Physics 200 (Stapleton) Name: Answers

Notes: Waves and Sound, Part 1

1. Give some examples of waves.
Water waves, Earthquake, Sound, Electromagnetic radiation.

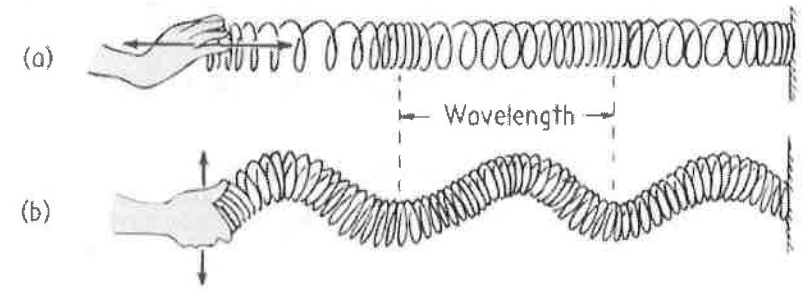
2. Transverse and Longitudinal Waves

A. A transverse wave (a.k.a. shear wave, sinusoidal wave) is a disturbance perpendicular to the direction of propagation.

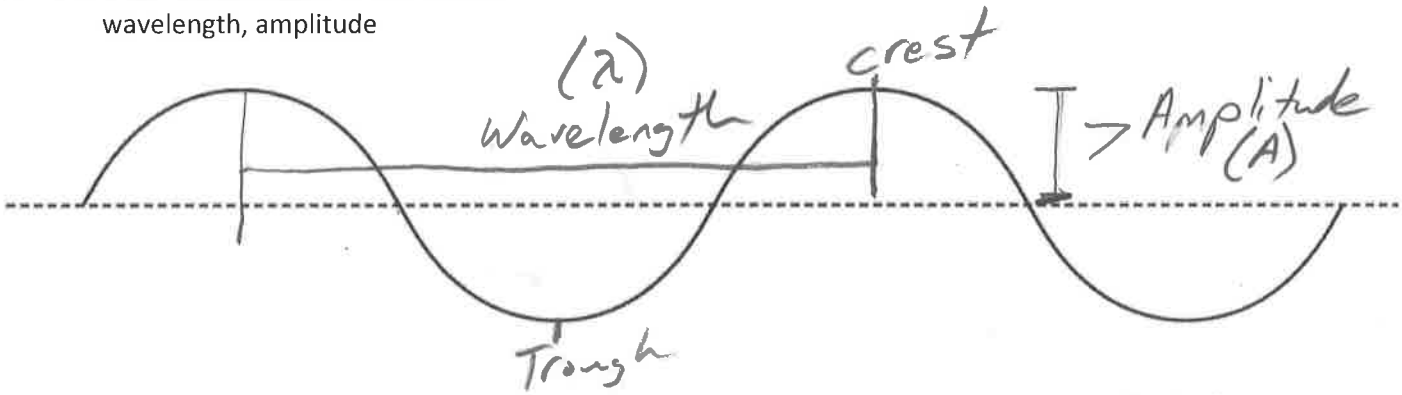
B. A longitudinal wave (or compressional wave) is a disturbance parallel to the direction of propagation.

Types and parts of waves:

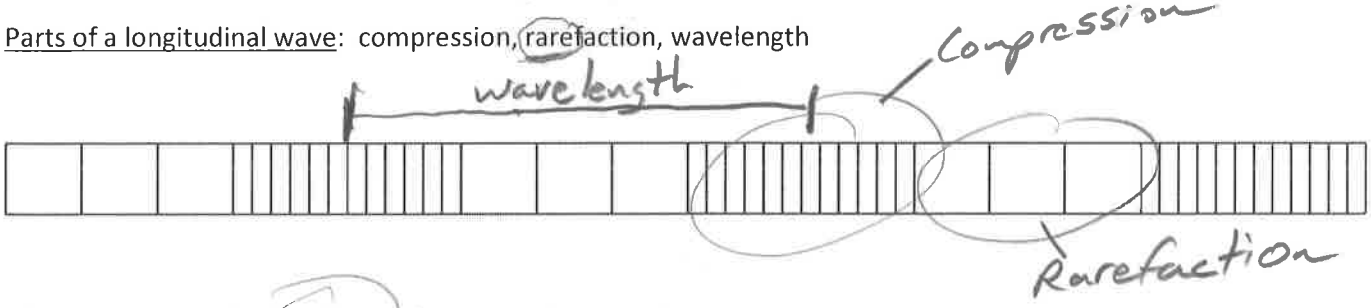
Identify the two different types of waves on the right.



