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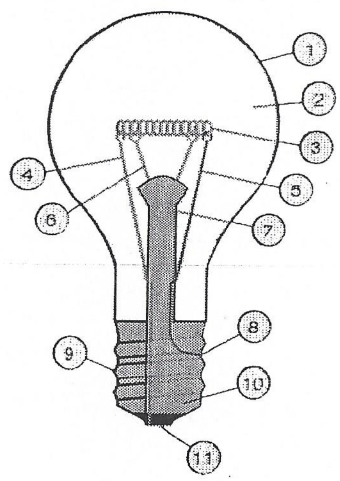
LIGHT BULBS

INCANDESCENT BULBS

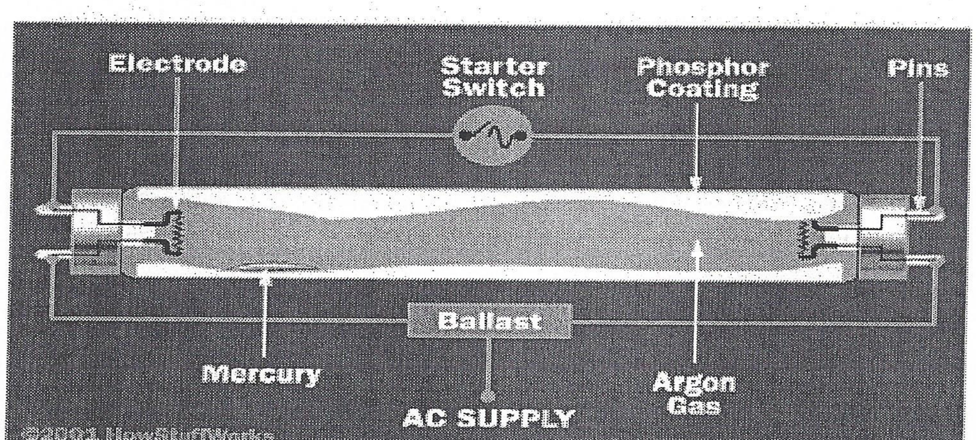
Incandescent bulbs produce light from heat. The filament inside the bulb, made out of double coils of tungsten, has a high electrical resistance, causing it to glow (=incandesce) when an electric current flows through. The heat is due to the friction between the material and the electrons that are flowing through the material, meaning the electric current. Tungsten is used for incandescent bulb filaments because it is extremely resistant to melting at high temperatures, and it does not burn because gas is injected into the bulbs to eliminate all oxygen. The incandescent lamp was invented by Thomas Edison in 1879. At that time, filaments were made of bamboo grown in Kyoto, Japan. Today these bulbs come in many shapes, sizes, and designs that all optimize the light output.

FLORESCENT BULBS

Compared to the light of **fluorescent bulbs**, incandescent light appears yellowish. Fluorescent bulbs have a more complicated light emission mechanism than incandescent bulbs. Fluorescent bulbs are slender glass tubes coated with fluorescent material on their inner surfaces. Mercury vapor is injected inside, and electrodes are attached at both ends. When voltage is applied, an electric current flows in the electrodes, causing the filaments on either end to be heated up and start emitting electrons. Ultraviolet rays from emitted electrons within fluorescent lamps transform into visible light. Today, florescent bulbs come in other forms such as rings, twists, and bulb-shaped. These new florescent bulbs are adapted to fit in traditional incandescent lamps to be used as a more energy efficient form of illumination.



1. Outline of Glass bulb
2. Low pressure inert gas (argon, neon, nitrogen)
3. Tungsten filament
4. Contact wire (goes out of stem)
5. Contact wire (goes into stem)
6. Support wires
7. Stem (glass mount)
8. Contact wire (goes out of stem)
9. Cap (sleeve)
10. Insulation
11. Electrical contact



BATTERIES

A battery produces an electrical current through a chemical reaction. When the reaction is complete, the battery is discharged and no current flows, we call this a "dead" battery. However, some kinds of battery can be recharged so that the reaction may resume.

A battery typically consists of a number of separate cells; it is the connection of these cells that originally provided the name battery, originally meaning a grouping of separate elements, such as a set of artillery pieces. The history of the battery stretches back 200 years. In 1780, Luigi Galvani (1737–1798), a professor of anatomy at the University of Padua, Italy, discovered a phenomenon he called "animal electricity." In the course of conducting a number of experiments on the legs of dissected frogs, Galvani found that the legs could be made to twitch when they were attached to an iron railing by a brass hook that passed through the spinal cord. Galvani thought that the twitch was caused by the presence in the frog's body of a "subtle fluid" that was likely related to the curious "electrical" fluid. In actuality, the reaction of the legs suspended on the hook occurred because two different metals—brass and iron—generated an electrical current that fired the nerves controlling the muscles.

Alessandro Volta (1745–1827) discovered that an electrical current was produced by dissimilar metals which led directly to his construction of what is generally considered to be the first battery. It consisted of a series of zinc and silver disks, each pair separated from the next pair by a piece of cardboard that had been soaked in salt water. Volta's description of his battery (or "voltaic pile" as it was then called) in a paper published by Britain's Royal Society in 1800 gave a powerful stimulus to electrical science and technology. Electricity supplied by an early battery was soon used to decompose water into hydrogen and oxygen.

In 1859, the amount of electricity produced by a battery was significantly increased through the invention of the lead-acid battery in France by Gaston Plante (1839–1882). The lead-acid battery is the most commonly used large battery; one important application is powering the starter motor of automobiles. In this type of battery, plates of lead and lead dioxide are immersed in a dilute sulfuric acid (H_2SO_4) electrolyte. When the circuit between the two types of plates is closed the lead atoms lose some of their electrons, which then flow as an electrical current. The lead ions (the lead atoms that have lost some of their electrons) combine with sulfur ions to form lead sulfate. When a battery's plates have been converted to lead sulfate, the battery is discharged. Since lead-acid batteries use a liquid sulfuric acid, they are known as wet-cell batteries.

Dry-cell batteries, such as those used for flashlights, use a paste for the electrolyte. Most batteries of this type are alkaline batteries, because their electrolyte is alkaline rather than acidic. Nickel-cadmium batteries, such as the ones commonly used in cameras, contain more energy and power than lead-acid batteries. Nickel-metal hydride batteries, the sort that are used in laptop computers and cellular telephones, contain about the same energy as nickel-cadmium batteries but have half the power capacity.