C.5

Redshift

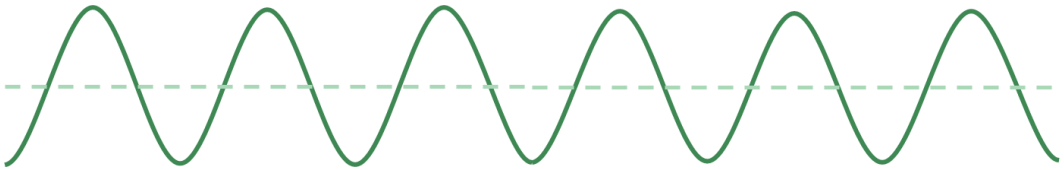
IB PHYSICS | ASTROPHYSICS

The Doppler Effect

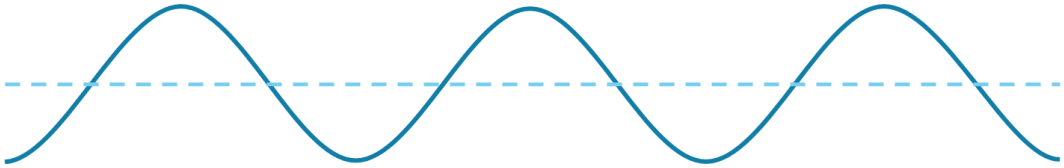
C.5

The shape of a sound wave affects how it sounds

