Unit 5 Packet: WAVES and SOUND

Physics 100
Mechanical Waves Notes

Name: A1/2

Wave: An oscillation that travels through space, transferring energy

Oscillation: A back and forth movement; a vibration

Types of Waves:

Mechanical Wave: Oscillation In matter

Examples of Mechanical Waves: Slinky waves, water waves, sound waves, Earthquake waves...

Electromagnetic Wave: Oscillating electric and magnetic fields, traveling through space.

Examples of Electromagnetic waves:

Light, radio, microwaves, gamma rays, ultraviolet, x-rays, infrared

Types and parts of waves:

Name the two different types of waves, below, and explain their primary difference.

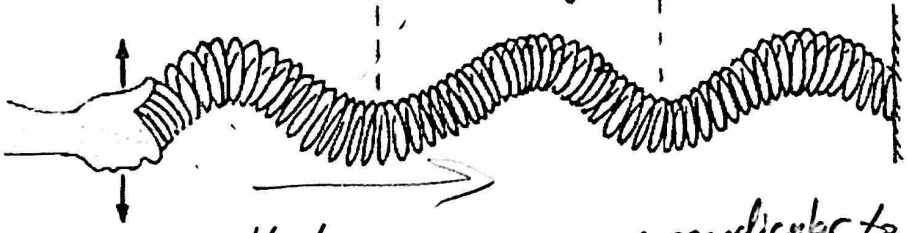
oscillations parallel to travel

(a)

Longitudinal wave

Wavelength

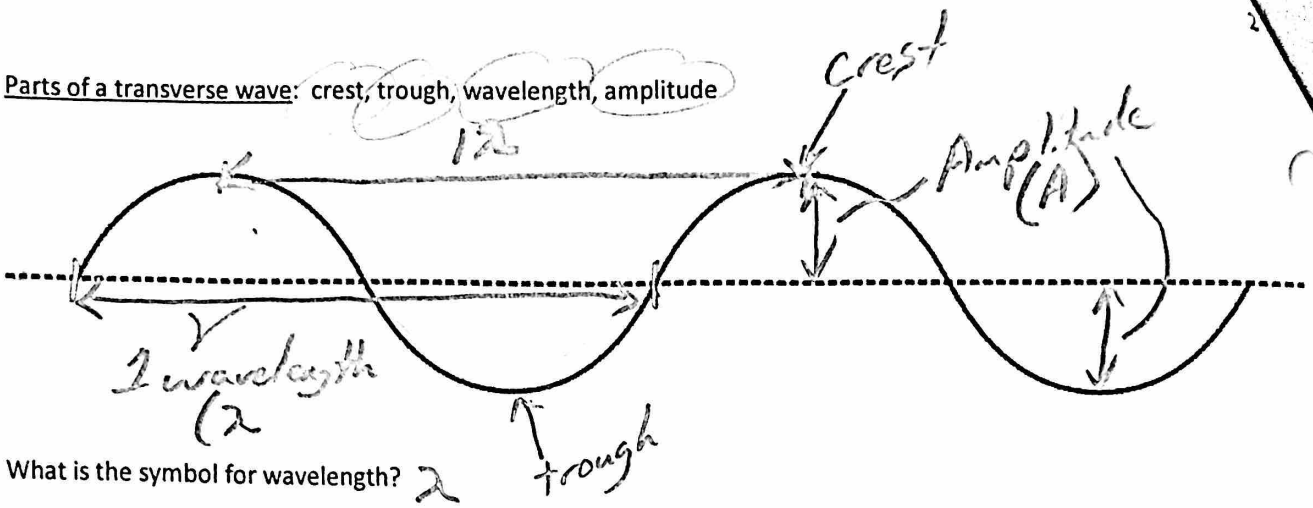
(b)



