

THE LIGHTBULB: A BRIGHT IDEA

The sun is setting. Daylight is fading. It's getting hard to see the book you're reading. What do you do? You turn on the lights! Many kinds of lightbulbs light our homes. The most common ones are standard incandescent, halogen, and fluorescent.

Standard Incandescent

An incandescent lightbulb lights when an electrical current flows through a filament inside and the filament heats up to incandescence—that is, it gets so hot that it glows with light. The filament is a thin wire made of the metal tungsten. Heat generated by the current through the tungsten causes the tungsten gradually to evaporate, leaving a dark spot on the inside of the glass. Because tungsten is evaporating, the filament gets thinner and thinner.

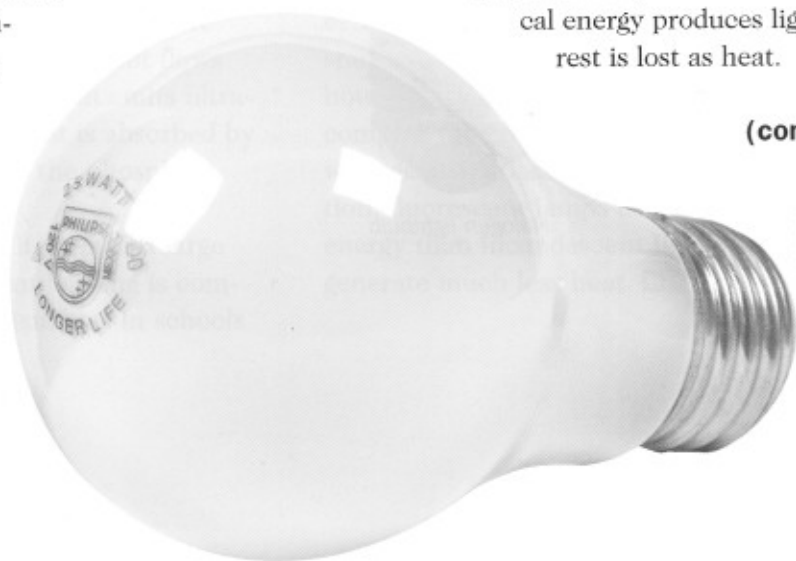
The evaporated tungsten condenses on the inside surface of the lightbulb, creating a black deposit, which you can see. Eventually the lightbulb “burns out” because the filament at some spots gets so thin that it breaks.

Other parts of a standard incandescent lightbulb include a glass bulb and a metal base. The glass bulb encloses the filament. The bulb is filled with nitrogen and argon gases, which reduce the tungsten's evaporation rate. A slower evaporation rate makes the filament last longer. Screw-type bases hold lightbulbs in lighting fixtures and provide the means to connect the lightbulb to an electrical power source. The base completes a circuit and allows current to flow through the filament.

Standard incandescent lightbulbs are inexpensive and come in many shapes and colors. They produce different amounts of light, and require 40–150 watts of power. A 100-watt bulb will last about 1,000 hours. Standard incandescent bulbs, however, are not very energy efficient.

Only about 8 percent of the electrical energy produces light. The rest is lost as heat.

(continued)



Incandescent lightbulb

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Halogen

A halogen lightbulb is a modified incandescent lightbulb. Halogen lightbulbs use a tungsten filament, too, but they contain a small amount of a chemical element—usually iodine or bromine. Some of the tungsten combines with the iodine or bromine, causing the tungsten to deposit back on the filament instead of the lightbulb. The filament does not thin as quickly as in an incandescent lightbulb. Therefore, a halogen lightbulb lasts longer. Because halogen lightbulbs operate at very high temperatures, ordinary glass cannot be used for the bulb. Most halogen bulbs are made of quartz to withstand the extreme heat.

