

PHYS1120
Summer 2025

1. Red light has a wavelength of 600 nm and green light has a wavelength of 480 nm. Suppose you are pulled over for running a red light. Running a red light carries a fine of \$100, and a speeding ticket is fined \$5 for every mile-per-hour over the speed limit you are driving. Having just passed physics II and willing to take a potentially cheaper speeding ticket, you ingeniously claim that you were approaching the traffic light, and the red light was blue-shifted to appear green in your frame of reference. How much can you expect your fine to be? The speed of light is $3 \times 10^8 \text{ m s}^{-1}$. Assume the speed limit is 30 mph, and there are 5 kilometers in 3.1 miles. Ignore special relativistic effects (use the Doppler equations shown in class).