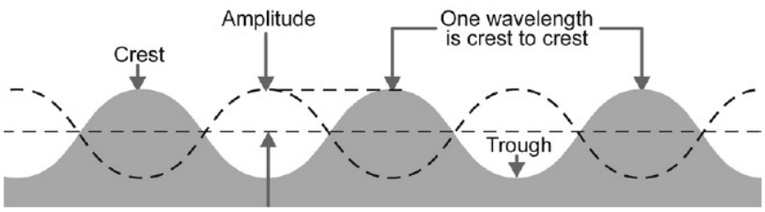
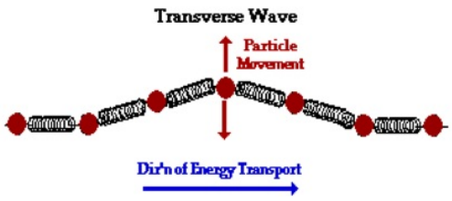
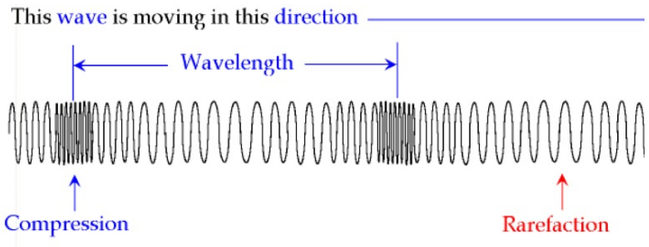
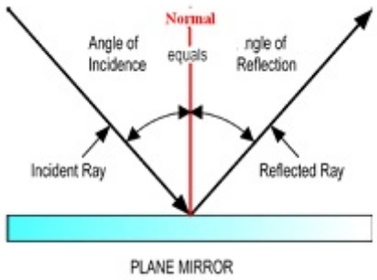
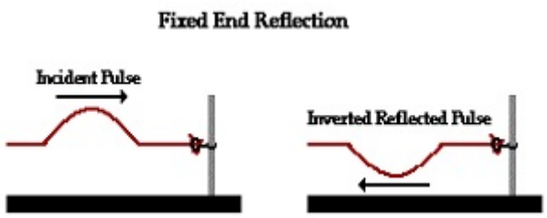
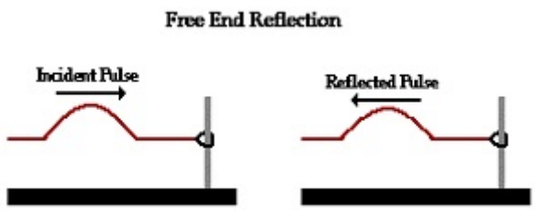
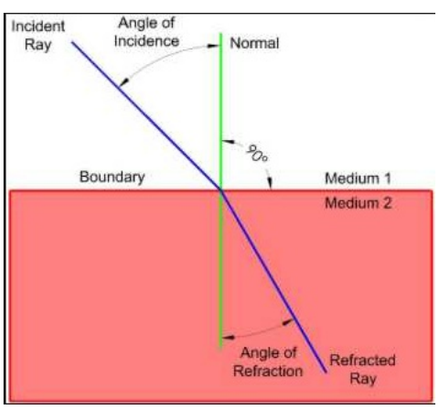
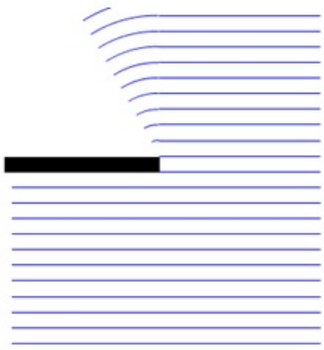
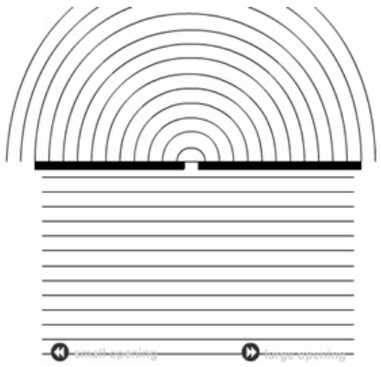
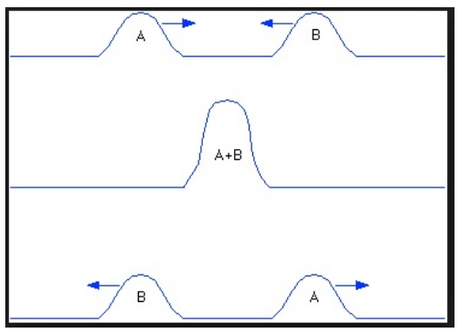
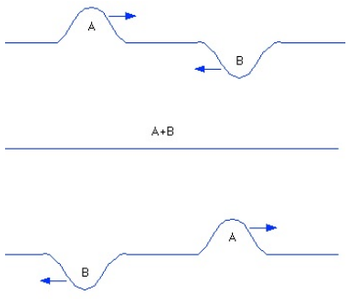
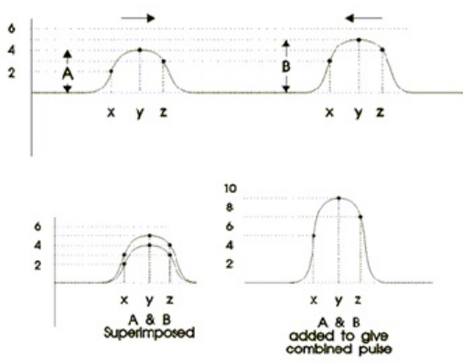
PHYSICS 32204
UNIT 4: Waves Study Guide

