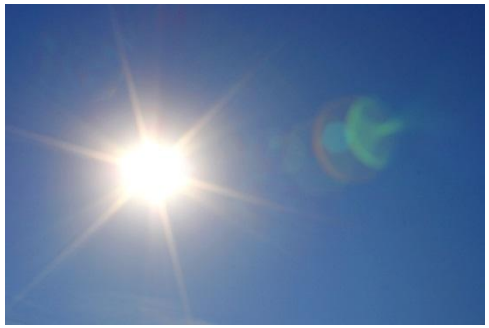
Chapter 17 The Electromagnetic Spectrum

NOTES 17.3 PRODUCING VISIBLE LIGHT

An object is **illuminated** if you see it by some kind of reflected light.

An object is **luminous** if it gives off its own light.



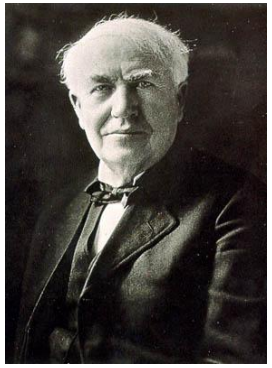
We use different types of light bulbs to illuminate the world around us. Different types of light bulbs will produce varying amounts of the spectrum of wavelengths of visible light.

A **spectroscope** may be used to view the different colors of light produced by a light bulb.

When a glassblower heats glass, it turns “red hot”.
It glows and gives off a red light.

At a higher temperature, the glass is “white hot” and gives off white light.

An **incandescent light** is a light bulb that glows when a filament inside it gets white hot. We have Thomas Edison to thank for this invention that he patented in 1879.



Ordinary Bulbs

A thin wire, made from the metal tungsten, is heated above 525°C by allowing an electric current to run through it. The wire will glow and emit white light.

Tungsten is used because it has a high melting point of nearly 3400°C.

As useful as these may be, they are not very efficient. Less than 10% of their energy is given off as light. Most of their energy is given off as infrared rays – heat!

Tungsten will quickly burn away if it is exposed to oxygen. To avoid this, the filament is placed in a sealed glass bulb which is usually filled with an inert gas such as argon or krypton, with a small amount of nitrogen added as well. This helps the filament from evaporating.

Tungsten-Halogen Bulbs

The bulb is made of quartz instead of glass, which allows them to withstand the high temperatures required.

Some incandescent light bulbs contain halogen gas , such as iodine or bromine, instead of argon or krypton and nitrogen. Under very high temperatures, halogen gases help reduce evaporation of the filament even more.

Because the filament can get even hotter than an ordinary light bulb, it glows whiter.

These bulbs are more efficient because they give off more light and use less electrical energy.

Their high temperatures make halogen lights more dangerous to use. Care must be taken to keep these away from materials that are flammable.

ELECTRIC –DISCHARGE LIGHTS

Fluorescent Lights

A glass tube containing mercury vapor coated with a powdered substance called **phosphor**.

When there is a current in the mercury vapor, UV light is emitted.

The photons from the UV light excite the phosphor, which gives off visible light.

Fluorescent lights are highly efficient:

- they do not get as hot as incandescent light bulbs
- they usually last longer than incandescent light bulbs
- they use less electrical energy for the same brightness
- a 40-watt fluorescent tube can produce as much light as a 150-watt incandescent bulb.

Vapor Lights

The bulb contains neon or argon gas and a small amount of solid sodium or mercury.

When an electric current passes through the gas, the gas heats up. The hot gas then heats the sodium or mercury, which causes them to change from a solid to a gas.

With the sodium vapor light, the particles of the **sodium** gas give off a **yellowish** glow of light.

A **mercury** vapor light produces a **bluish** light.

Both types are used for street lights and parking lots.

They require very little electrical energy to give off a great deal of light, making them very efficient.

Lights

Basically, neon lights are glass tubes filled with neon gas.

When an electric current passes through the neon, particles of the gas absorb energy.

The gas particles cannot hold the energy for very long, and the energy is released in the form of light.

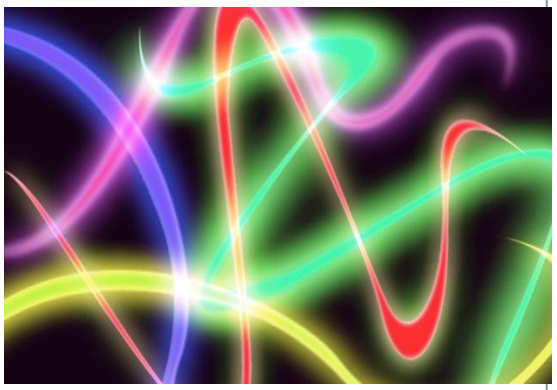
(Electric discharge through gases.)

The neon gas emits red light when there is a current through it.
Different gases produce different colors of light.

Argon and mercury vapor give off bluish-green light.

Helium gives off pink light.

Krypton gives off a pale violet light.



Oftentimes colored glass tubes are used to produce other colors.