Colors outside the visible spectrum

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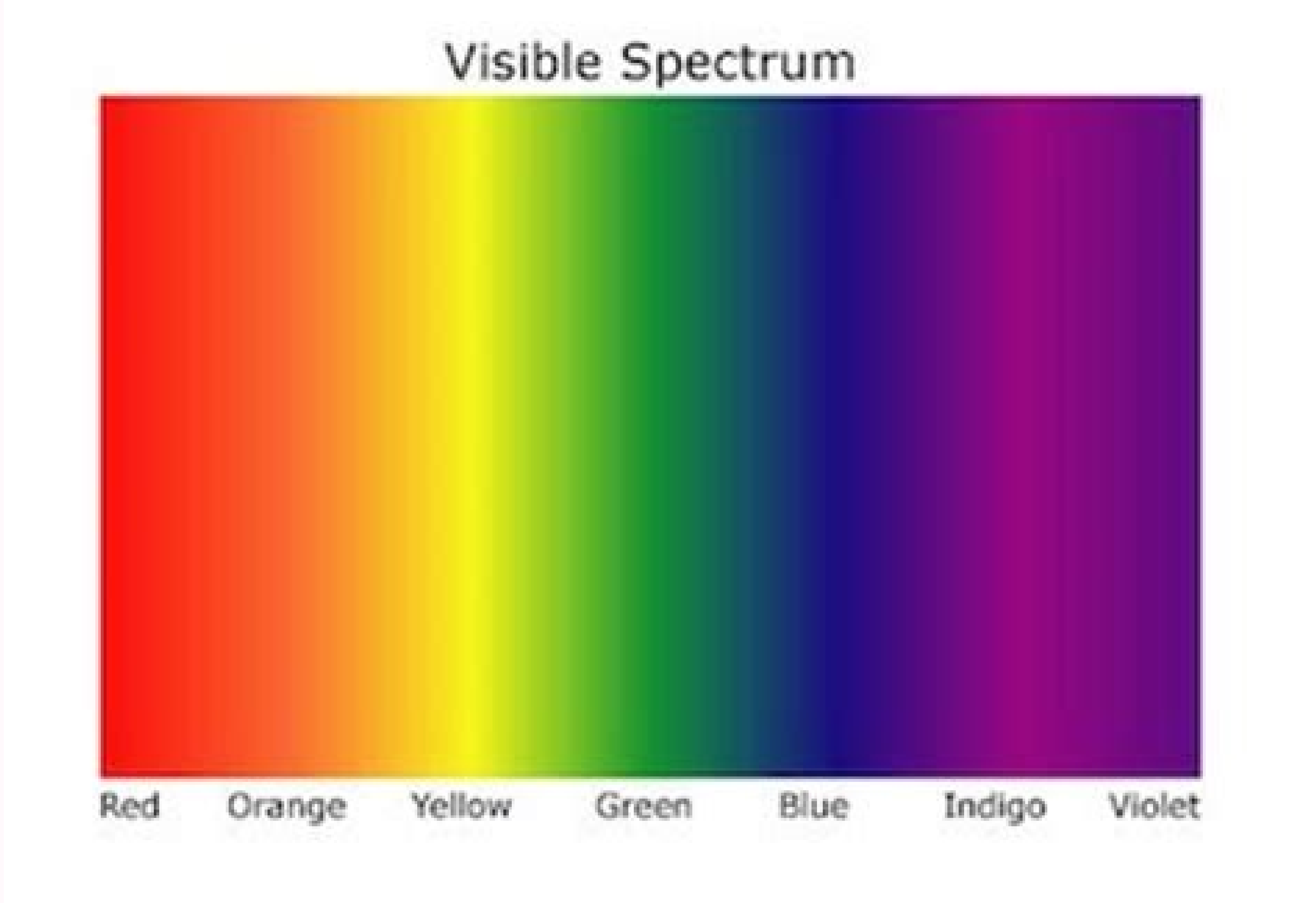
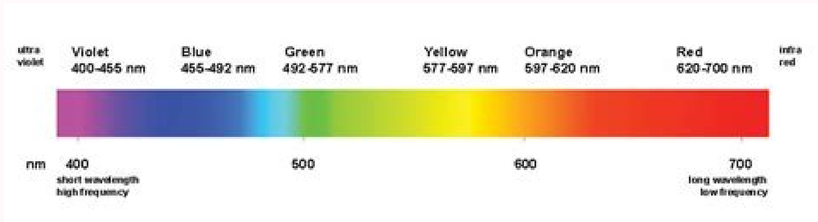
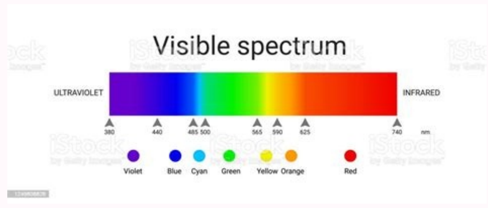
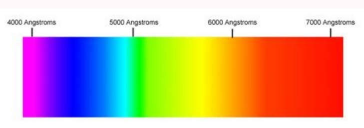






Wavelength [nm]	Absorbed color	Complementary color
650-780	red	blue-green
595-650	orange	greenish blue
560-595	yellow-green	purple
500-560	green	red-purple
490-500	bluish green	red
480-490	greenish blue	orange
435-480	blue	yellow
380-435	violet	yellow-green



What are the 7 colors of the visible spectrum. What is the most visible color in the spectrum.