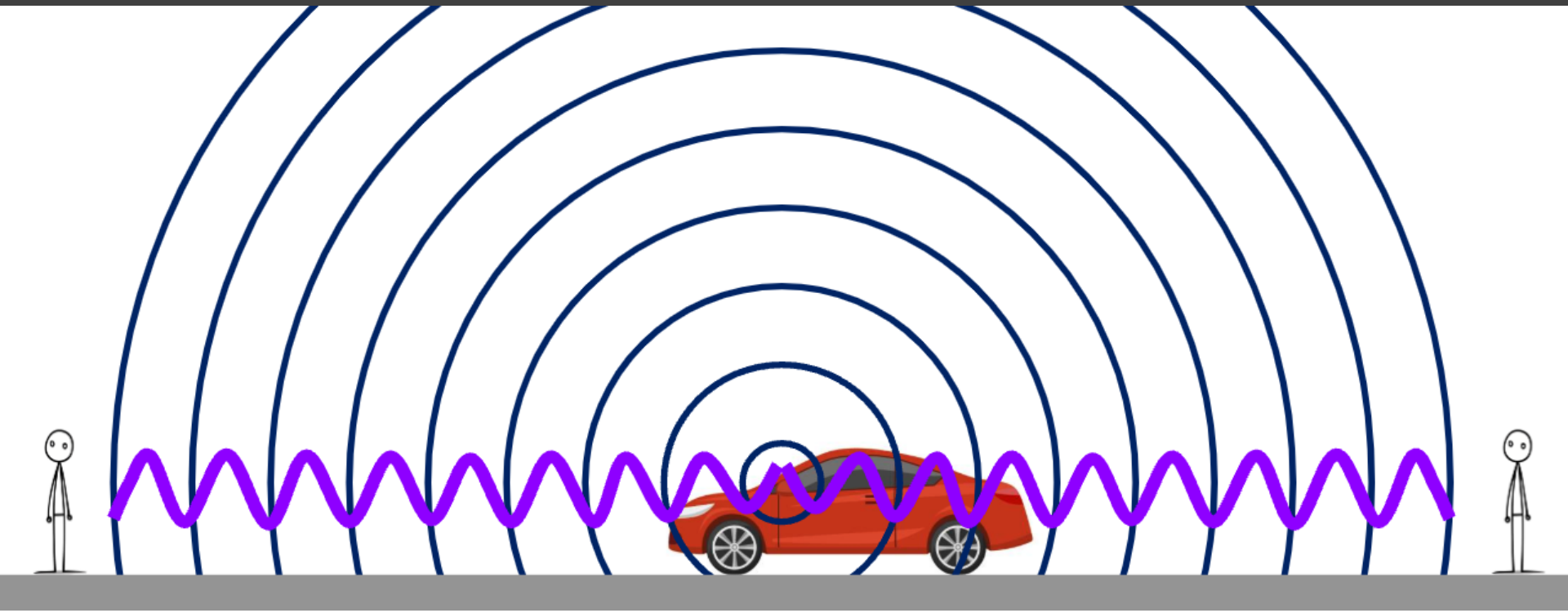
Short Wavelength
High Frequency



Long Wavelength
Low Frequency



Stationary Sound Source

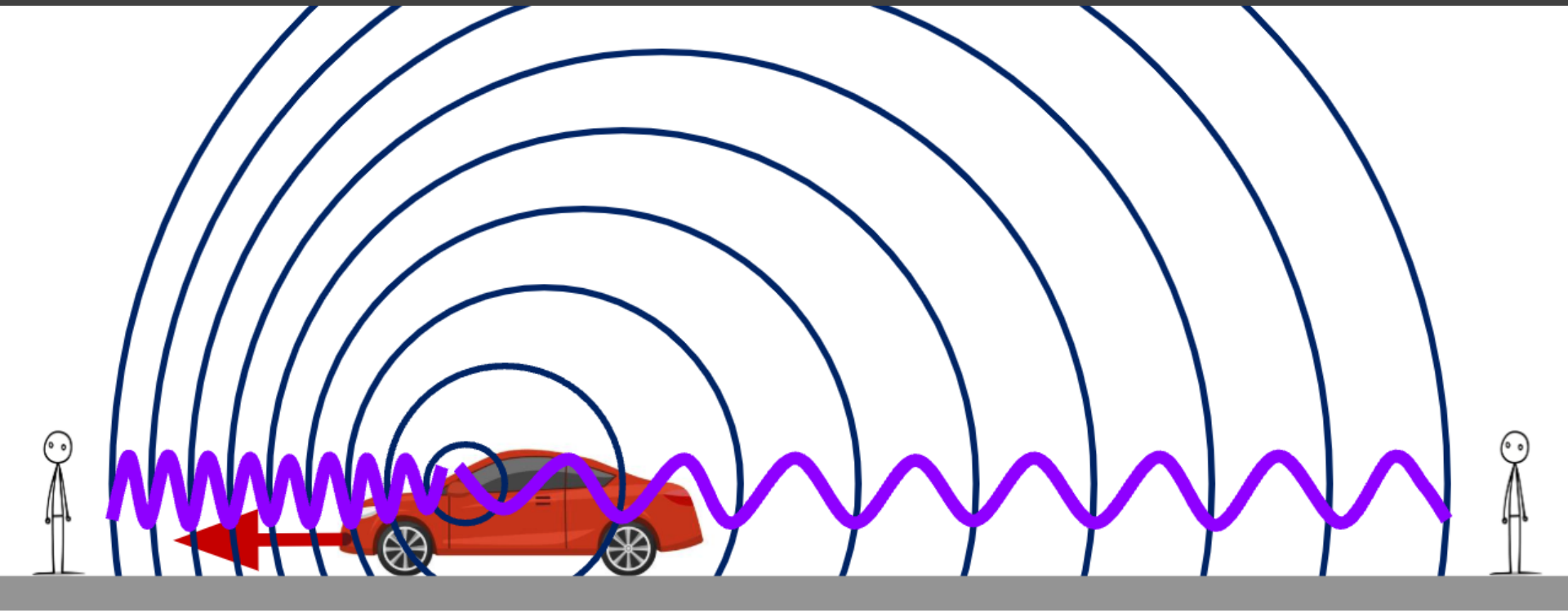


How does their sound experience compare?

