



A Complete Guide To The Full Spectrum of Light

It may come as no surprise that light affects most living beings.

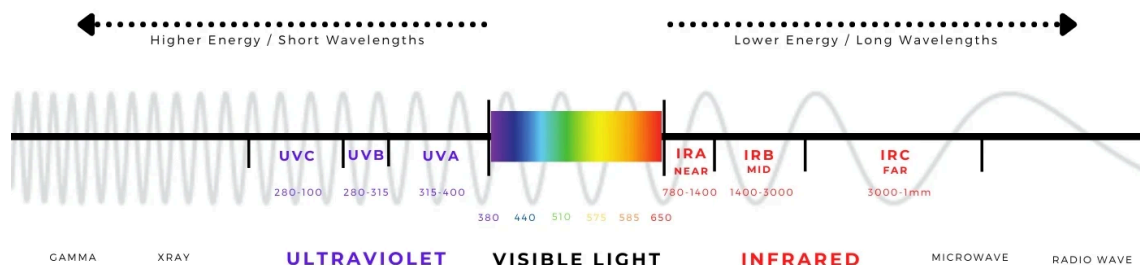
But what exactly is light? In this article, we'll deep dive into all things concerning the light spectrum, exploring the full spectrum of light as we know it in greater detail.

We'll cover the three essential spectrums of light for health: going into detail on ultraviolet, visible, and infrared light.

Some light we see (the visible light spectrum and its constituent colors), and some light we feel (infrared & UV), but no matter the type, all light affects us, our physiology, mood, and overall well-being!

Let's explore!

Understanding the full spectrum of sunlight: The three vital spectrums of light



Even though "light" can technically refer to the larger electromagnetic spectrum (containing everything from gamma rays to radio waves), there are only three spectrums of light that are the focus of everything and anything discussing light or full spectrum light and health.

They are, in order of appearance on the spectrum:

-Ultraviolet Light (UV)

-Visible Light (white light and all the colors of the rainbow)

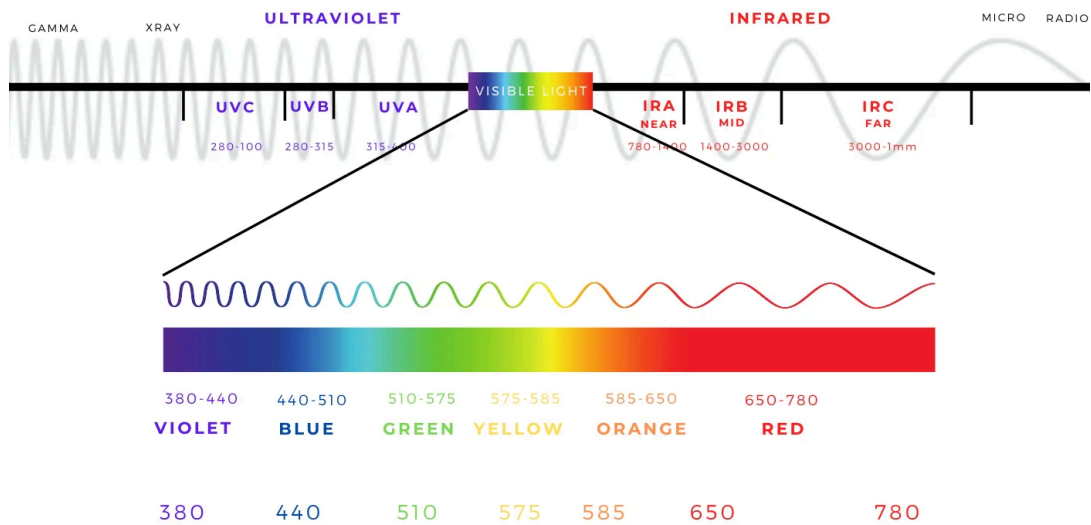
-Infrared Light

They affect our circadian sleep/wake schedule and all downstream effects, such as digestion, hormones, body temperature (through visible light), the production of Vitamin D (through UV light), and cellular energy production (through infrared light).

Let's first learn more about the most universally recognized spectrum of light: the visible light spectrum.

