

Artificial Light

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CONCEPT

1

Artificial Light

- Identify five different types of artificial lights.
- Explain how each type of artificial light produces visible light.



What an exciting scene! The picture above shows Times Square in New York City. There are so many artificial lights that it's almost as bright as day even after the sun has gone down. Sunlight provides most of the visible light on Earth, but artificial lights are also important. That's obvious to someone in Times Square at night. It's also obvious to anyone who's ever experienced a power outage after dark.

Turn on the Lights

If you're like most people, you don't give it a thought when you flick a switch to turn on a light—at least not until the power goes out and you're left in the dark! When you flick on a light switch, electricity normally flows through the light, and some type of light bulb converts the electrical energy to visible light. This can happen in various ways, depending on the type of light bulb. Several different types of light bulbs are described below. All of them are examples of **artificial light**, as opposed to natural light from the sun or other sources in nature.

Incandescent Light

An incandescent light bulb like the one pictured in the **Figure 1.1** produces visible light by incandescence. Incandescence occurs when something gets so hot that it glows. An incandescent light bulb contains a thin wire filament made of tungsten. When electric current passes through the filament, it gets extremely hot and emits light. You can learn more about incandescent light bulbs at this URL: <http://science.discovery.com/videos/deconstructed-how-incandescent-light-bulbs-work.html>



FIGURE 1.1

Fluorescent Light

A fluorescent light bulb produces visible light by fluorescence. Fluorescence occurs when a substance absorbs shorter-wavelength ultraviolet light and then gives off the energy as visible light. The compact fluorescent light bulb (CFL) in the **Figure 1.2** contains mercury gas that gives off ultraviolet light when electricity passes through it. The inside of the bulb is coated with a substance called phosphor. Phosphor absorbs the ultraviolet light and then gives off most of the energy as visible light. You can learn more about fluorescent light bulbs at this URL:

<http://science.discovery.com/videos/deconstructed-compact-fluorescent-light-bulb.html>



FIGURE 1.2

Neon Light

A neon light produces visible light by electroluminescence. In this process, neon or some other gas gives off light when an electric current passes through it. Other halogen gases besides neon—including krypton and argon—also produce light in this way. The word “OPEN” in the sign **1.3** is a neon light. It is a long glass tube that contains neon gas. When electricity passes through the gas, it excites electrons of neon atoms, and the electrons jump to a higher energy level. As the excited electrons return to their original energy level, they give off visible light. Neon produces red light. Other gases produce light of different colors. For example, krypton produces violet light, and argon produces blue light.

Vapor Light

A vapor light also produces visible light by electroluminescence. The bulb contains a small amount of solid sodium or mercury as well as a mixture of neon and argon gases. When an electric current passes through the gases, it causes the solid sodium or mercury to change to a gas and emit visible light. Sodium vapor lights, like the streetlights pictured in the **Figure 1.4**, produce yellowish light. Mercury vapor lights produce bluish light. In addition to lighting city

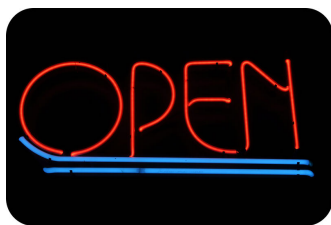


FIGURE 1.3

streets, vapor lights are used to light highways and stadiums. The bulbs are very bright and long lasting so they are a good choice for these places.



FIGURE 1.4

LED Light

LED stands for “light-emitting diode.” An LED light contains a material called a semi-conductor, which gives off visible light when an electric current flows through it. LED lights are used for traffic lights (see **Figure 1.5**) and also indicator lights on computers, cars, and many other devices. This type of light is very reliable and durable.



FIGURE 1.5

Q: Some light bulbs produce a lot of heat in addition to visible light, so they waste energy. Other bulbs produce much less heat, so they use energy more efficiently. Which light bulbs described above would you place in each category?

A: Incandescent light bulbs, which produce light by incandescence, give off a lot of heat as well as light, so they waste energy. The other light bulbs produce light by some type of luminescence, in which light is produced without heat. These light bulbs use energy more efficiently. Which types of light bulbs do you use?

Summary

- Most artificial lights use electricity for energy and have a light bulb that changes the electrical energy to visible light. The production of visible light can happen in various ways, depending on the type of bulb.
- Types of light bulbs include incandescent, fluorescent, neon, vapor, and LED bulbs. They produce light in different ways and have different uses. Incandescent lights use heat to produce visible light, so they are not as energy efficient as the other types of lights.

Vocabulary

- **artificial light:** Light produced by a human-made device such as a light bulb.

Practice

Do the activity on types of light bulbs at the following URL. First, think about the Before Reading question. As you read, consider the During Reading question. Check out the Vocabulary to Learn, and look up any terms you're not sure of in the Glossary. Be sure to work through the animation at the bottom of the Web page. Finally, write a paragraph addressing the After Reading question. http://www.gelighting.com/na/home_lighting/gela/students/tech_bulbs.htm

Review

1. Compare and contrast incandescent and compact fluorescent light bulbs.
2. How do neon lights produce visible light?
3. Where are vapor lights used? Why are they a good choice for these places?
4. What are some pros of LED lights?