Physics of Sound Quiz1 Spring 2014

Name_____solution_____

Consider an ultrasound wave at 345000 Hz in air.

a) What is the wavelength of this wave?

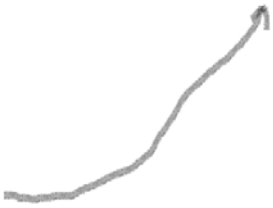
Start with **S**= $\boldsymbol{f}\,.\lambda$
Using algebra to "solve for lambda", you see that λ=S/f =*(340m/s)/(345000 1/s)* .

The units simplify to meters (m) and the number you can leave as the ratio.

λ =*340/345000 (m)*

b) Use the ray theory to show what happens to sound in a normal atmosphere (The air temperature is higher near the ground). In other words, draw a typical ray on the sketch.

The speed of sound is slower further up so the rays refract upward.



Sound source
/ | \
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Ground level_____

Typical speed of sound in air: 340m/s

$f = \frac{1}{2\cdot\pi}\sqrt{\frac{k}{m}}$ $T = \frac{1}{f}$ $Z = \sqrt{F\cdot W}$ **S**= $\boldsymbol{f}\,.\lambda$ $S = \sqrt{\frac{F}{W}}$

$$\frac{f_{source}}{f_{air}} = 1 - \frac{v_s}{S} \qquad \frac{f_{receiver}}{f_{air}} = 1 + \frac{v_o}{S}$$