Visible light (380nm-780nm)

Environmental cue for the circadian rhythm



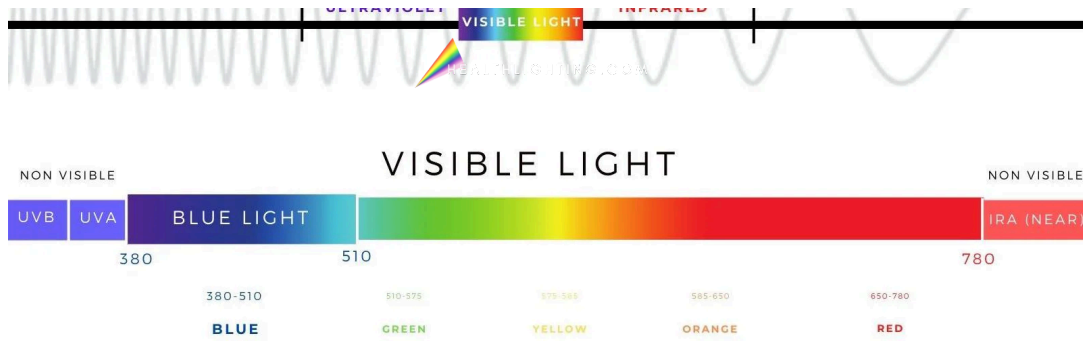
Visible light is the spectrum that allows us to see and contains the rainbow of colors - Red, Orange, Yellow, Green, Blue, and Violet - all of which comprise white light. When most people refer to "light," they refer to this small spectrum of colors.

The presence or absence of visible light is the critical component that dictates human and animal circadian rhythms.

Two critical light colors to understand are blue and red light wavelengths:

Even though visible light is made of all the colors of the rainbow (ROYGBIV), it's these two portions of the visible light, blue and red, that have most of a hold on our day-to-day lives.

Blue light (380nm - 510nm)



What is blue light?

Perhaps the best-known (or most spoken about!) of all the visible light wavelengths is blue light. Blue light is the shortest wavelength of visible light, which sits right above ultraviolet light. It is the first color wavelength of visible light right above ultraviolet.

Blue light is present in high amounts in natural sunlight during the day, and plays a critical role in human and plant life. The presence or absence of blue light controls our circadian rhythm and all the subsequent biological processes controlled by our 24 hr clock. We need high-quality blue light in order to regulate the body's circadian rhythm and improve alertness and mood. However, exposure to blue light, especially at night, can disrupt sleep and cause other health problems.

How does blue light work?

Blue light affects the production of the hormone melatonin, which is best known as the hormone regulating sleep.

When the eyes are exposed to blue light, it sends a signal to the brain's suprachiasmatic nucleus (SCN), which regulates the body's internal clock. This signal suppresses the production of melatonin, which can help to increase alertness and reset the body's circadian rhythm to be more awake and active during the day.

Conversely, when blue light exposure decreases, such as in the evening or at night, the production of melatonin increases, which signals to the body that it's time to sleep.

This is why it's important to limit exposure to blue light at night, particularly from electronic devices like smartphones and computers, as this can disrupt the production of melatonin and interfere with the body's natural sleep-wake cycles.

Is blue light bad for you?

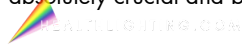
Many people have heard about blue light in a negative light: as we've just learned, blue light can interfere with the body's production of melatonin, and can therefore lead to difficulty falling asleep as well as poor quality of sleep when used at night. That means using devices and screens should be avoided at night for a better night's sleep.

Blue light is a fundamental and biologically necessary portion of the light spectrum, the specific type of light that innervates our circadian rhythm and the resulting cascade of biological processes that keeps our bodies running in good health.

So, while "artificial" blue light from screens and other electronics isn't the greatest idea (especially at night), blue light is present naturally in sunlight during the morning and daytime hours. It's a necessary ingredient in the recipe for good health.

In other words: blue light is necessary, just not at night: it's stimulating and prevents our bodies from winding down for a night of deep and restorative rest.

As we've learned, blue light can be both absolutely crucial and beneficial and harmful, depending on the timing and intensity of exposure.



