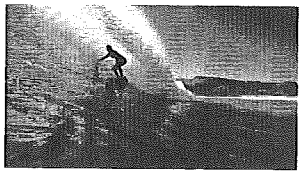
Chapter 14-Wave Notes



Name: Key Hr.__

A) Waves and the Types of Waves

wave- *a transfer of* energy *from one point to another with no transfer of* mass
* stadium wave

medium- *the* material *through which a wave travels*
examples: air, water, metal

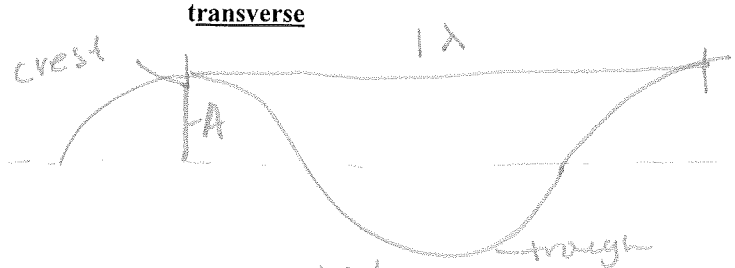
water waves have both

transverse wave- ***a wave whose particles vibrate*** perpendicular ***to the direction of motion of the wave***
example: stadium wave, rope moving up down

longitudinal wave- ***a wave whose particles vibrate*** parallel ***to the direction of motion of the wave***
example: sound wave, spring

B) Parts of Waves

transverse



crest- *the* high *point of a transverse wave*

trough- *the* low *point of a transverse wave*

wavelength- *the distance from one part of a wave until it* repeats *ex.* crest to crest
variable for wavelength: λ (lambda)

amplitude- *the measurement of the* height *of the wave*

longitudinal

compression- *the area of* higher *concentration in a longitudinal wave*

rarefaction- *the area of* lower *concentration in a longitudinal wave*

C) Frequency, Period, and Wave Speed

Frequency (f)- *the* number *of waves that pass a given point each* second
(waves per sec)

Heinrich Hertz - radar - 1st to prove existance of EM waves

Unit: Hertz (Hz) = $\frac{1}{sec}$ (cycles per sec)

* ***The higher the frequency the higher the*** pitch ***of the sound.***
* ***Humans can hear*** 20-20,000 ***vibrations per second or*** 20-20000 ***Hz***

Period- (T)- *the* time *it takes for one wave to pass a given point, measured in* sec

Equation for period and frequency: $f = \frac{1}{T}$ **or** $T = \frac{1}{f}$

Ex. What is the period of a 10-Hz sound? What does that mean?

$T = \frac{1}{f} = \frac{1}{10} = .1\,sec$ It takes 0.1 sec for 1 wave to pass

Derive the speed of a wave equation:

YOU CAN USUALLY ASSUME THAT WAVES TRAVEL AT A CONSTANT SPEED!

$$v = \frac{\Delta x}{\Delta t} = \frac{\lambda}{T} = \frac{\lambda}{\frac{1}{f}} = \lambda f$$

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

v = velocity in m/s

f = frequency in Hz

λ = wavelength in m

Example: The piano string that is tuned to middle C vibrates with a frequency of 264 Hz and has a wavelength of 1.3 m.

a. What is the speed of the wave? ***(343.2 m/s)***

$$v = f\lambda = (264\ Hz)(1.3m) = \boxed{343\ m/s}$$

b. How long will it take the wave to travel the length of a football field, (91.4 m)? ***(0.27 sec.)***

$$v = \frac{\Delta x}{\Delta t} \qquad 343\frac{m}{s} = \frac{91.4\ m}{\Delta t} \qquad \boxed{\Delta t = 0.275 sec}$$

c. What is the period of the wave? ***(0.004 sec.)***

$$t = \frac{1}{f} = \frac{1}{264} = \boxed{.004 sec}$$

Review and Assess:

1. What is the difference between a longitudinal and transverse wave?