Because halogen lightbulbs burn at very high temperatures, they produce

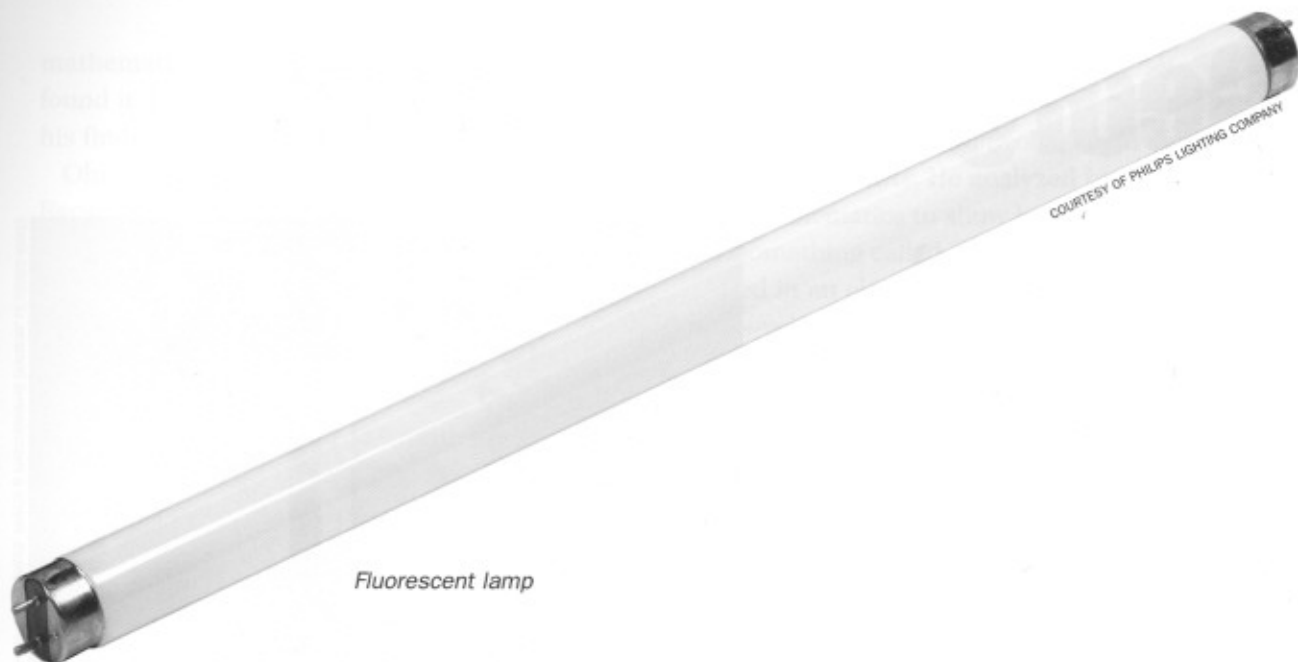


Halogen lightbulb

Tips for Changing Lightbulbs

- Always turn off or unplug the lamp or device before you replace its lightbulb.
- Make sure that the lightbulb has cooled sufficiently before you touch it to avoid burning your fingers.
- Do not touch the glass part of the lightbulb with your fingers. Put a cloth around the glass part of the lightbulb when removing or putting in the new lightbulb. The oils from your fingers can reduce the life of some lightbulbs.

a brilliant white light. They are more expensive than standard incandescent lightbulbs, but they can last twice as long. In addition, halogen lightbulbs are more energy efficient. Depending on the number of watts, they may use 20–40 percent less electrical energy to produce the same amount of light as standard incandescent lightbulbs.



Fluorescent lamp

Fluorescent

Fluorescent lamps come in different shapes. Some are long glass tubes. Others, such as compact fluorescent lightbulbs, look more like standard incandescent lightbulbs. Whatever their shape, they work the same way. The inside surface of the tube or bulb is coated with powders called phosphors. The tube or bulb contains small amounts of mercury vapor. When the lamp is switched on, electrical current flows through the mercury vapor, which emits ultraviolet light. The ultraviolet light is absorbed by the phosphors, which makes the phosphors glow, or fluoresce.

Fluorescent tubes spread light over a large area. This kind of fluorescent lighting is commonly used in large rooms, such as in schools

and stores. In homes, fluorescent tubes are sometimes used in kitchens and large playrooms. Compact fluorescent lightbulbs usually fit in standard incandescent lightbulb sockets and can be used throughout a home.

On average, fluorescent tubes last about 15,000 hours, fluorescent lightbulbs about 13,000 hours. That's a lot longer than incandescent lightbulbs last. For example, a 100-watt standard incandescent lightbulb burning for 8 hours every day will last about 4 months. A compact fluorescent lightbulb of equivalent wattage would last more than 4 years! In addition, fluorescent lamps use 60–80 percent less energy than incandescent lightbulbs, and they generate much less heat. □