Parts of a transverse wave: crest, trough, wavelength, amplitude



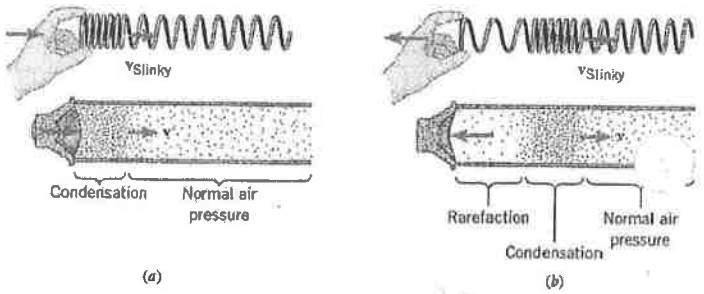
Parts of a longitudinal wave: compression, rarefaction, wavelength



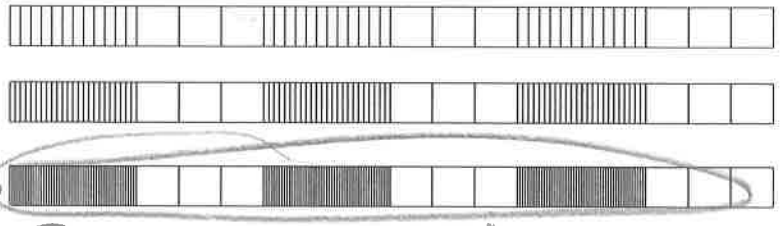
What determines the amplitude of a longitudinal wave?

Density of compression

Fomation of a sound wave (compression wave)



Which of the series of waves on the right shows the greatest amplitude?



Greatest Amplitude = Densest Compression

Sound waves are longitudinal, but they can be represented as transverse waves:

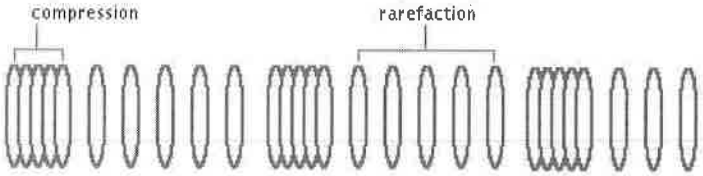


Figure 1: Longitudinal Wave

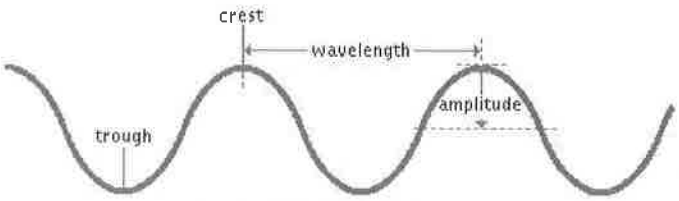


Figure 2: Transverse Wave

Period, Frequency, and Wave Speed

Period: (T) Time for one wavelength to pass

units → s

Frequency: (f) Wavelengths passing each second.

