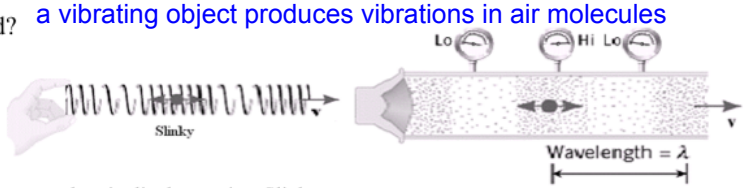
Sound Waves

1. How are sound waves produced? a vibrating object produces vibrations in air molecules

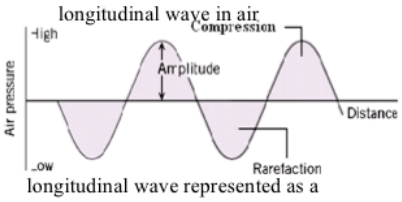
2. What type of a wave is sound?

   a) mechanical

   b) longitudinal



longitudinal wave in a Slinky



longitudinal wave in air

3. How can a longitudinal wave be represented as a transverse wave?

   compressions = peaks

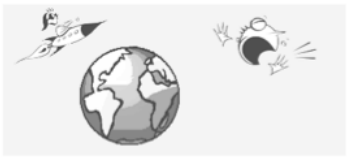
   rarefactions = troughs

longitudinal wave represented as a transverse wave

4. What happens when this wave of varying air pressure reaches your ear?

   vibrations of ear drum ... send electrical signal to brain

5. Can sound be heard in outer space? Explain.



no, there's no medium for sound to travel through

6. Speed of sound in air at STP: ~ 330 m/s

7. Speed of sound in air at room temp: 331 m/s + 0.6 m/s × temp (in °C)

8. How is the speed of sound related to air temperature? Explain.

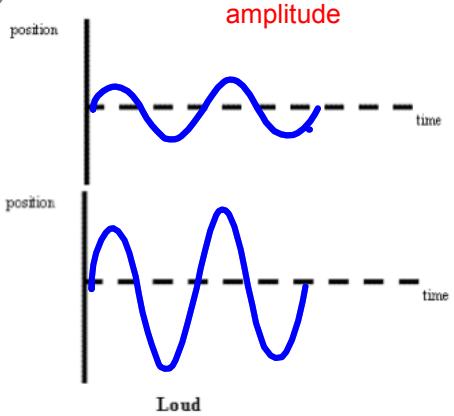
   higher temp, fasters s.o.s.

9. Does sound travel fastest in a solid, a liquid, or a gas?

   solid

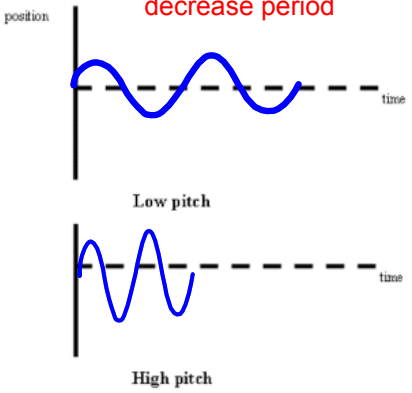
10. As you increase the loudness (volume) of a sound, you increase its . . .

    amplitude



11. As you increase the pitch of a sound, you …

    decrease period



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?

b) Which fork has a greater period?

c) Which note has a longer wavelength?

d) Which note is traveling fastest?

e) Calculate the wavelength and period of the 256 Hz tuning fork.

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?

Light Waves

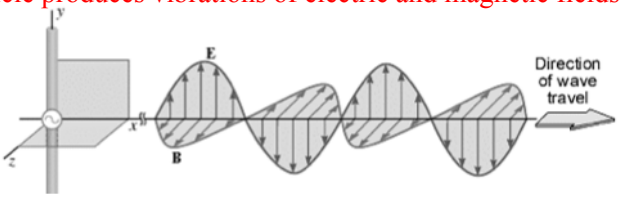
1. How are light waves (and all electromagnetic waves) produced

periodic vibration of a charged particle produces vibrations of electric and magnetic fields

2. What type of a wave is light?

a) electromagnetic

b) transverse

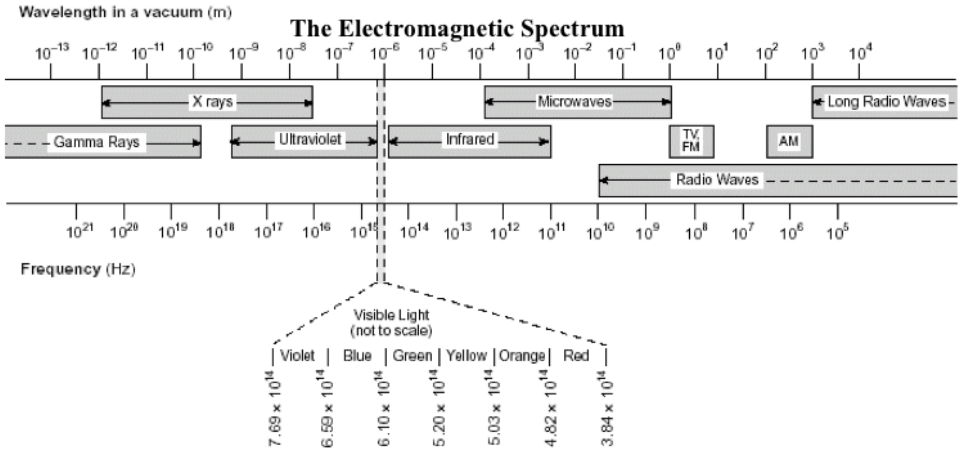


3. How fast does light travel?

in a vacuum: 3×10^8 m/s

in air: $\sim 3 \times 10^8$ m/s

in other materials: slower $n = c/v$



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

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

different freq (period)

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

EM wave vs. mechanical wave

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

gamma rays long radio waves

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

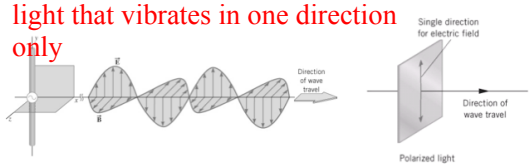
5-6 x 10 ^14 hz

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

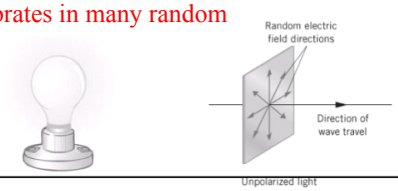
violet red

Polarization

Polarized Light – light that vibrates in one direction only



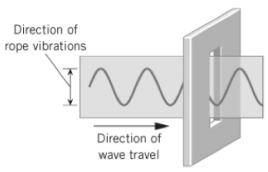
Unpolarized Light light that vibrates in many random directions



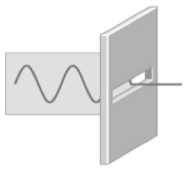
Polarizer – device that produces polarized light from unpolarized light

Transmission axis – direction of 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: only transverse waves can be polarized – not longitudinal waves – sound cannot be polarized