They hear the same pitch

C.5

Moving Sound Source

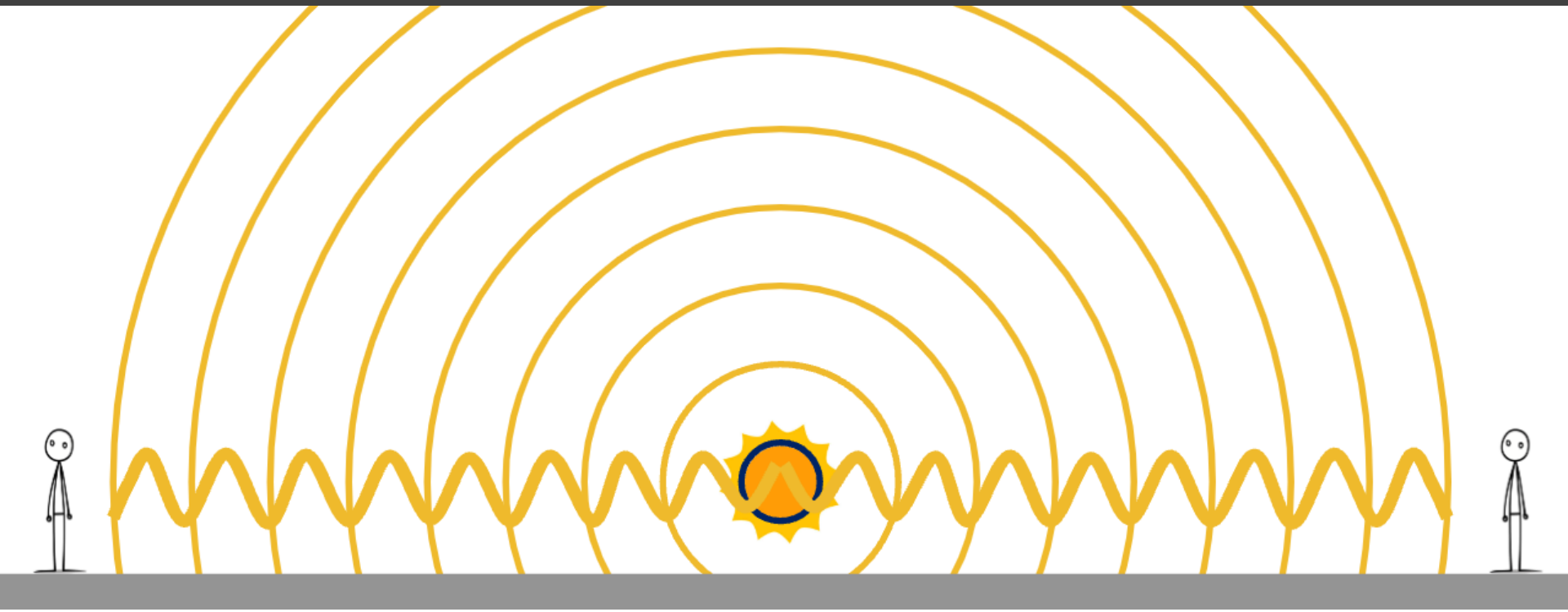


How does their sound experience compare?

