Pegah Mathur, Sep 13 2015

Explain the relationship between wavelength, visibility, and temperature.

Electromagnetic radiations have a spectrum or a range of possible frequencies. Visible light, to which the human eyes are sensitive, is a small part of this electromagnetic spectrum. This visible range is extended from ultraviolet wavelength (380 nm) to infrared wavelength (780 nm) thresholds.

Depending on their temperature, all objects emit different range and amount of electromagnetic radiations. Objects with a higher temperature emit more short-wavelength radiations, while objects with a lower temperature emit more long-wavelengths radiations. For this reason, temperature of an object is related to the wavelength of most of its emitted radiations; the higher the temperature, the shorter the wavelength of radiations (Figure 1). This all could be interpreted as that there is more chance that objects with a higher temperature emit more visible light. For example, if we heat a non-emitting black object in a dark room to certain temperatures, it emits visible light as well as other ranges of waves in the electromagnetic spectrum to release its energy. However, regardless of temperature of sources of radiations and temperature of reflecting objects, visible light can strike and reflect of objects (its extent depends on the color of light and objects), and this is the basis for visual perception of our environment as the light enters the human eyes.

In summary, visibility of objects is dependent on availability of visible light in the environment (reflections or emissions from the objects). This visible light is a small part of the electromagnetic spectrum and objects that have a certain range of temperature can emit visible light with a certain wavelength. Objects with higher temperatures have more energy to release and they emit more short-wavelength radiations (that are able to carry more powerful waves) than objects with lower temperatures (Figure 2).

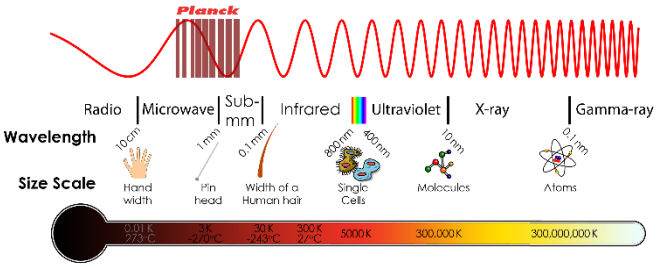

Figure 1: The size scale of the wavelengths and the corresponding characteristic temperature (from http://planck.cf.ac.uk/science/mm-wave-astronomy)

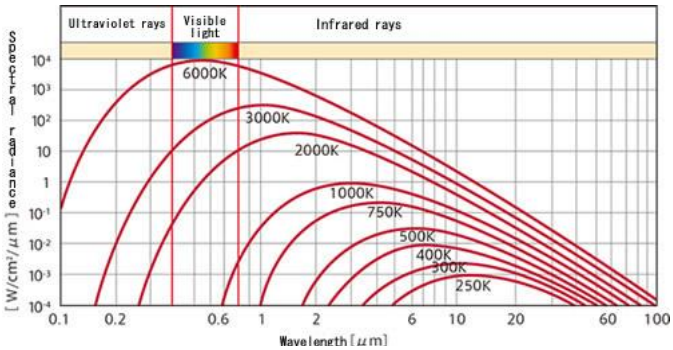

Figure 2: The relationship between wavelength, visible light spectrum, and temperature (from http://www.apiste-global.com/files/user/en/technology/fsv/img/tech13_img01.jpg)