Ch15 P 20, 37, 81-84
Ch16 P 7.

Ch15. 20

Wate wave w/ wavelength of 95m travels at 12 m/s. A small boat is at the crest of this wave 1.2m above the equilibrium position. What will be the vertical position of the boat 5.0s later?

$y(t) = A\cos(2\pi ft)$ general form

$A = 1.2m$ The boat is at A at t=0 so we want cos

$f = v/\lambda = 12m/s / 95m = 0.126Hz$

$y(t) = 1.2m \cos(2\pi\ 0.126Hz\ 5.0s)$

$= -0.81\ m$

← Make sure your calculator is in radians

37. The sound intensity from a jackhammer breaking concrete is $2.0\ W/m^2$ at a distance of 2.0m. This is loud enough to cause permanent hearing damage. What are the a) Sound intensity and b) Sound intensity level at 50m?

Find Power then use Power at 50m to plug into find Intensity (I) & Intensity level (β).

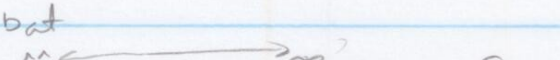
$I = P/4\pi r^2$ $\quad P = I \cdot 4\pi r^2 = 2.0\ W/m^2\ 4\pi(2.0m)^2 = 100.5W$

a) $I_{50} = P/4\pi r^2 = \frac{100.5W}{4\pi(50m)^2} = 0.0032\ W/m^2$

b) $\beta = 10 \log \frac{I}{I_0}$

$= 10 \log \frac{0.032\ W/m^2}{1 \times 10^{-12}\ W/m^2}$ $= \boxed{95\ dB}$

81. Bats separate the bones in their middle ear when emitting an ultrasonic pulse to avoid damaging their ears from the loud sound. If a bat can hear an echo from an object 1 m away, Approximately how long after a bat emits a pulse is it ready to hear its echo?



Sound travels 2m total

$v = d/t$ $\quad t = d/v = 2m / 340\ m/s = 0.00588\ s$

$= 5.9\ ms$

Option $\boxed{D = 6\ ms}$

82. Bats are sensitive to very small changes in frequency. What information does this allow them to determine about their prey?

A change in frequency is caused by the relative motion of the bat and prey. So the bat is detecting the bugs speed by analyzing the Doppler Shift (w/out math!)

B: Speed

83. Some bats have specially shaped noses that help them focus ultrasound pulses. Why is this useful?

B. The energy of the pulse is concentrated in a smaller area, so the intensity is larger.

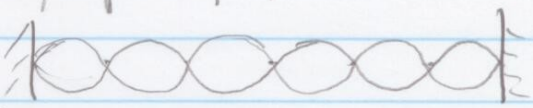
84. Some bats use a sound pulse with a rapidly decreasing frequency. A decreasing frequency has

C. Increasing wavelength.

$v = df$ We know the speed is the speed of sound which stays constant if the temperature & material (a.v) stay the same so wavelength has to change.

Ch 16.7

A 2.0m long string is fixed at both ends w/ a wave speed of 40.0 m/s. What is the frequency of the standing wave shown?



3 wavelengths are shown since $\frown = \lambda$

$2.0m = 3\lambda$ so $\lambda = 2/3\ m = 0.667m$

$f = v/\lambda = 40m/s / 0.667m = \boxed{60Hz}$