Wave	Traveling oscillator that carries energy from one place to another  **Amplitude** :measurement of the maximum distance that a vibrating object moves from its rest position. **Crest:** high point of a wave. **Trough** low point of a wave. **Wavelength** the length of one complete cycle. SI units is (m) and is represented by the greek symbol (λ) lambada,
Period	The amount of time it takes for a vibrating object to go through one oscillation or one cycle. $T = \frac{\text{total time}}{\text{\# of cycles}}$ The unit of measure is seconds
Frequency	The number of cycles in one second. $f = \frac{\text{\# cycles}}{\text{total time}}$ the unit of measure is s^{-1} or Hertz (Hz)
Frequency - Period	**Note that The frequency and the period are reciprocals of each other.** $f = \frac{1}{T}$ and $T = \frac{1}{f}$
Wave Equation	Frequency (hertz) Speed (m/sec) → $v = f\lambda$ ← Wavelength (meters)

Transverse wave	
Longitudinal waves	
Reflection	refers to when a wave reaches a boundary between two media, usually some or all of the wave bounces back into the first medium 
Fixed End	
Free End (Open End)	
Refraction	When traveling from a less optically dense to a more optically dense medium the refracted rays bends toward the Normal 

Diffraction	means the bending of waves around an obstacle or through an opening  The longer the wave, the greater the diffraction effect  diffracted wave will become more and more circular as the opening becomes smaller and smaller
Construcutive Interference	waves come together so that they are in phase with each other. This means that their oscillations at a given point are in the same direction, the resulting amplitude at that point being much larger than the amplitude of an individual wave. 
Destructive Interference	waves come together in such a way that they completely cancel each other out. When two waves interfere destructively, they must have the same amplitude in opposite directions. 
Principle of superposition	when two or more waves come together, the result is the sum of the individual waves 

Speed of Sound

$$v = (332 + 0.6\ T)\ \text{m/s}$$

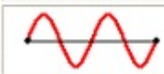
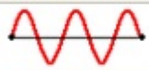
v = Speed of sound (m/s)
T = Temperature

Resonance

when one object vibrating at the same natural frequency of a second object forces that second object into vibrational motion.

Harmonics

Harmonics are sounds that are produced at multiples of the same frequency of a base sound.

Harmonic	# of Nodes	# of Antinodes	Pattern
1st	2	1	
2nd	3	2	
3rd	4	3	
4th	5	4	
5th	6	5	
6th	7	6	
nth	n + 1	n	--

Two important formula

$$\lambda_n = \frac{2}{n} L$$

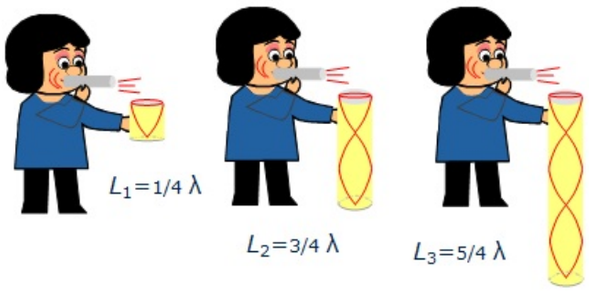
$$f_n = n f_1$$

Overtone

The number of the overtone is always 1 less than the harmonic number

Overtone = n - 1

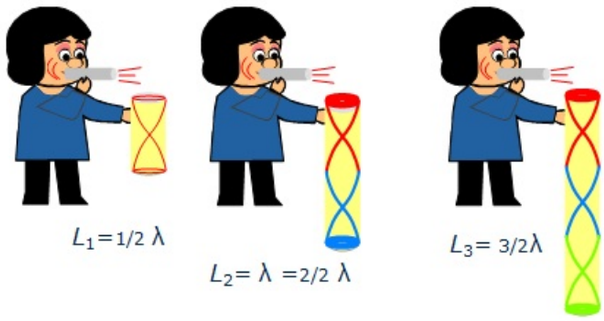
Resonance in a Tube Open at One End



$$L_n = \frac{2n-1}{4}\lambda$$

Or

$$\lambda = \frac{4L_n}{2n-1}$$

Resonance in Tubes Open at Both Ends	 $L_n = \frac{n}{2}\lambda$ or Or $\lambda = \frac{2L_n}{n}$