This distribution of colors is called a spectrum; separating light into a spectrum is called spectral dispersion. The reason that the human eye can see the spectrum is because those specific wavelengths stimulate the retina in the human eye. The spectrum is arranged in the order red, orange, yellow, green, blue, indigo, and violet according to the different wavelengths*1 of light; the light in the region with the longest wavelengths is seen as red, and the light in the region with the shortest wavelengths is seen as violet. The light region which the human eye can see is called the visible light region. If we move beyond the visible light region toward longer wavelengths, we enter the infrared region; if we move toward shorter wavelengths, we enter the ultraviolet region. Both of these regions cannot be seen by the human eye. Light is just one portion of the various electromagnetic waves flying through space. The electromagnetic spectrum covers an extremely broad range, from electrical and radio waves with wavelengths of several thousand kilometers to gamma (³) rays with wavelengths of 10-13m and shorter. The visible light region is only a very small portion of this: from approximately 380 to 780nm*2. The light reflected from an object and which we recognize as color is (with the exception of man-made monochromatic light) a mixture of light at various wavelengths within the visible region. *1 Wavelength: Light has wave characteristics; wavelength is the peak-to-peak distance of two adjacent waves. *2 nm (nanometer): A unit of measure often used when discussing wavelengths of light; mm (micrometer) is also sometimes used. 1nm=10-6 mm-=10-3¼m 1¼m=10-3mm=1000nm The invisible colours of space 3 ESO (14-15 years old) In this experience, explore the large portion of the spectrum of light that is invisible to human eyes, discover the information it contains, and a new view of the cosmos.... Material that could add value if prepared before coming to ESAC: Thermal Energy: Heat and temperature. Videos Material to be used at ESAC: Scientific Case and Game. We see our world in a huge variety of colour. However, there are other “colours” that our eyes can't see, beyond red and violet, they are: infrared and ultraviolet. Comparing these pictures, taken in these three “types of light”, the rainbow appears to extend far beyond the visible light. Multispectral rainbow. Courtesy of Dr. A. Dominic Fortes, Earth Sciences In addition to ultraviolet and infrared, there are other “colours” which are hidden from sight. The whole set of “colours” is called the electromagnetic spectrum, which is divided into different ranges. In order, from the highest to the lowest energy, they are: gamma rays, X rays, ultraviolet, visible light, infrared, microwaves, radiowaves. Electromagnetic spectrum. Source: Wikipedia.org To see the cosmos in light beyond the visible part of the spectrum, special instruments are needed, with different types of detectors depending on the wavelength. These instruments/detectors, allow astronomers to obtain a huge amount of information about the Universe. Galaxy observed at different wavelengths. Credit: In this Space Science Experience, students will match images of astronomical objects to the corresponding wavelength. Nowadays, the European Space Agency has a fleet of satellites that observe the Universe in all the ranges of the electromagnetic spectrum. This is to enable astronomers to obtain a complete picture of the different process that take place around astronomical objects. ESA'S fleet across the spectrum. Credit: ESA Let's go study the sky in all these “colours”! Something went wrong. Wait a moment and try again. Our eyes are one of the smallest organs in our bodies, yet there are more than 100 million tiny cells—called rods and cones—inside the retina alone that are responsible for responding to light. While rods help with vision in low light, cones help us see the world in color. In fact, our eyes can visualize all colors of the rainbow through reflected light, but the colors we see are part of a very narrow band of wavelengths on the light spectrum. The question is – What can't we see? What Is Visible Light? Our eyes are sensitive to a narrow band of electromagnetic waves known as the visible light spectrum. To understand how visible light is broken into various wavelengths, take a cue from Isaac Newton and shine a light through a prism. A prism separates visible white light into separate wavelengths, and each color that appears—red, orange, yellow, green, blue, and violet—is a characteristic of the distinct wavelengths. Certain colors are seen as objects around us and absorb some light and reflect the rest, depending on the properties of the object. For example, a strawberry reflects the wavelength of visible light that appears as red. What about white and black? White is the result of a mixture of two or more colors of light. This is why visible light—or the mix of the rainbow of colors—is also referred to as white light. Black is the absence of the visible light spectrum wavelengths. Everything in a dark room appears black because there is no visible light to strike your eye as you gaze at the surrounding objects. Blue light, or blue-violet light, has shorter wavelengths and more energy than any other visible light. While blue light helps regulate circadian rhythm and boost memory and cognitive function, excessive exposure can lead to digital eye strain, retina damage, and age-related macular degeneration. Special lenses like Eyezen™ can help with digital eye strain. For proactive blue light protection, Crizal® Prevencia™ anti-glare lenses can be a great solution. A comprehensive eye exam with an eyecare professional can help you find the right lenses. What Is Non-Visible Light? The human