Transverse wave

Oscillations are perpendicular to travel

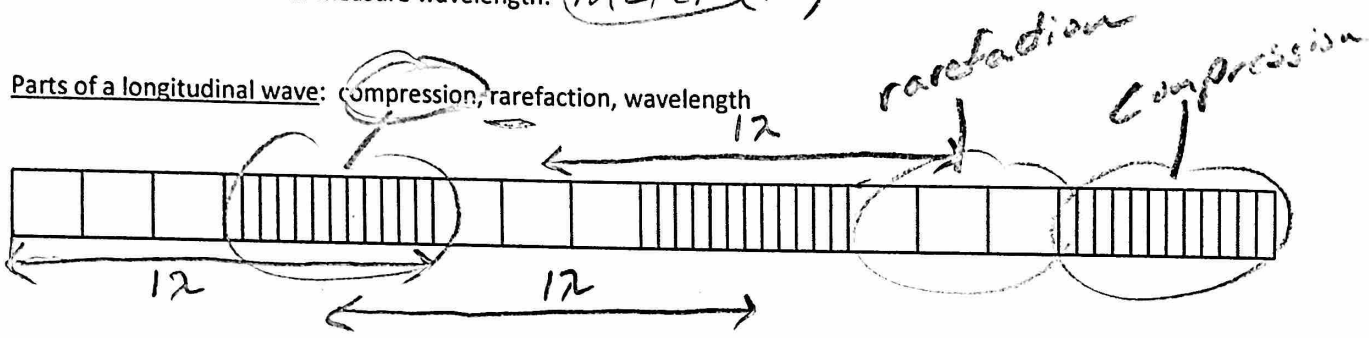
Parts of a transverse wave: crest, trough, wavelength, amplitude



What is the symbol for wavelength? λ

Name a unit that is used to measure wavelength: meter (m)

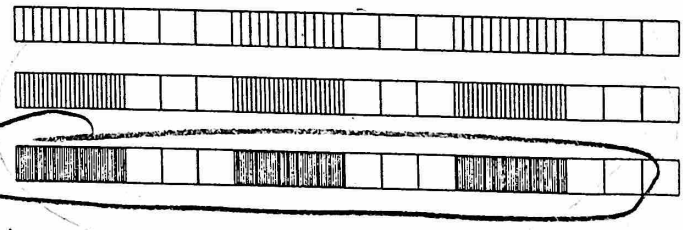
Parts of a longitudinal wave: compression, rarefaction, wavelength



What determines the amplitude of a longitudinal wave?

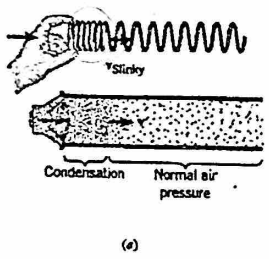
How tightly compressed it is

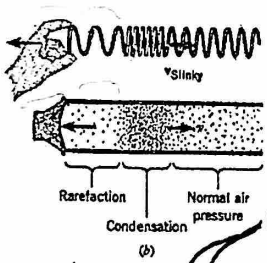
Which of the series of waves on the right shows the greatest amplitude?



greatest

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





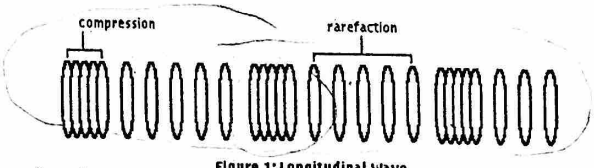


Figure 1: Longitudinal Wave

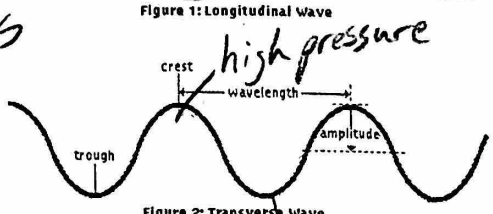


Figure 2: Transverse Wave

rarefactions

compressions

high pressure

low pressure

Period and Frequency

Period: Time it takes for one wavelength to pass; (seconds per wavelength)
(T)

