts or a light fixture can use a transformer to create higher or lower voltages.

***Watts** – The standard measurement for electricity is watts. When buying a light bulb, it is best to select one with the same number of watts as the bulb you are replacing. A light bulb with fewer watts than your existing globe will produce a weaker light.

Connection – Screw-in base versus plug-in base. Not all light fittings are the same. Take your old light bulb with you to the shop to ensure an exact match.

*Federal law requires both lumens and wattage on light bulb packaging.

Defining Uses

There are three categories of lighting you must consider when planning:

- **Ambient lighting** provides security and safety as well as general illumination for doing daily activities.
- **Task lighting** provides enough illumination that tasks can be completed accurately but not so much light that entire areas are illuminated.
- **Accent lighting** illuminates walls so they blend more closely with naturally bright areas like ceilings and windows.

The type of lighting needed will also depend on the activities done in the area:**

- For areas of detailed work (offices, work benches, sewing rooms, etc.), choose a halogen or incandescent bulb.
- For areas of moderate detailed work (living rooms, kitchens, etc.), choose an incandescent or compact fluorescent.
- For large areas with little detail work (basements, garages, bathrooms, etc.), choose an incandescent or fluorescent bulb.
- For areas where heat can be a problem (e.g., a small room with little ventilation) or where the bulb may be brushed against, try to avoid halogen bulbs. If possible try a fluorescent or compact fluorescent.
- For areas with hard-to-reach fixtures, choose bulbs with a longer life, e.g. longlife incandescent, halogen, or compact fluorescent.

Remember, too, that older people need more light. If color is a concern, try several different types of bulb. Choose the color that provides the desired effects.

For bulbs that are used heavily (more than three hours a day), consider a more energy-efficient bulb.

**Always compare brands for price, lumens, watts, CRI, and CCT. Be sure to read the label to see where the light bulb can be used. Many are made for specific fixtures such as recessed cans.

Types of Light Bulbs

Incandescent – these are the standard bulbs that most people are used to. Incandescent bulbs work by using electricity to heat a filament in the

bulb until it glows. They produce steady, warm, white light that is good for most household applications. When incandescent bulbs glow, minute amounts of tungsten evaporate from the filament and are deposited as “soot” on the inner shell of the bulb. This burned-off tungsten has two drawbacks: the “soot” gradually reduces light output, and it slowly weakens the filament until it becomes thin and breaks and the bulb “burns out.”

Fluorescent – works by passing a current through a tube (no filament) filled with argon gas and mercury. This produces ultraviolet radiation that bombards the phosphorous coating causing it to emit light. Bulb life is very long – 10,000 to 20,000 hours. Fluorescent bulbs are also very efficient, producing very little heat. Fluorescent bulbs are ideal for lighting large areas where little detail work will be done.

Compact Fluorescent – work like fluorescent bulbs but in a much smaller package. Similar to fluorescent bulbs, they produce little heat and are very efficient. Compact fluorescent lights (CFLs) are very popular because of their tremendous efficiency.

Halogen – work by passing electricity through a tungsten filament, which is enclosed in a tube containing halogen gas. The light produced is a brilliant white color which is ideal for situations requiring focus on small items such as hobbies, reading, writing, etc. A halogen bulb will last 2,000 to 4,000 hours. Halogen bulbs burn hotter than incandescent bulbs but are more efficient related to lighting.

High-Intensity Discharge (HID) – similar to incandescent in appearance and compactness with concentrated and directed light output, HID bulbs operate similar to fluorescents. They are most suitable for outdoor/security lighting. They are very energy efficient, provide a very long service life and can save 75 to 90 percent of lighting energy when they replace incandescent lamps.

Low-Pressure Sodium – the most efficient artificial lighting and have the longest service life. Where color is not important, this light is a good choice as they tend to cast tones of yellow or gray – security lighting often uses low-pressure sodium bulbs.

Light Emitting Diode (LED) – generate light not through heat but the electronic movement of particles. LEDs are also used for many other applications including stereo lights, microwave ovens, digital watches, and calculators.