units → $Hz = \frac{1}{s}$ $f = \frac{1}{T}$

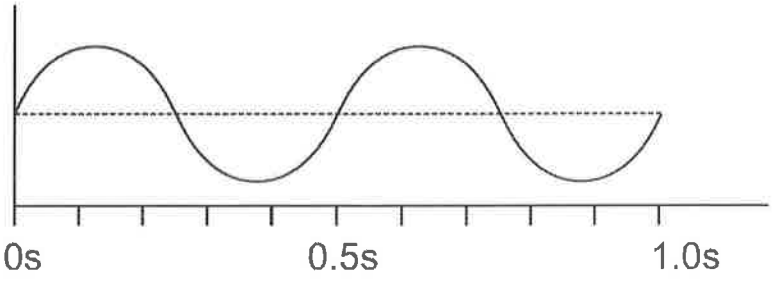
Wave speed: $v = \lambda f$

What is the period of the waves below? 0.5s

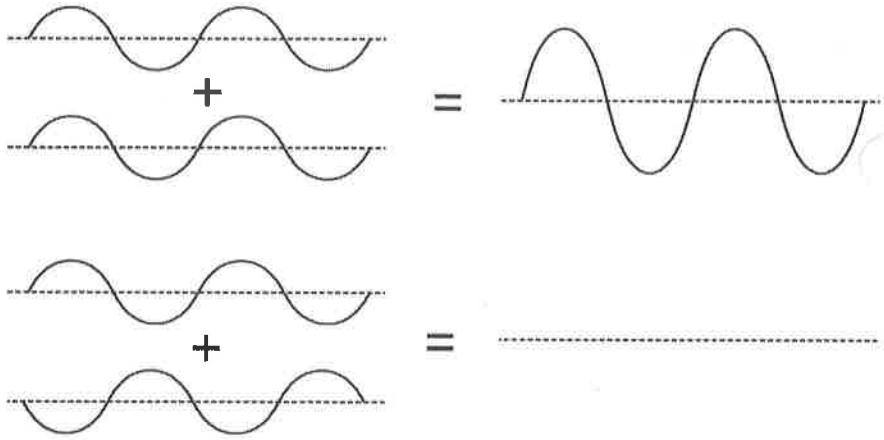
Calculate the frequency of those waves. $f = \frac{1}{0.5s} = 2Hz$

If the wave below has a wavelength of 10m, what is its wave speed?

$v = \lambda f = 10m(2Hz) = 20m/s$

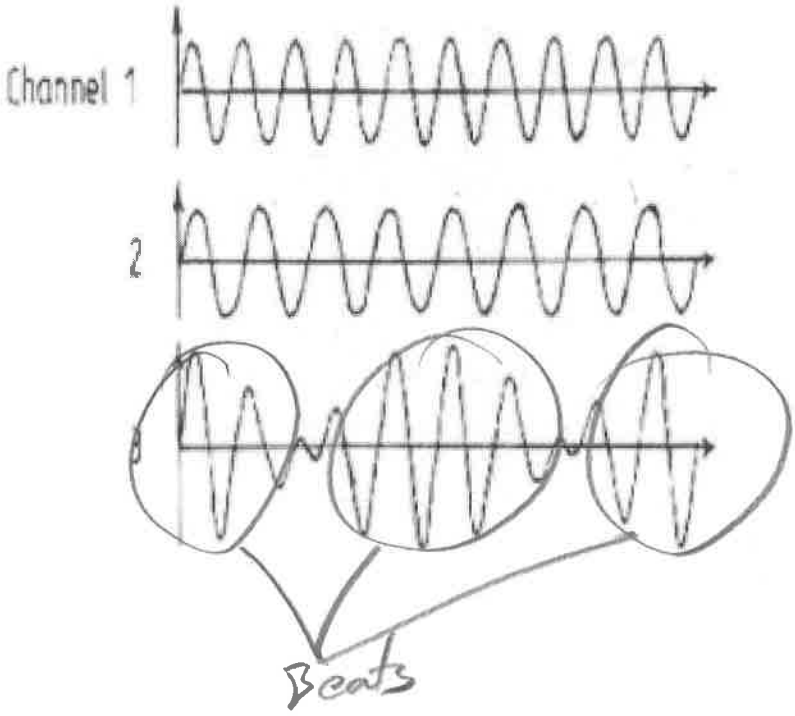


Wave Interference: When two waves overlap one another, their oscillations can add to one another, or they can diminish one another. Label the examples of interference on the right.



Wave Interference can cause "**beats**". When two waves have slightly different frequencies, their interference alternates between constructive and destructive. The diagram below shows transverse representations of two sound waves (channels 1 and 2) and their resultant sound (channel 3).

- In the diagram, label the channel with the highest frequency (1 or 2).
- Then label regions of constructive and destructive interference. Channel 3 is the "sum" of channels 1 and 2.
- Label the "beats" that will be heard



Beat frequency =difference in frequencies of two notes that are played together

Example: What is the beat frequency when 220Hz and 216Hz are played at the same time? 6 Hz