12. In a classroom experiment, a student strikes first a 256 hertz tuning fork and then a 394 hertz one.

a) Which fork plays a note with a higher pitch? 394 Hz

b) Which fork has a greater period? $f = \frac{1}{T}$ 256 Hz

c) Which note has a longer wavelength? 256 Hz

d) Which note is traveling fastest? same speed

e) Calculate the wavelength and period of the 256 Hz tuning fork. $T = \frac{1}{256\,Hz} = .0039\,s$ $\lambda = \frac{V}{f}$ $\frac{343\,m/s}{256\,Hz} = 1.34\,m$

f) How long would it take a second student to hear a note from the 256 Hz tuning fork if they are sitting 7.5 meters away? $t = \frac{d}{V}$ $\frac{7.5\,m}{343\,m/s} = 0.022\,s$

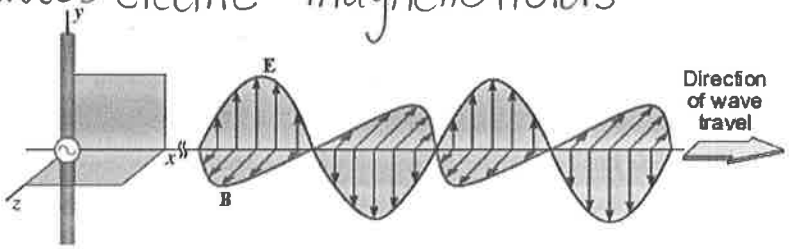
Light Waves

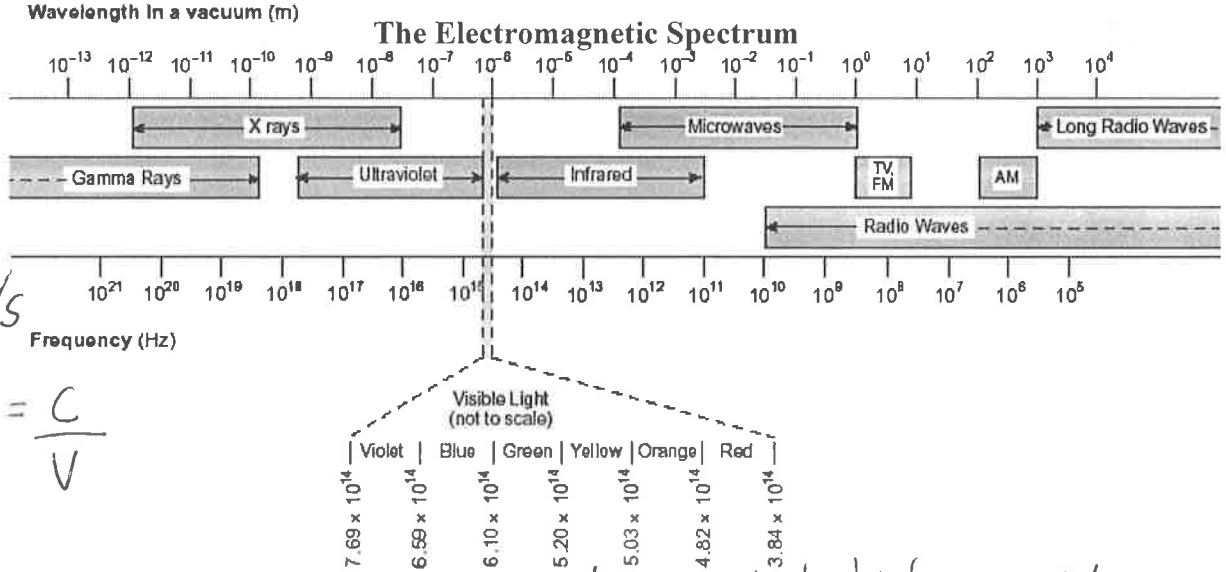
1. How are light waves (and all electromagnetic waves) produced by periodic vibrations of a charged particle that produces electric + magnetic fields

