

PHYSICS Waves

• Waves

- Waves are _____ that alternate between states in space & time.
- _____ waves vibrate compressed matter.
- _____ waves vibrate electromagnetic fields of pure energy.
- Simple harmonic motion (back and forth) if propagated (moved in a line) makes a _____ (the most basic curve in Trigonometry).
- The _____ is the time for one wave.

• Vibrations

- Pendulum - the period is independent of mass (like falling bodies); dependent on length.
- Description of a wave.
 - _____ is length.
 - _____ is height.
 - _____ is width.
- 1 vibration/sec = 1 _____ (Heinrich Hertz: radio waves in 1886.) AM is kHz, FM is MHz.
- ? Guess what vibrates at 60 Hz? (AC current) At 500 kHz? (Tesla Coil) At 440 Hz? (middle C) At 0.1 Hz? (a building)
- Wave Speed = wavelength / frequency (like $v = d / t$)
- _____ **Waves**: at right angles to propagation (like a wiggled rope or slinky). Ex: electromagnetic, music, water.
- _____ **Waves**: compression waves in line with propagation. Ex: sound, explosions.
- Note: SOUND vibrates matter, LIGHT vibrates electromagnetic fields of pure energy.

• Interference

- When waves overlap, you make _____ **patterns**.
- Waves interfere because they obey the _____ **principle** ... to be in the same space.
- _____ interference reinforces and is additive.
- _____ interference cancels and is subtractive.
- _____ **Waves**: waves that bounce back where parts don't move (**nodes**). Ex: musical instruments, the beating in your ear from one window open in the car.

• _____ **Effect**

If the object emitting a wave moves away from you, the frequency is lowered: red shift for light; lower pitch for sound.

• _____ **Waves**

your speed = your waves' speed.

• _____ **Wave**

your speed > your waves' speed.

• _____ **Boom**

For sound, a shock wave is the sonic boom. The loud

crack you hear is not really from the plane breaking the sound barrier. Yes, the plane must be going faster than sound – but the listener hears the 'v' wave front (made by the plane's speed being greater than its own sound waves) when the 'v' reaches the listener. This is not necessarily the moment where the plane just went faster than sound. It is true however that the airplane has to pierce the compression wave of its own sound – and there is resistance there - and it does fly better without the drag of its sound compression wave.

