Q: How fast should we approach the red traffic light to see it turn green? To get a specific answer, take the red wavelength as 640 nm and the green wavelength as 540 nm.

Sol:

$$\frac{\lambda'}{\lambda} = \sqrt{\frac{1-\frac{v}{c}}{1+\frac{v}{c}}}$$

$$\rightarrow \left(\frac{540}{640}\right)^2 = \frac{1-\frac{v}{3*10^8}}{1+\frac{v}{3*10^8}} \rightarrow 0.71 + \frac{0.71*v}{3*10^8} = 1 - \frac{v}{3*10^8}$$

$$2.1*10^8 + 0.71*v = 3*10^8 - v \rightarrow 1.71*v = 0.9*10^8$$

$$v = \frac{0.9*10^8}{1.71} = 0.53*10^8$$