Physics (NCEA Level 1)

Dispersion

Light of all wavelengths travels at the same speed in free space. If the speed was the same in glass and in water a prism would not produce a spectrum and rainbows would not be seen in the sky. Shorter wavelengths travel a little slower in a dispersive medium such as glass or water. Blue light is bent a little more than red at a glass-air interface. The refractive index, (v_{air} / v_{glass}) is a little greater for blue light.

The refractive index of all common materials decreases with increasing wavelength across the visible spectrum. Blue light is deviated more by a prism than red light. Dispersion is a problem when images are formed by simple lenses. The blue image is closer to the lens than the red image which leads to the appearance of coloured fringes around objects where there is a marked change in contrast.

Cameras and telescopes made with simple uncorrected lenses produce images with coloured fringes. The effect is not present with reflections from curved mirrors which is one of the reasons large astronomical telescopes have mirrors as objectives rather than lenses.

Remember: refractive index between air and a medium is the ration v_{air} / v_{medium} .
For **shorter wavelengths** (e.g. blue) v_{medium} is **smaller** than for larger wavelengths (e.g. red). Thus the refractive index for blue light is slightly larger than for red light.

Therefore if white light shines through a prism blue light is bent slightly more than red light and you see a spectrum of light.