Here are some tips for using blue light in a healthy way:

Morning and daytime: Get your blue light exposure in the morning/daytime: Whether you're getting outside first thing in the morning, or turning on some bright white overhead lights, exposure to blue light in the morning can help to reset your circadian rhythm and improve your alertness and mood.

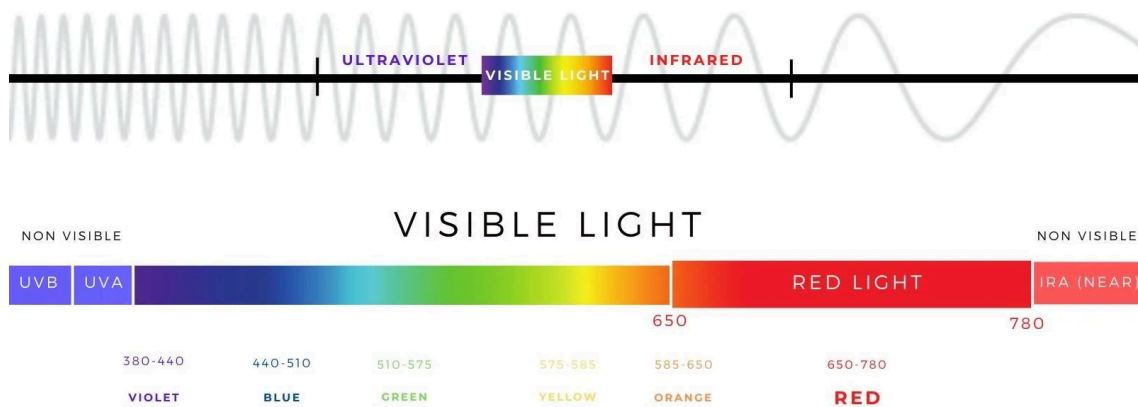
Evening and nighttime:

Limit exposure to blue light in the evening, especially in the hours leading up to bedtime. You can try using software or apps that filter out blue light from electronic devices, and use dimmer, warmer-colored lights in your home at night. Some great options would be warm white led bulbs, or for those LED-averse, the following low-wattage incandescent bulbs. Incandescent bulbs naturally have a lower, warmer color temperature with essentially zero blue light.

Take breaks from devices/set your screens to warm: Be sure to give your eyes plenty of rest when using electronic devices such as smartphones, tablets, or computers.

We also recommend adjusting the brightness and color temperature setting of your display to a warm white setting.

Red light (650nm-780nm)



Now that we know everything about blue light, let's move on to the other important portion of the visible light spectrum: red light.

What is red light?

Red light has a longer wavelength and lower energy than blue light and marks the end of the visible spectrum right before infrared light.

Whereas blue light can be considered energetic, red light has a more soothing, nourishing effect. Red light has no effect on the production of melatonin and therefore is a great option to use at night before bed.

What is red light used for?

Red light is also a popular light therapy tool often used in conjunction with infrared light (which we'll learn about soon) and has been found to have some therapeutic benefits for skin conditions.

The visible light spectrum and color temperature

What do these have to do with light bulbs and light bulb color temperature?

Color temperature - for those that need a quick refresher - is a visual representation on a scale of how warm or cool a light source appears. In other words, a measure of the whiteness of a light source. Light sources whose spectrum skews more towards the red is referred to as warm white, whereas light skewing more towards blue is referred to as cool white or daylight white.

Which color temperature to use at night or during the day?

According to what we've learned about blue light, you'd want to use light sources with more blue light in its spectrum (i.e., a natural or cool white/daylight white (4200-6500K)) during the morning and daytime, saving those warmer, redder light sources for the evening (warm white 2500-3500K)

Ultraviolet light (200nm-400nm)

Now that we've learned about the visible light spectrum, we'll move on to one of the most commonly known *invisible* light spectrums, ultraviolet (UV) light.

UV light sits directly to the left, or below, blue/violet visible light (hence the name, *ultra*-violet), and is too short a wavelength to be visible to the human eye. UV light can be broken down into three segments, UVA, UVB, and UVC light, but only UVA and UVB light are important to our health, as natural UVC light doesn't reach Earth's surface.

