# Free physics essay example

Law

## Light and Its Properties

Light is around us. Source of natural light is sunlight and in night we are using light generated from various power and energy sources. Without light we cannot imagine our life. Light is energy following conservation law of energy. It cannot be generated or destroyed. It just transforms into another kind of energy or vice versa. In following paragraphs light and its various properties have been discussed.

Light is electromagnetic radiation having properties of waves. It does not require a medium to travel through and for this reason light is able to travel through vast vacuum of space. Light has the highest speed among any natural phenomenon and the speed is about 300, 000, 000 meters per second or 186, 000 miles per second. With this speed light can travel around the earth in 0. 13 second. Time taken by sunlight to reach the earth is 8. 3 minutes. This electromagnetic spectrum is generally classified into several bands based on wavelength.  Visible light represents a narrow group of wavelengths between about 380 nm and 730 nm.  If there is only a single wavelength or limited group of wavelengths which enters in human eyes, it is interpreted as a certain color. Monochromatic light has single wavelength. When all wavelengths of visible light are present, human eyes recognize it as white light. In dark no visible wavelength is present.

## Energy of light can be expressed in terms of its frequency and velocity as follows:

E = h● = hC/✦

where E = energyh = Planck's constant, 6. 62517 x 10-27 erg. sec● = frequencyC = velocity of light = 2. 99793 x 1010  cm/sec✦ = wavelength

## When light travels through a substance, its velocity reduces. It can be explained by following equation -

C = ●✦

Frequency of vibration, ●, remains unchanged while light passes through a substance. If the velocity, C, is decreased on passage through the substance, wavelength, ✦, must also reduce. Ratio of speed of light in a vacuum, C, to the speed of light in a material through which it passes, Cm, is termed as refractive index, n, of the material or substance

n = C/Cm

As Cm can never be greater than C, the value of refractive index is always greater than 1. 0. Cm generally depends on density of the material, with Cm reducing with increasing density. So higher density materials will have higher refractive indices.

When light encounters a surface three phenomenons can take place such as reflection, absorption, and refraction. After encountering a surface light can be reflected from it. According to law of reflection angle of incidence and angle of reflection is same. The angles are measured from a line perpendicular to the surface. Visible colors are as a result of them not being absorbed by a substance. White light is made up of all colors. When all wavelengths of visible light are present, human eyes interpret this as white light. As the black substance doesn't reflect any of the colors on it, the substance is seen as black. For this reason a black dress is felt hotter than dresses of other colors in sun. Reflection has vast application in many devices or technologies from wardrobe mirror, wide angled mirrors used to see around corners on blind corners to satellite dishes and periscopes. When light is incident upon a surface from where light is unable to be reflected or

to continue its movement through material of that surface, energy of light is absorbed by the material. This makes the material of the surface to get hotter. This is called absorption. In case light is able to pass through material like glass or Perspex a process known as refraction occurs. In refraction the light is changing medium.

When ray of light enters the substance with different refractive index, angle of refraction depends on the angle of incidence and the refractive index of materials on either side of the interface according to Snell's Law:

ni sin (i) = nr sin (r) ,

where “ i” is angle of incidence, “ r” is angle of refraction, “ ni “ and “ nr “ are refractive indices. Refraction of light is utilized in the design of microscopes, telescopes, eyeglasses, and other optical instruments. Refractive indices vary for each wavelength of light generates an effect called dispersion. When a beam of white light entering a triangular prism made of glass, the light is refracted in the prism by different angles depending on the wavelength of the light.

Refractive index for longer wavelengths like red is lower than refractive index for shorter wavelengths like violet. This causes a greater angle of refraction for the longer wavelengths than for the shorter wavelengths.

Another important phenomenon is Polarization of Light. Normal light is a transverse wave with electric and magnetic fields oscillating perpendicular to its path of propagation. When the light is constrained to vibrate in only on plane, it is termed as plane polarized light. Direction in which light vibrates is called vibration direction. There are few common methods for polarization of light. Polarization of light can be achieved by passing the light through a

substance which absorbs light vibrating in all directions except one.

Anisotropic crystals have this property in certain directions.

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