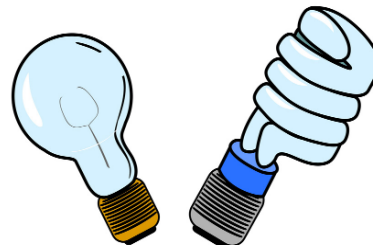
Comparing Light Bulbs

Pros and Cons of Common Light Bulbs		
Type	Pros	Cons
Incandescent	<ul style="list-style-type: none"> • Cheaper than halogen and fluorescent • Suitable for use with dimmer switches • Available in a wide range of shapes, sizes and colors 	<ul style="list-style-type: none"> • High running cost • Least energy-efficient bulb type
Halogen	<ul style="list-style-type: none"> • Produce a bright, pure light that's superior to incandescent light bulbs • More energy efficient than incandescent light bulbs related to lighting (but not heat) 	<ul style="list-style-type: none"> • More expensive than incandescent light bulbs
Fluorescent	<ul style="list-style-type: none"> • Most energy efficient – can last up to 10,000 hours • Produce less heat than other light bulb types 	<ul style="list-style-type: none"> • Generally most expensive type • Some fluorescent light bulbs project an unflattering light • Not suitable for dimming
Light-Emitting Diode (LED)	<ul style="list-style-type: none"> • More energy efficient than incandescent • Can produce light in varying colors • Are suitable for dimming • Have the longest life span – they last twice as long as the best fluorescent light bulb • Produce less heat than their incandescent counterparts 	<ul style="list-style-type: none"> • A more expensive lighting option • To get optimum performance, special wiring must be set up

Compact Fluorescent versus Incandescent Wattage

If you want to convert from Incandescent Bulbs to CFLs, you will need to understand the ratio of wattage. As a rough guide:

CFL Watts = Incandescent Watts	
4 Watts	25 Watts
9 Watts	40 Watts
15 Watts	60 Watts
20 Watts	75 Watts
25 Watts	100 Watts
42 Watts	150 Watts



Comparing the Operating Cost of Bulbs

Use this simple worksheet to compare the cost of light per thousand hours for any bulb you are considering. Remember that meaningful comparisons are only possible for bulbs that have a similar lumens output.

Method of Comparison		Bulb 1	Bulb 2	Bulb 3
A	What is the cost per kWh? (Get this amount from your local electric company.)			
B	How many watts are used by the fixture you will be using?			
C	What is the rated lifetime of the bulb?			
D	How much does the bulb cost?			
E	Estimate the electricity costs. (Multiply A by B.)			
F	Estimate the replacement costs. (Divide D by C and multiply by 1,000.)			
G	Estimate the air conditioning penalty. (Multiply B by 0.15 by A.)			
H	Estimate the total operating cost of the bulb. (Add E, F and G.)			

Maintenance

Proper maintenance is vital to efficient lighting. The amount of light produced decreases over time because of aging lamps and dirt on fixtures, lamps, and room surfaces. This can reduce total illumination by 50 percent or more while lights continue drawing full power. These basic maintenance suggestions can help prevent this.

- Clean fixtures, lamps, and lenses every 6 to 24 months by wiping off the dust. Never clean an incandescent bulb while it is turned on or it is hot.
- Replace lenses if they appear yellow.
- Clean or repaint rooms in your home every two to three years. Dirt collects on surfaces, reducing the amount of light reflected.
- Because fluorescent lights and some compact fluorescent lamps contain small amounts of hazardous chemicals, dispose of them with other household hazardous wastes such as batteries, solvents, and paints at your community's designated drop-off point.

Energy Conservation Tips

- Use compact fluorescent bulbs to replace outdoor flood lights.
- Motion sensors used in low traffic areas and out-of-doors keep lighting costs to a minimum.
- When you leave a room, turn off the lights.
- Keep light and lamp fixtures clean to get maximum light.
- Fewer lamps may be needed if fixtures are kept clean of accumulated dust.
- Consider the amount of light needed before buying light bulbs.
- Use task lighting in kitchen or other work areas instead of lighting the entire room.



- Select the lowest wattage bulb that provides the desired lighting.
- Where you use incandescent bulbs, three-way fixtures allow light level choices.
- Replace incandescent bulbs with fluorescent where possible.
- Compare light bulb brands for price, lumens, and hours of life.
- If wiring and light fixtures allow, use one large bulb instead of several smaller ones.
- Individual light switches make it possible to have lights on only where they are needed.
- Use occupancy sensors in bathrooms, hallways, garages and outdoors.
- Timers can be used to automatically turn lights on and off according to the schedule you set.
- Photocell units respond to changes in natural light levels and will switch the lights on at dusk and off at dawn to ensure lights are not left on all day.

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