High Pitch

Low Pitch

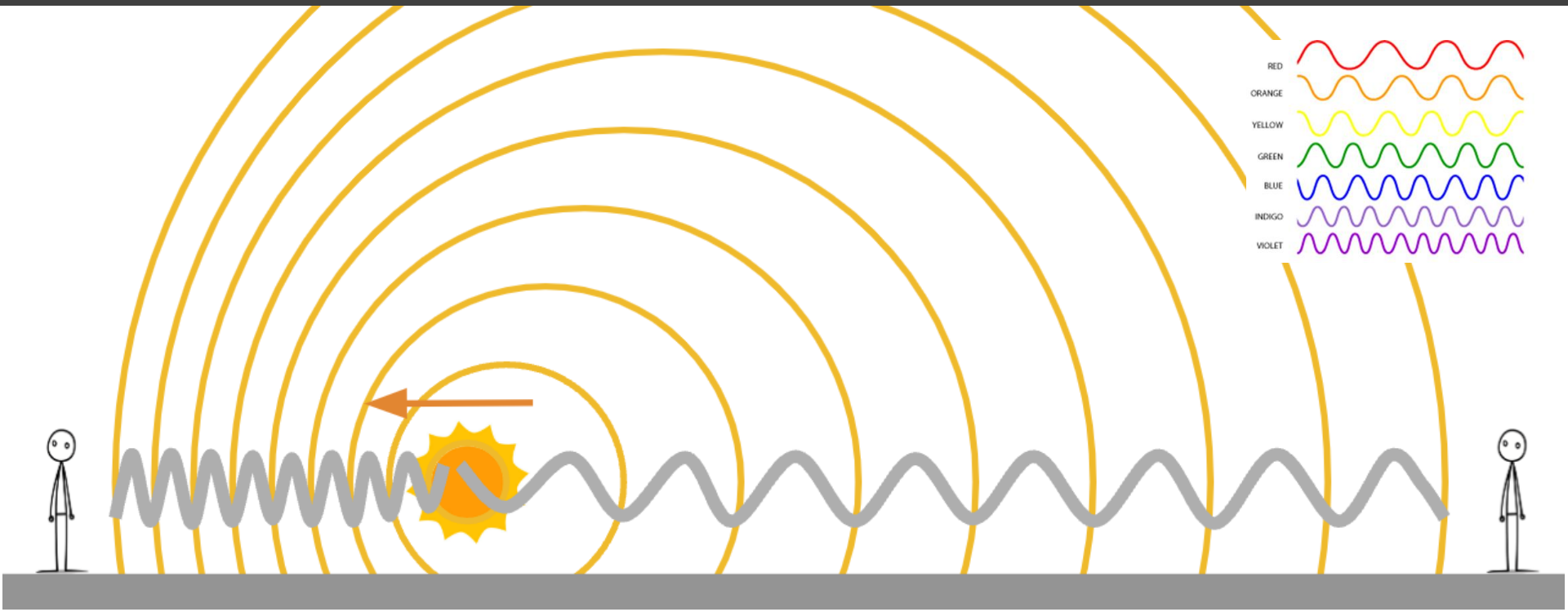
Stationary Light Source



How does their **light** experience compare?

They see the same color light

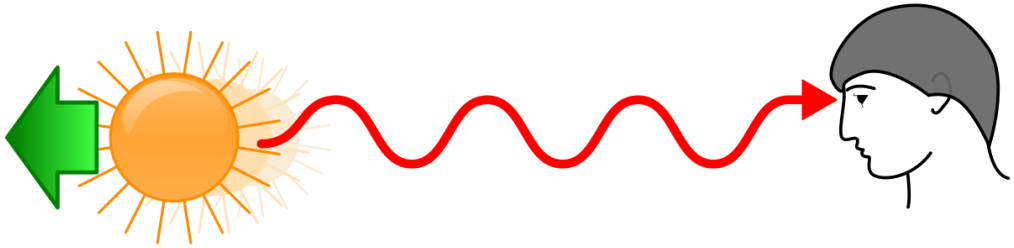
Moving Light Source



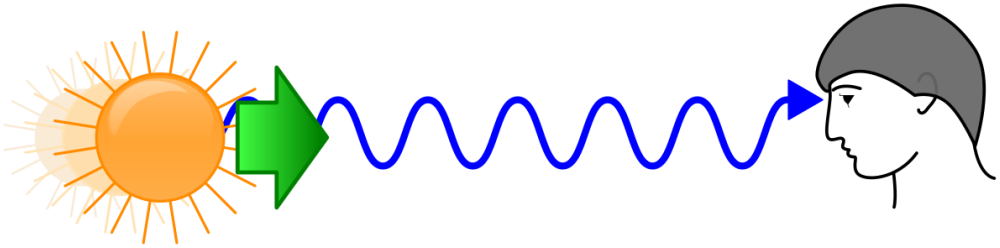
How does their **light** experience compare?