2. What type of a wave is light?

a) transverse

b) electromagnetic





3. How fast does light travel?

in a vacuum: $3.00 \times 10^8\,m/s$

in air: $\approx 3.00 \times 10^8\,m/s$

in other materials: slower $n = \frac{c}{V}$

cones in eyes are tuned to visible light frequency

4. What is the difference between an X-ray and a microwave?

different frequency + different wavelength

5. What is the difference between a radio wave and a sound wave?

radio waves = EM & transverse sound waves = mechanical, compressional

6. Which type of electromagnetic radiation has the highest frequency? Longest wavelength? Highest speed?

highest frequency = gamma longest λ = radio waves ↓ same speed

7. What range of frequencies is considered to be green light?

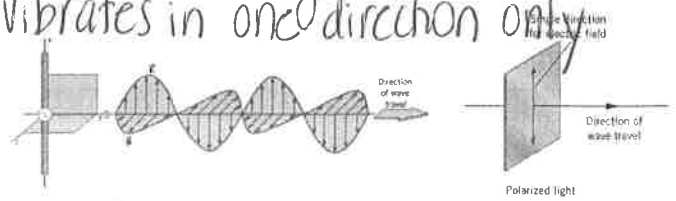
$5.20 \times 10^{14}\,Hz$ to $6.10 \times 10^{14}\,Hz$

8. Which color of visible light has the highest frequency? Longest wavelength?

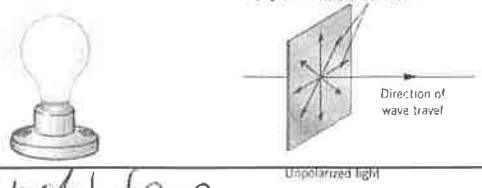
violet red

Polarization

Polarized Light – light that vibrates in one direction only



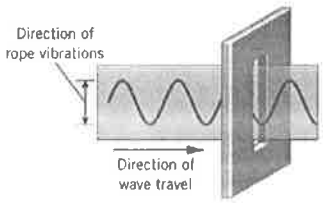
Unpolarized Light light that vibrates in all directions



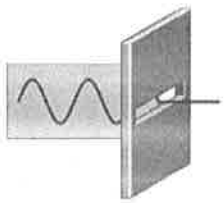
Polarizer – device that produces polarized light from unpolarized light

Transmission axis – direction of a vibration that a polarizer allows through

A simple model of a polarizer using a wave on a rope



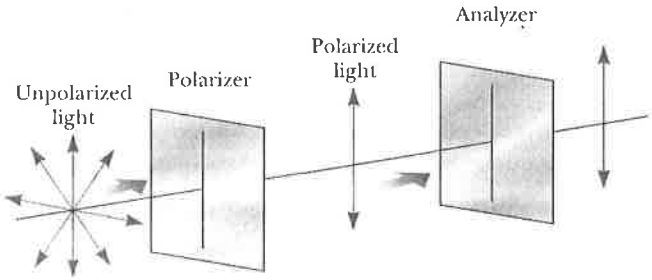
Transmission axis of polarizer is parallel to the plane of polarization of the wave.



Transmission axis of polarizer is perpendicular to the plane of polarization of the wave.

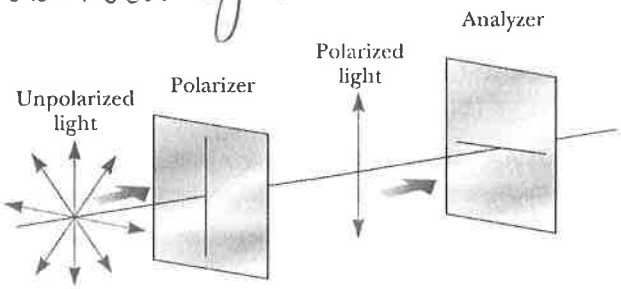
NOTE: longitudinal waves (such as sound waves) cannot be polarized

Analyzer – polarizer used to detect polarized light



When the transmission axis of the analyzer is parallel to that of the polarizer . . .

polarized light passes through



When the transmission axis of the analyzer is perpendicular to that of the polarizer . . .

no light passes through

How do polarized sunglasses reduce glare?

Transmission axis is vertical - does not allow glare to pass through since the glare is light that has been horizontally polarized by the reflection of the water.