Frequency: # of waves passing each second (waves per second)
(f)
wavelengths

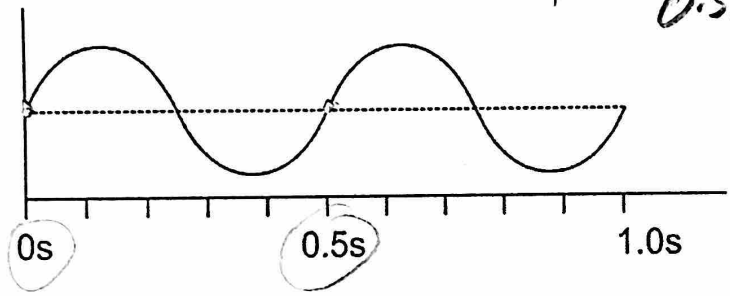
Symbol for frequency: f

Units for frequency: Hz (Hertz)

Relationship between period and frequency: $f = \frac{1}{T}$ $T = \frac{1}{f}$

What is the period of the waves below? 0.5s Calculate the frequency of those waves. f = 2 Hz

$f = \frac{1}{0.5s} = 2Hz$



Wave Speed

What are the standard (SI) units for wave speed?

m/s (meters per second)

Two formulas that can be used to calculate wave speed:

$v = f\lambda$

$v = \frac{d}{t}$

$d = vt$

$v = \frac{d}{t}$

$v = f\lambda$

What is the speed of a wave if its wavelength is 5m and its frequency is 20Hz?

$v = f\lambda = 20Hz(5m) = 100 m/s$

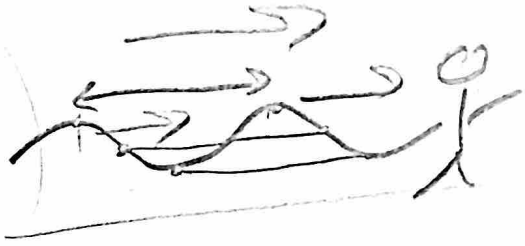
What is the speed of a wave that travels 20m in a time of 5 seconds?

$v = \frac{d}{t} = \frac{20m}{5s} = 4m/s$

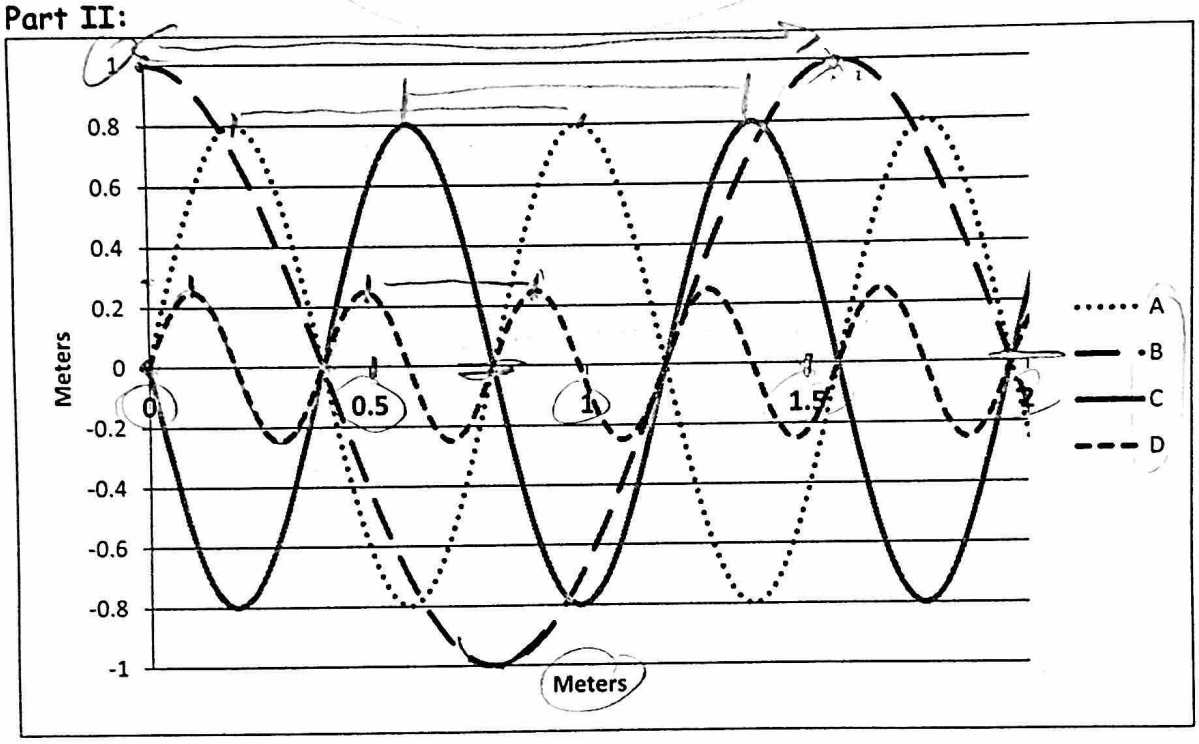
Chapter 25-26 PRACTICE #1- Waves and Sound

Part I: Write the SI unit for each of the following quantities.

Quantity	Abbrev.	SI Units
Wavelength	λ	m
Wave Speed	v	m/s
Frequency	f	Hz



Part II:



1. Which wave has the longest wavelength? B
2. What is that wavelength? 1.6
3. Which wave has the shortest wavelength? D
4. What is that wavelength? 0.3 - 0.4 ?
5. Which wave has the largest amplitude? B
6. What is that amplitude? 1m
7. Which wave has the smallest amplitude? D
8. What is that amplitude? 0.25
9. Which two waves, when added together, will give complete destructive interference?
10. Give an example of a transverse wave.

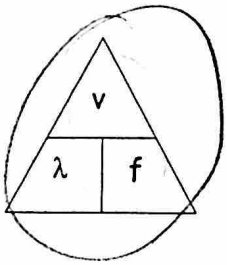
People doing "the wave" at a baseball game.

11. Describe (or list) an example of a longitudinal wave.

Sound wave

Part III:

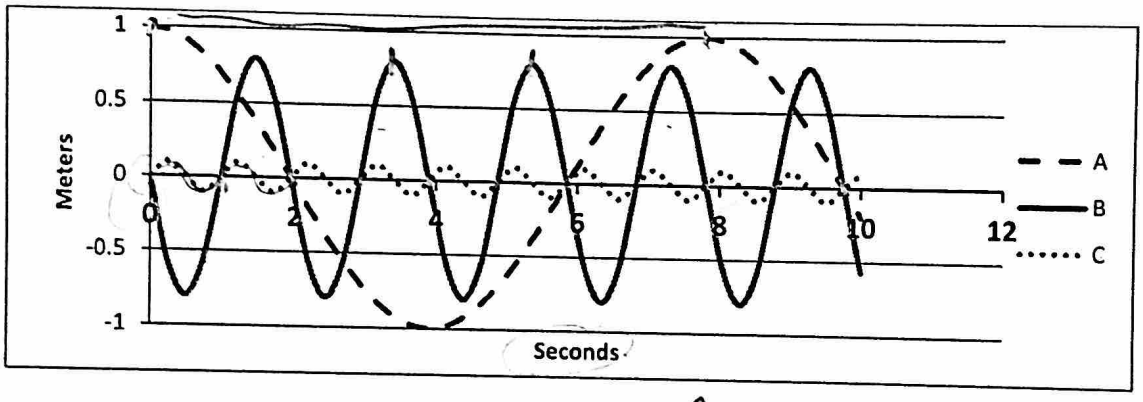
Key Equations:



$\lambda = \frac{v}{f}$

f = waves/seconds T = seconds/waves

$T = \frac{1}{f}$ $f = \frac{1}{T}$ $v = \lambda f$



12. Which wave has the longest period? A

13. What is that period? 8

14. Which wave has the highest frequency? C

15. What is that frequency? 1 Hz

$T_c = 1s$

$f = \frac{1}{T} = \frac{1}{1s} = 1$

16. Given v = 20.0 m/s, find T, f, A, and λ.

T = 4s $f = \frac{1}{T}$

f = 1/4 Hz or 0.25 Hz

A = 4m

λ = 80m $\lambda = \frac{20 m/s}{0.25 Hz} = 80 m$