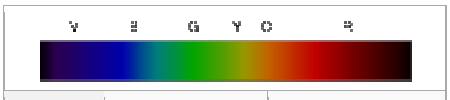
Light

Light is an electromagnetic radiation, particularly radiation of a wavelength that is visible to the human eye (about 400–700 nm, or perhaps 380–750 nm). In physics, the term light sometimes refers to electromagnetic radiation of any wavelength, whether visible or not. The speed of light in a vacuum is presently defined to be exactly 299.792.458 m/s (about 186.282 miles per second), rounded to 300.000 km/s.

Colors that can be produced by visible light of a single wavelength (monochromatic light) are referred to as the pure spectral colors.

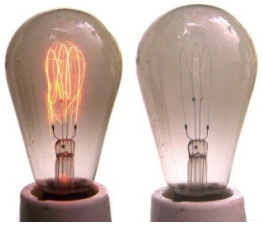


Color	Wavelength	Frequency
violet	380–450 nm	668–789 THz
indigo	420–450 nm	668–714 THz
blue	450–495 nm	606–668 THz
green	495–570 nm	526–606 THz
yellow	570–590 nm	508–526 THz
orange	590–620 nm	484–508 THz
red	620–750 nm	400–484 THz

There are many sources of light. Examples include sunlight, incandescent light bulbs (which emit only around 10 % of their energy as visible light and the remainder as infrared), and glowing solid particles in flames.

Light bulb

The incandescent light bulb or incandescent lamp is electrical equipment that converts electric current into electric light.
Invention of electric light bulb (as we know it today) is attributed to an American inventor Thomas A. Edison (in 1879).
An electric current passes through a thin filament, heating it until it produces light. The heated filament emits light that approximates a black body in a continuous spectrum. The useful part of the emitted energy is visible light, but most energy is given off in the near-infrared wavelengths.
The glass of light bulb is impermeable for ultraviolet rays.



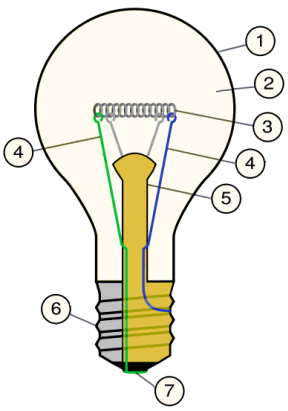
Original Edison's bulbs had carbonized bamboo filament in a vacuum bottle. Today a wolfram, which can better withstand high temperatures, is used. Wolfram filament is twisted into a spiral (spiral is 2 cm long, after expanding the spiral the filament is around one meter long).

The current heats the filament to an extremely high temperature, typically 2000 K to 3300 K depending on the filament type, shape, size, and amount of current running through it.

To prevent the filament from burning, it is placed in a glass bulb where the air is substituted for an inert gas under low pressure (argon). Light bulbs can be filled with halogen gas too (halogen light bulbs).

The light bulb only converts part of power into light. 92 % of energy is emitted in other spectrum (e. g. heat).

The glass bulb comes in two basic finishes - clear and matte. The first emits harsh light and the second disperses the light.
Light bulbs are also used for decorative purposes and come in different colors and shapes.
Standardized socket E 27 or E 14 is used to connect them to electric power.



A light bulb usually consists of:

1. **Glass bulb**
2. **Low pressure inert gas**
3. **Tungsten filament**
4. Contact wire
5. **Stem** (Glass mount)
6. **Cap** (Sleeve)
7. **Electrical contact**

Incandescent bulbs are manufactured in a wide range of sizes and voltages, from 1,5 volts to about 300 volts and powers: 25, 40, 60, 75, 100 and 150 W.

An average life of a light bulb is approximately 1000 hours.

Today, incandescent light bulbs are being replaced by fluorescent light bulbs because of longer life expectancy and energy efficiency. Fluorescent light bulbs are usually bigger in size than incandescent light bulbs. In recent years arrays of Light Emitting Diodes (LEDs) are being used as light bulb replacements.

Compact Fluorescent Light bulbs (CFLs) have longer life expectancy (from 6 000 to 16 000 hours) and lower energy consumption. The manufacturers claim that CFLs use 80 % less energy than regular incandescent light bulbs at the same light output.

CFLs are built from a glass tubes and a resistor built into the plastic base. Tubes, usually several of them glued together, have U or spiral shapes. Just like in a regular fluorescent lights, the inside wall of the CFL tubes is covered with luminophore and mercury plus some inert gas is injected into the tube. The CFL has a regular Edison's cup just a like a regular light bulb.

As of September 1, 2009, the sale of incandescent light bulbs with output higher than 80 W is banned in European Union. Starting September 1, 2012, only incandescent light bulbs with input power lower than7 W will be available for purchase.

Light pollution

Light pollution, also known as **photo-pollution** or **luminous pollution**, is excessive or obtrusive artificial light. *Light pollution* definition is:

Any adverse effect of artificial light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste.

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This photograph of New York City at night shows sky glow, one form of light pollution.
Light pollution vastly reduces the visibility of stars.

It obscures the stars in the night sky for city dwellers, interferes with astronomical observatories, and, like any other form of pollution, disrupts ecosystems and has adverse health effects. Light pollution can be divided into two main types:

- annoying light that intrudes on an otherwise natural or low-light setting and
- excessive light (generally indoors) that leads to discomfort and adverse health effects.

Since the early 1980s, a global dark-sky movement has emerged, with concerned people campaigning to reduce the amount of light pollution.

Light pollution is a side effect of industrial civilization. Its sources include building exterior and interior lighting, advertising, commercial properties, offices, factories, street-lights, and illuminated sporting venues. It is most severe in highly industrialized, densely populated areas of North America, Europe, and Japan and in major cities in the Middle East and North Africa like Cairo, but even relatively small amounts of light can be noticed and create problems. Like other forms of pollution (such as air, water, and noise pollution) light pollution causes damage to the environment.

Light therapy

Light therapy or phototherapy consists of exposure to daylight or to specific wavelengths of light using lasers, light-emitting diodes, fluorescent lamps, dichroic lamps or very bright, full-spectrum light – by a so-called light box. The light is administered for a prescribed amount of time and, in some cases, at a specific time of day. Light therapy directed at the skin is used to treat Acne vulgaris, psoriasis, eczema and neonatal jaundice. Light therapy which strikes the retina of the eyes is used to treat circadian rhythm disorders such as delayed sleep phase syndrome and can also be used to treat seasonal affective disorder, with some support for its use also with non-seasonal psychiatric disorders.

Description of the therapy

Right after waking up, the patient looks at the light from a distance of at least one meter for a period of 20 to 60 minutes. The effectiveness is evident after an exposure to 10 000 lux for a period of 30 minutes or an exposure to 2 500 lux for a period of two hours. It is important that the light passes through the retina of the eye. The patient however doesn‘t have to look directly into the source of light.

VOCABULARY

incandescent light bulb – žiarovka
invention – vynález
thin filament – tenké vlákno
wavelength – vlnová dĺžka
carbonized bamboo filament – uhlíkové vlákno
depending – v závislosti, závislý
tungsten filament – volfrámové vlákno
stem – stonka
socket – objímka
cap – závit do objímky
sleeve – objímka

efficiency – účinnosť
average – priemerný
light emitted diode (LED) – svietiaca dióda
arc lamp – oblúková lampa
lamp – výbojka
fluorescent tube – žiarivka
approximately – približne
lifetime – životnosť
scattered light – rozptýlené svetlo