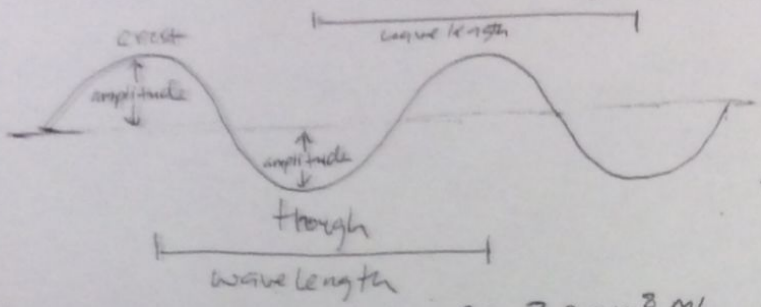
Periodic Wave and Wave Speed.



$c = 3.0 \times 10^8$ m/s

period $= T = \frac{t}{\#}$ wave length $= \lambda = \frac{\text{distance}}{\#}$

frequency $= f = \frac{\#}{t}$ $\frac{1}{\text{sec.}} = \text{Hz}$

V = wave speed $= f \cdot \lambda$

$V = \frac{\text{distace}}{\text{time}} = \frac{\#}{\text{time}} \cdot \frac{\text{distance}}{\#}$

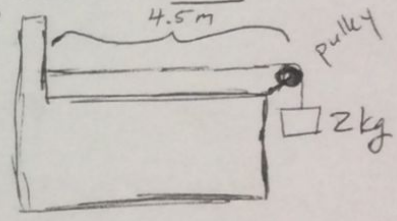
(1) Two different frequency waves of the same kind travel through the same medium. Does the wave with the higher frequency have a longer, shorter, or the same wavelength compared to the lower frequency?

(2) What happens to a wave when it loses energy? Energy $\propto$ (Amplitude)^2

For transverse waves is a string: wavespeed $= V = \sqrt{\frac{F_T}{m/L}}$

m = mass
F_T = tension
m/L = linear density

(3) The .1 kg 5 meter long uniform rope has a 2 kg block hung on it over a pulley. Find (a) the speed of this rope (b) the time it takes for a wave pulse to travel from wall to the pulley (c) If we wish to halve the time from part (b) what mass block should be hung?



Intensity: $I = \frac{\text{energy/time}}{\text{area}} = \frac{\text{power}}{\text{area}}$ units are $\frac{\text{Watts}}{(\text{meters})^2}$

Energy $\propto$ (Amplitude)^2 $I \propto A^2$ For a 3D (or spherical wave) $I = \frac{\text{Power}}{(4\pi r^2)} \propto \frac{1}{r^2}$ (area of sphere)

$I \propto A^2 \propto \frac{1}{r^2} \Rightarrow \boxed{A \propto \frac{1}{r}}$ $\boxed{I \propto \frac{1}{r^2}}$

(4) The sound wave produced by the base of a vacuum cleaner 2 meters away has an amplitude of A_0 and Intensity I_0. What would the amplitude and sound intensity be .5 meters away?