They see different colors

Moving Light Source



Redshift

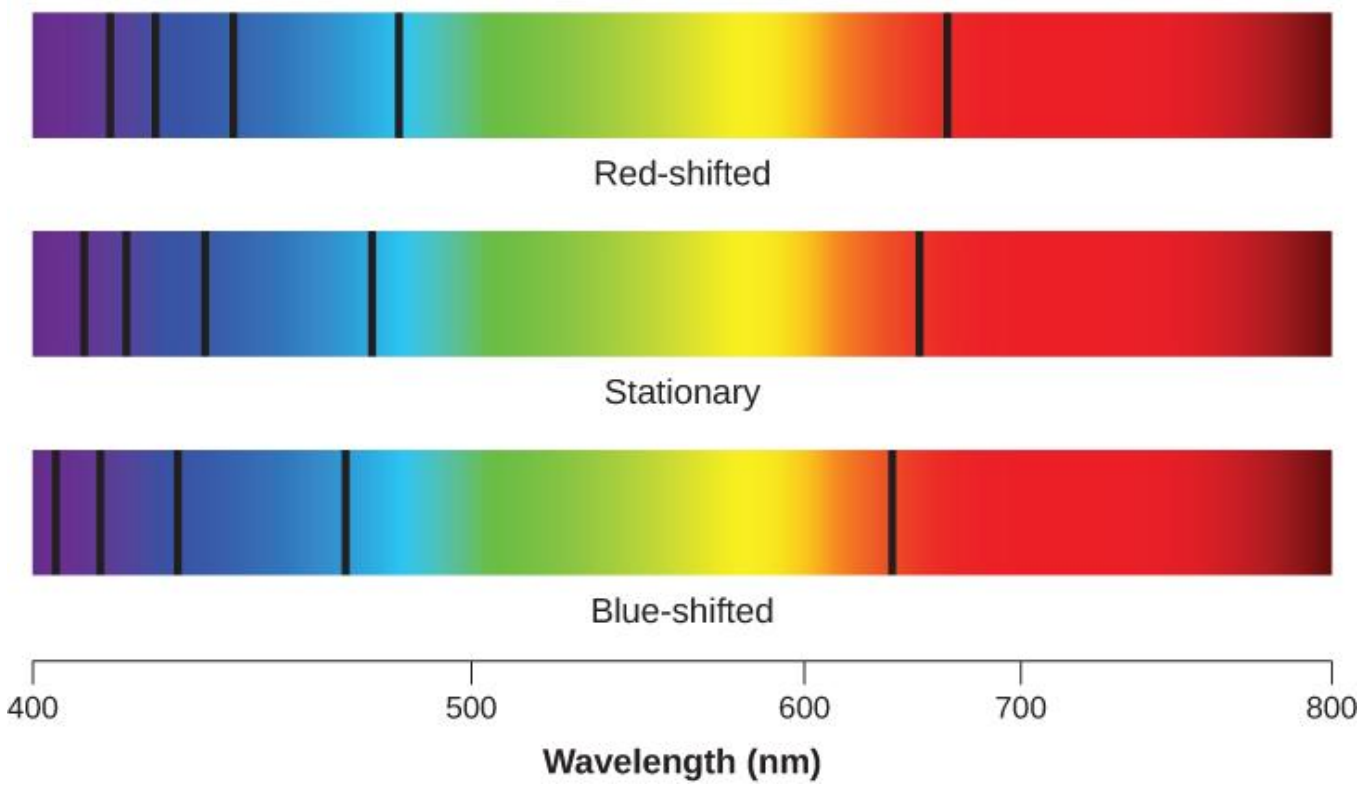


Blueshift

Red Shift, Blue Shift

C.5

C.5 Doppler effect	$\frac{\Delta f}{f} = \frac{\Delta \lambda}{\lambda} \approx \frac{v}{c}$



Calculating Redshift | #1

C.5

A characteristic absorption line often seen in stars is due to ionized helium. It occurs at 468.6 nm. If the spectrum of a star has this line at a measured wavelength of 499.3 nm what is the recession speed of the star?

$$\frac{\Delta\lambda}{\lambda} \approx \frac{v}{c}$$

Calculating Redshift | #2

C.5

Reference Spectrum

Work Space

C.5

C.5 Doppler effect	$\frac{\Delta f}{f} = \frac{\Delta \lambda}{\lambda} \approx \frac{v}{c}$

Lesson Takeaways

C.5

- ❑ I can describe how light changes when the source is moving
- ❑ I can use a shift in wavelength or frequency to calculate the speed of the wave source