eye can only see visible light, but light comes in many other "colors"—radio, infrared, ultraviolet, X-ray, and gamma-ray—that are invisible to the naked eye. On one end of the spectrum there is infrared light, which, while too red for humans to see, is all around us and even emitted from our bodies. Warm-blooded animals, including humans, radiate infrared light. That's why infrared cameras are helpful for thermal imaging and night vision when searching for people or animals. On the other end of the spectrum there is X-ray light, which is too blue for humans to see. X-rays are another common light source that many of us have encountered at a doctor's office. X-rays can penetrate skin and muscles, allowing doctors to look at our bones. What you might not know is that the sun also emits X-rays. Lucky for us, the Earth's atmosphere blocks X-ray light. Non-visible light can also be found in your home in a device you most likely use every day: remote controls! Your remote control uses infrared light to transmit signals to the television and other electronics. While the signal is invisible to you, your television can process the light and respond. Dangerous Light Unfortunately, not all light is safe, and particular bands of light are hazardous to our health. Ultraviolet light can sunburn unprotected skin. Infrared light can emit thermal energy that can harm your body. A microwave, the wavelength of light falls between radio and infrared waves, can heat the water molecules in deep tissues, affecting the body’s moisture levels. Plus, gamma rays are the most dangerous because they can warp the body’s cells. Beneficial Light However, some lights are actually more helpful to us than you might think. Aside from helping us see, visible light is also beneficial to our bodies and overall health. Research shows that certain wavelengths of red light can penetrate the skin to reduce wrinkles and help repair skin damage, while parts of the blue light wavelength regulate the biological clock, or sleep/wake cycle, and play a role in basic functions of the human brain such as alertness, memory, emotion, and cognitive performance. A spectral color is a color that is evoked in a normal human eye by a single wavelength of light in the visible spectrum, or by a relatively narrow band of wavelengths, also known as monochromatic light. Every wavelength of visible light is perceived as a spectral color, in a continuous spectrum; the colors of sufficiently close wavelengths are indistinguishable for the human eye. There are colors that cannot be perceived by the normal human eye. Our human eye can only see colors that fall within our visible color spectrum. Outside the color spectrum, we have ultraviolet and infrared light. Keep in mind that objects reflect colors they absorb. The spectrum contains a division of colors based on their wavelengths as violet is assumed to be shorter and red to have a longer wavelength in the color spectrum. The range of the human color spectrum is about 400 nanometers in wavelength to 700 nanometers in wavelength. This means that any color that has a wavelength within this range should be seen by the normal human eye. The spectrum is often divided into named colors, though any division is somewhat arbitrary; the spectrum is continuous. Traditional colors in English include red, orange, yellow, green, blue, and violet. In some other languages, the color names’ ranges do not necessarily agree with those in English. The color spectrum is a collection of the colors that are displayed when light passes through a prism with each of them ordered by emission or wave. Red has a wavelength interval of 700–635 nm and a frequency of 430–480 THz Orange has a wavelength interval of 635–590 nm and a frequency of 480–510 THz Yellow has a wavelength interval of 590–560 nm and a frequency of 510–540 THz Green has a wavelength interval of 560–520 nm and a frequency of 540–580 THz Cyan has a wavelength interval of 520–490 nm and a frequency of 580–610 THz Blue has a wavelength interval of 490–450 nm and a frequency of 610–670 THz Violet has a wavelength interval of 450–400 nm and a frequency of 670–750 THz So what about colors that have wavelengths shorter than 400 nanometers or longer than 700 nanometers? In elementary school when we first started learning about colors, we were taught that there are three primary colors. Which meant that other colors we see are a combination of some of the three. We, humans, are typically trichromats, which is why we refer to people who can only see two colors as color blind. But some species of shrimp, like the mantissa, will view us as color blind seeing as they have longer color spectrum than we do and therefore can see more colors outside of our color spectrum. Many people, however, have argued that color is a concept of perception. And without perception, there are no colors. So if we can’t see it, then it is not there. However, this triggers the question of how color blind individuals fit into this. They cannot identify or differentiate particular colors; does it mean those colors do not exist? No! So if we had the capability to expand our color spectrum (probably wishful thinking) or somehow see out outside of our restricted color spectrum by some enhanced technology, then everything would be different. If our eyes could perceive deeper into the infrared light then each object will appear more colorful based on their heat signature. The world would explode into a version of wonderful colors but there is no telling how these colors will appear to us. Maybe we will be able to see brand new colors that our imagination now lacks comprehension and description or maybe we will still see the same colors but with deeper wavelengths.

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