Benefits of UV light

UV light is a critical part of the light spectrum for overall health and well-being, providing many of the beneficial parts of light not available in other types. Like anything, overexposure can harm the skin and eyes, but a balanced consumption of UV is absolutely critical for total health.

Whereas the visible light spectrum and blue color light control our sleep/wake 24-hour cycles, it is ultraviolet light (and its constituent UVA and UVB spectra) that control the very important synthesis of vitamin D.

UVA light (315-400nm) and UVB light (280-315nm)

We combine UVA and UVB since they serve many of the same functions.

UVA light is closest to visible light and actually overlaps a bit into the visible spectrum, while UVB light has a shorter wavelength and higher energy than UVA light.

You're probably familiar with the effects of UVA and UVB overexposure, such as sun spots, wrinkles, and skin cancer, yet UVB in particular, is a crucial light element that you won't otherwise find in your indoor lighting (unless you have a tanning bed!), and let's our body produce Vitamin D and serotonin.

Vitamin D synthesis: When the skin is exposed to UVB light, it produces vitamin D, a vitamin crucial for immune function, bone health, and other physiological processes.

Improved mood: Exposure to UV light can increase the production of serotonin, a neurotransmitter that helps to regulate mood and can help to alleviate symptoms of depression and other mood disorders.

Again, it's important to get outside under natural sunlight every morning to get UV light (the amount varies depending on the season and how fair or dark-skinned you are), as it's nearly impossible to get the necessary amount of UV light from light bulbs. A full spectrum light bulb will not provide UV in any quantity nearly sufficient for human usage.

UVC light (200-280nm)

Last up on the ultraviolet spectrum is UVC light, the last band of UV light farthest from visible light, and unable to penetrate Earth's atmosphere.



Infrared light (780nm-1nm)

Next is infrared light, another band of light energy invisible to the human eye, which sits directly next to the visible red color wavelengths.

Felt at thermal energy or heat (like that emitted from a fire or incandescent light bulb), infrared light is incredibly nourishing, with red and near-infrared light (the infrared band closest to visible red light) being the only wavelengths of light able to penetrate the skin, promoting cell regeneration, tissue oxygenation, and overall health and energy in the cells.

Infrared light is also used in various medical treatments, including pain relief, wound healing, and muscle recovery, as well as non-health applications such as night vision goggles and thermal imaging cameras.

Infrared A (Near-Infrared Light) 780nm-1400nm

Infrared A (IR-A) or near-infrared light (NIR) refers to a range of electromagnetic radiation with wavelengths between 780 nanometers (nm) and 1400 nm.

IR-A or NIR radiation is the wavelength most commonly used for Photobiomodulation to stimulate cellular activity and promote healing in the body. Some of the benefits of NIR light include:

Benefits of Near-Infrared Light Include:

Pain relief: NIR light has been shown to reduce pain and inflammation by promoting the release of endorphins and increasing blood flow to affected areas.

Reduced inflammation: NIR light has anti-inflammatory effects, which can be beneficial for a wide range of conditions, including arthritis, tendonitis, and other inflammatory conditions.

Improved circulation: NIR light therapy has been shown to improve circulation by increasing the formation of new blood vessels and promoting blood flow to damaged or injured areas.

Improved skin health: NIR light can improve the appearance of skin by stimulating collagen production, reducing fine lines and wrinkles, and promoting wound healing.

Enhanced athletic performance: NIR light therapy has been shown to improve muscle recovery and reduce muscle fatigue, leading to enhanced athletic performance.

Infrared B (Mid-Infrared Light) 1400nm-3000nm

While NIR light is more commonly used in photobiomodulation therapy (it has better tissue penetration) mid-infrared light (MIR) light is more effective in treating deeper tissues, such as muscle and bone, due to its longer wavelengths.

Infrared C (Far-Infrared Light) 3000nm-1mm

While not as commonly used as near-infrared light (NIR) in photobiomodulation (PBM) therapy

Wrapping up...

We're big believers in being armed with lighting knowledge: the more you know, the less in the dark you'll be about using light to your advantage!