

QUESTION:

Hi!

My textbook says that dispersion of light takes place in prism due to differing speed and wavelength(hence frequency). But white light(a mixture of 7 colors) travels at $3 \cdot 10^8$ m/s. Then how come speed changes inside prism? Also if the deviation of a particular colored light is inversely proportional to wavelength and directly proportional to frequency then how come they travel at different speeds? Please help me... I am totally confused!

SOLUTION:

Hi! First of all I'd like to tell you that white light is not a mixture of 7 colors. This classification is rather conventional, because colors in visible spectrum gradually pass from one to another.



Newton divided the spectrum into seven named colors, and he chose this number out of a belief, derived from the ancient Greek philosophers, that there was a connection between the colors, the musical notes, the days of the week, etc.

And not only white light, but all electromagnetic radiation travels at $3 \cdot 10^8$ m/s but only in vacuum. The speed of light in vacuum is a universal physical constant. But in a medium, light usually does not propagate at a speed equal to $3 \cdot 10^8$ m/s. The speed of the light in a medium depends on the properties of the medium, or more precisely **on the refractive index** of a material. The refractive index of a material is defined as the ratio of speed of light in vacuum to the speed of light in the material: larger indices of refraction indicate lower speeds. **The refractive index of a material depends on the light's frequency.** And because of different refractive indexes for different wavelengths, red light refracts at one angle, green light refracts at another angle, hence we can see the spectrum:

