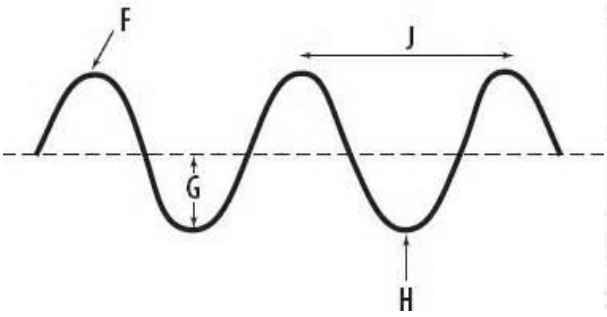
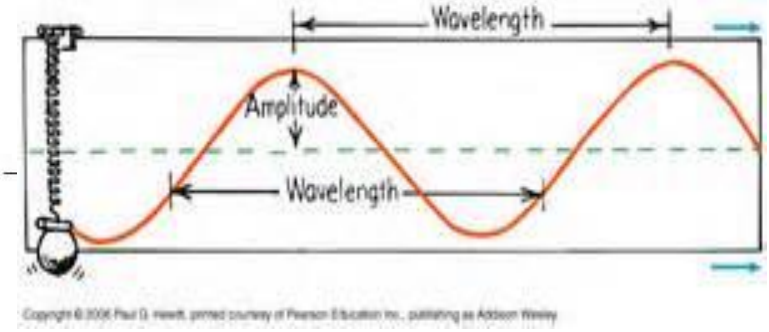
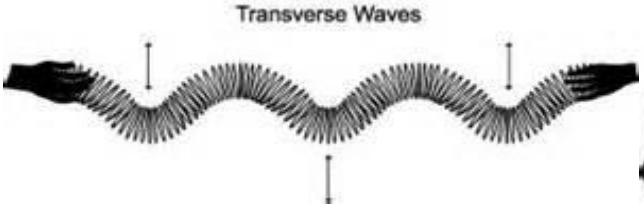
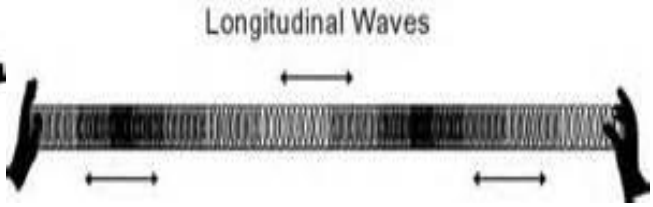
CHAPTER 10









Waves

Vocabulary for Chapter 10 - Waves

Vocabulary Word	Definition
1. Amplitude	
2. Compressional Wave	
3. Crest	
4. Diffraction	
5. Frequency	
6. Interference	
7. Medium	
8. Period	
9. Rarefaction	
10. Resonance	
11. Standing Wave	
12. Transverse wave	
13. Trough	

Vocabulary for Chapter 10 - Waves

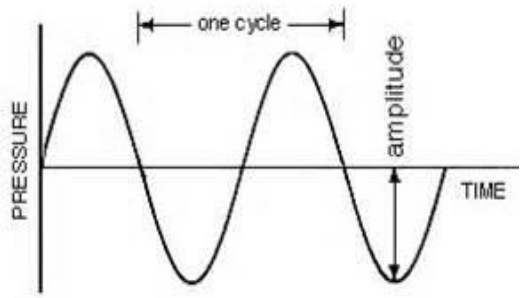
Vocabulary Word	Definition
14. Wave	
15. Wavelength	
16. Constructive Inference	
17. Destructive Inference	
18. The Law of Reflection	
19. Carrier Wave	
20. Cathode-ray tube	
21. Electromagnetic Wave	
22. Gamma Rays	
23. GPS	
24. Infrared waves	
25. Microwaves	
26. Photon	
27. Radio Waves	
28. Ultraviolet Waves	
29. X-rays	
30. Visible Light	

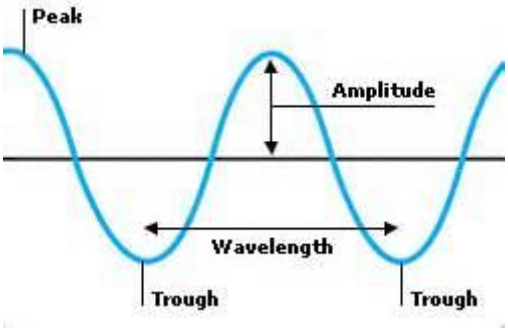
Characteristics of Waves

Amplitude - The Amplitude of a wave is the maximum amount of displacement of the particles from its rest position.

- In a **transverse wave** – the amplitude is the distance from the rest position to either the top of the crest or bottom of the trough.

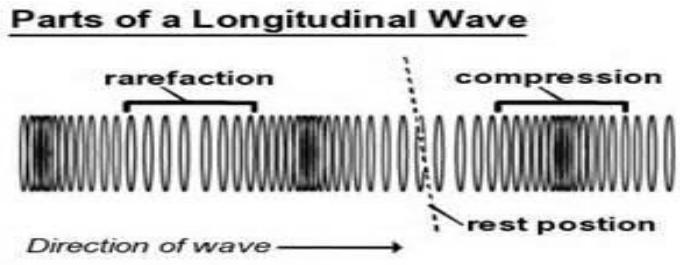
PARTS OF TRANSVERSE WAVE

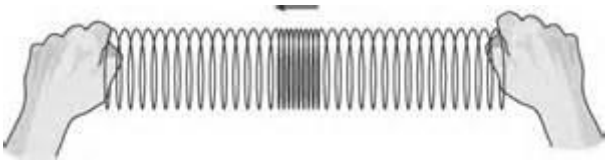




- In a **longitudinal wave** – the differences between the pressures of the compressions and the undisturbed air.

PARTS OF A LONGITUDINAL WAVE



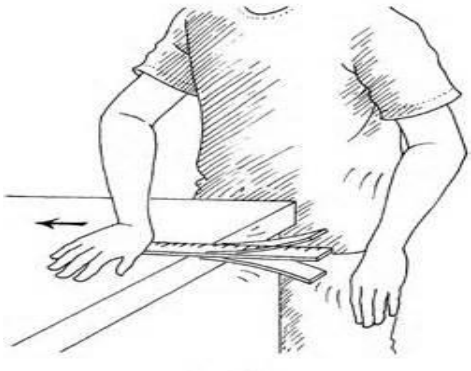


Wavelength:

- In a **transverse wave** is the distance from crest to crest or from trough to trough.
- In a **longitudinal wave** – the wavelength is measured from a point in one compression to the next or rarefaction to the next rarefaction.

Describe the amplitude of sound in the picture?

_____
_____
_____
_____
_____
_____
_____

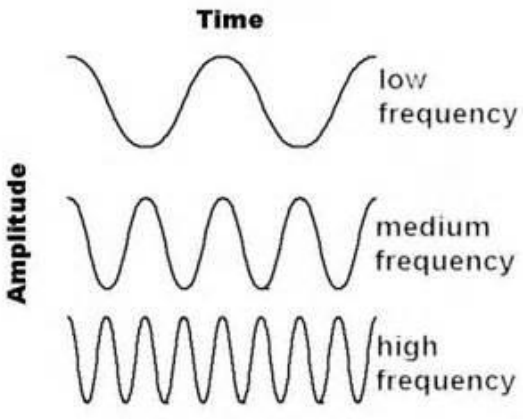


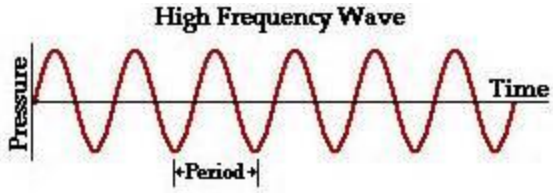
Characteristics of Waves

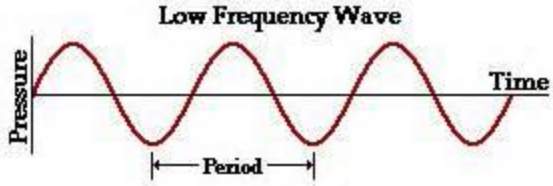
Frequency, Period, & Velocity

Frequency – is the number of wave cycles the particles go through per second.

Frequency of a wave







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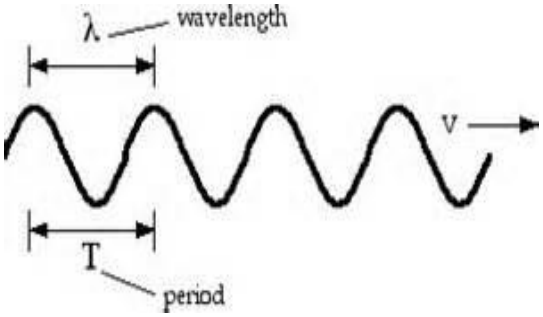
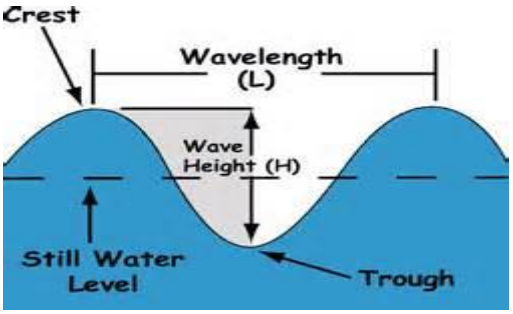




Velocity – is determined by the medium the waves passes through and the type of wave.

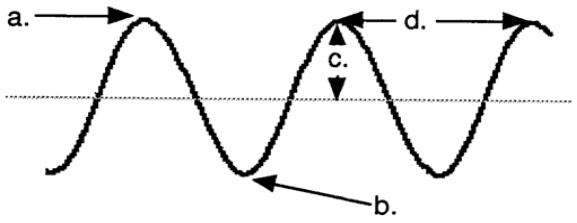
$$v = \frac{\lambda}{T}$$

v : speed $(m.s^{-1})$
λ : wavelength (m)
T : period (s)

$$v = \lambda f$$

WORKSHEET - LABELING WAVES

1. The highest point on a wave is the _____, while the lowest point is the _____.
2. The _____ of a wave is a measure of the amount of energy it carries.
3. The distance from one crest to the next crest is the _____.
4. The _____ is a measure of the number of waves that pass a point in a given amount of time.
5. The illustration to the right shows a wave. Label each part in the space below:



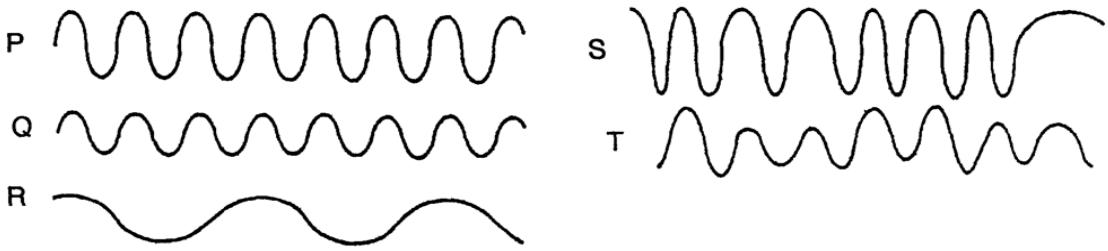
a. _____

b. _____

c. _____

d. _____

6. Use the five illustrations of waves drawn below to answer the following questions:



(a) Waves P and Q have the same _____, but wave P has twice the _____ of wave Q.

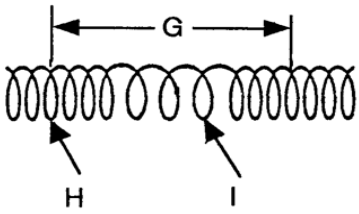
(b) Waves Q and R have the same _____, but wave R has twice the _____ of wave Q.

(c) Wave _____ shows a steady frequency but changing amplitude.

(d) Wave _____ shows steady amplitude but a changing frequency.

(e) Waves _____ and _____ have a low amplitude and a steady frequency.

7. The following questions refer to the diagram to the right:



(a) Is this wave transverse or longitudinal?

(b) Letter H represents a _____ and letter I represents a _____.

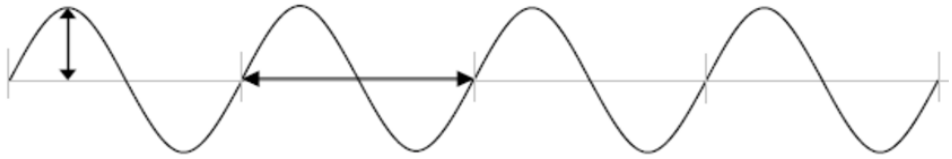
(c) Letter G represents a _____.

NAME:

PERIOD: A B E F G

Wave Worksheet

One full wave (cycle) Wave train – two or more waves



Amplitude – measures the energy of a transverse wave
a) measured from the equilibrium position to the top of a crest or the bottom of a trough (see vertical arrow)
Wavelength – length of a single wave cycle (horizontal arrow double sided arrow)
Frequency-# of waves that pass a point in a given amount of time
Speed = wavelength x frequency

The time from the beginning to the end of the wave train in each situation is 1 second.

Wave 1

a) How many waves are there in this wave train? _____

b) Wavelength _____ cm c) Amplitude _____ cm d) frequency _____ Hz e) speed _____ cm/s

Wave 2

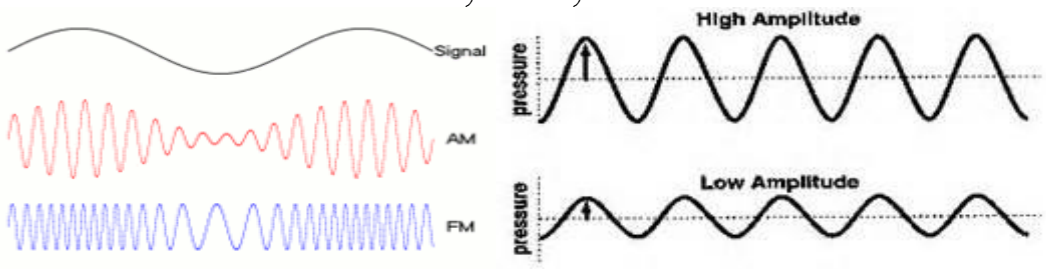
a) How many waves are there in this wave train? _____

b) Wavelength _____ cm c) Amplitude _____ cm d) frequency _____ Hz e.) speed _____ cm/s

Wave 3

a) How many waves are there in this wave train? _____

b) Wavelength _____ cm c) Amplitude _____ cm d) frequency _____ Hz e.) speed _____ cm/s



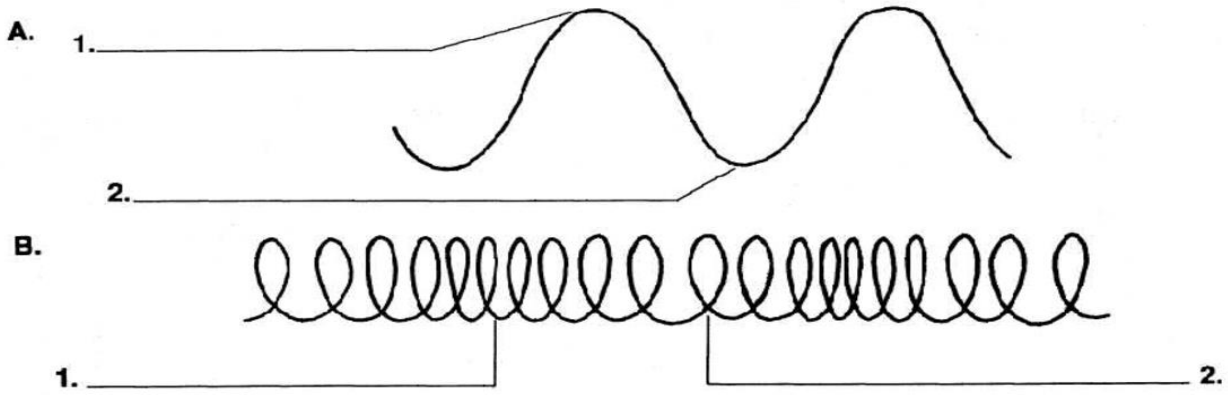
WAVE WORKSHEET #1 NAME _____

Complete the following.

1. A low point of a wave is called a_____ _____.
2. A crest is the _____of a wave.
3. When the particles of the medium move back and forth along the direction of the wave motion, the wave is a _____ _____.
4. When the particles of a medium are far apart, that part of the wave is called a _____.
5. Compression is the part of the medium where particles are _____.
6. A wave in which the particles of the medium move at right angles to the direction in which the wave travels is called a _____ _____.

Skill Challenge

Skills: *labeling, interpreting a diagram, classifying Complete the following.*

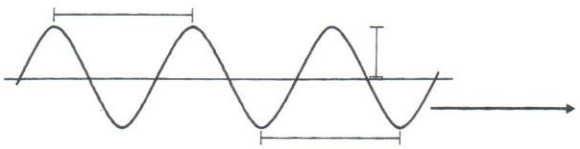


7. What type of wave is shown in Diagram A? _____
8. Label a crest and a trough on the wave in Diagram A.
9. What type of wave is shown in Diagram B? _____
10. Label a compression and a rarefaction on the wave in Diagram B.

NAME _____ DATE _____

Transverse and Longitudinal Waves

Answer the questions about waves.



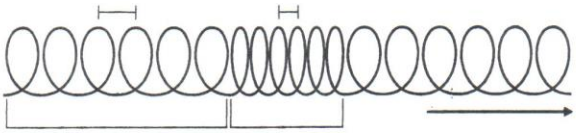
1. What kind of wave is pictured above?

_____

2. Label the following on the wave above: crest, trough, wavelength, amplitude, direction of travel.

3. In what direction would the particles in this wave move, relative to the direction of wave travel?

_____



4. What kind of wave is pictured above?

_____

5. Label the following on the wave above: compression, rarefaction, wavelength, direction of travel.

6. In what direction would the particles in this wave move, relative to the direction of wave travel?

_____

For each wave described below, identify the wave as more like a transverse wave or a longitudinal wave.

7. The wave created by moving the end of a spring toy up and down

_____

8. The wave created by moving the end of a spring toy back and forth parallel to the length of the spring

_____

9. A sound wave

_____

10. An ocean wave

_____

11. An electromagnetic wave

_____

Speed Frequency and Wavelength Worksheet 1

This worksheet is designed to give you some practice using the general wave equation: $v=\lambda f$. You'll be expected to use this equation correctly or the upcoming chapter test, sound lab and TAKS test.

1. What is the v if λ = 8 m and f = 20 Hz?
2. What is the λ if v = 50 m/s and f = 25 Hz?
3. What is the f if v = 50 m/s and λ = 10 m?
4. What is the v if λ = 1 m and f = 345 Hz?
5. What is the λ if v = 100 m/s and f = 3 Hz?
6. What is the f if v = 120 m/s and λ = 3 m?
7. What is the v if λ = 3 m and f = 10 Hz?
8. What is the λ if v = 345 m/s and f = 790 Hz?
9. What is the f if v = 345 m/s and λ = .25 m?
10. Joe the whistle maker knows that the maximum volume for a whistle will occur if the length of the whistle is exactly ¼ of the wavelength. If Joe must make a whistle that plays at a pitch of 320 Hz, how long will the whistle be?
11. How long is the wavelength of KAJA radio whose broadcast frequency is 97.1 MHz? (97.1 MHz =97,100,000 Hz and v = 300,000,000 m/s)
12. Using the velocity of sound at 343 m/s and given the frequencies of a piano scale, compute the wavelengths of that scale.

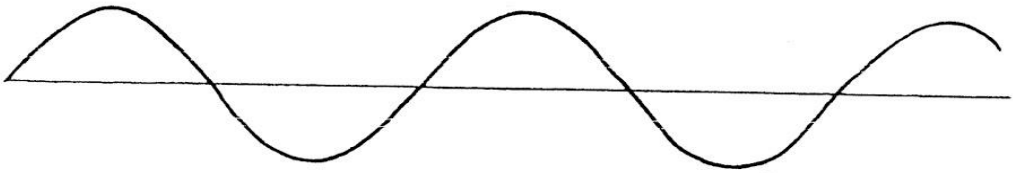
Note	Frequency	Wavelength	Note	Frequency	Wavelength
C_4	261.6		G_4	392	
D_4	293.6		A_4	440	
E_4	329.6		B_4	493.9	
F_4	349.2		C_5	523.2	

13. What is the relationship of the frequencies of notes C_4 and C_5?
14. What is the relationship of the wavelengths of notes C_4 and C_5?
15. What happened to the wavelength as the frequency increased between notes C_4 and C_5?

Name _____ Period _____ Date _____

Vibrations and Waves

1. A sine curve that represents a transverse wave is drawn below. With a ruler, measure the wavelength and amplitude of the wave.



a. Wavelength = _____ b. Amplitude = _____

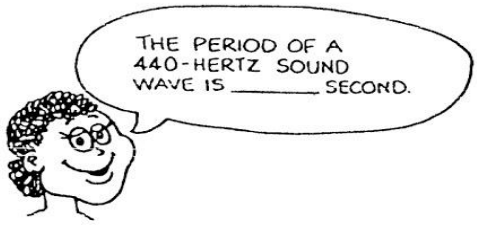
2. A kid on a playground swing makes a complete to-and-fro swing each 2 seconds. The frequency of swing is

(0.5 hertz) (1 hertz) (2 hertz)

and the period is

(0.5 second) (1 second) (2 seconds)

3. *Complete the statements.*



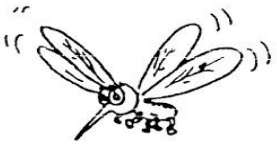
4. The annoying sound from a mosquito is produced when it beats its wings at the average rate of 600 wingbeats per second.

a. What is the frequency of the soundwaves?

_____

b. What is the wavelength? (Assume the speed of sound is 340 m/s.)

_____



Broughton High School

Waves & Sound Problems

1. Calculate the wavelength of a wave traveling on a spring if the wave moves at 0.2 m/s and has a period of 0.5s.

Formula	Set Up & Solve	Answer

2. The microwaves produced inside a microwave oven have a wavelength of 12.0 cm and a frequency of 25,000,000,000 Hz. At what speed do the microwaves travel in units of m/s?

Formula	Set Up & Solve	Answer

3. Water waves on a lake travel toward a dock with a speed of 2.0 m/s and a wavelength of 0.5m. How many wave crests strike the dock each second?

Formula	Set Up & Solve	Answer

4. A wave traveling in water has a frequency of 500.0 Hz and a wavelength of 3.0 m. What is the speed of the water?

Formula	Set Up & Solve	Answer

5. The highest-pitched sound humans can hear have a wavelength of 0.017 m in air? What is the frequency of these sound waves if their wave speed is 340.0 m/s?

Formula	Set Up & Solve	Answer

Waves & Sound Problems

6. A sound wave produced by a lightning bolt has a frequency of 36 Hz and a wavelength of 12.0 m. What is the speed of the sound wave?

Formula	Set Up & Solve	Answer

7. A sound wave produced by a lightning bolt has a frequency of 40 Hz and a wavelength of 15.0 m. What is the speed of the sound wave?

Formula	Set Up & Solve	Answer

8. A sound wave produced by a lightning bolt has a frequency of 45 Hz and a wavelength of 13.0 m. What is the speed of the sound wave?

Formula	Set Up & Solve	Answer

9. A sound wave produced by a lightning bolt has a speed of 550 m/s and a wavelength of 12.0 m. What is the frequency of the sound wave?

Formula	Set Up & Solve	Answer

10. A sound wave produced by a lightning bolt has a speed of 400 m/s and a wavelength of 14.0 m. What is the frequency of the sound wave?

Formula	Set Up & Solve	Answer

Waves & Sound Problems

11. A sound wave produced by a lightning bolt has a speed of 520 m/s and a wavelength of 14.5 m. What is the frequency of the sound wave?

Formula	Set Up & Solve	Answer

12. A sound wave produced by a lightning bolt has a speed of 660 m/s and a frequency of 40 Hz. What is the wavelength of the sound wave?

Formula	Set Up & Solve	Answer

13. A sound wave produced by a lightning bolt has a speed of 700 m/s and a frequency of 45 Hz. What is the wavelength of the sound wave?

Formula	Set Up & Solve	Answer

14. A sound wave produced by a lightning bolt has a speed of 500 m/s and a frequency of 50 Hz. What is the wavelength of the sound wave?

Formula	Set Up & Solve	Answer

15. A sound wave produced by a lightning bolt has a speed of 450 m/s and a frequency of 60 Hz. What is the wavelength of the sound wave?

Formula	Set Up & Solve	Answer