Human Hearing

p. 453 #1, 5, 7

① Make sure you know the parts of the ear and what each part does. See our note or read <u>10.1</u>

⑤ It is the cochlear hairs that ultimately relay "sound" to the auditory part of your brain. Hairs like the cochlear + certain hairs "fire" with an electric (neurological) signal when they vibrate. A sudden burst of noise or extended loud noise can damage these hairs making them unable to vibrate + send signals. You are then 'deaf' to these frequencies. These hairs do <u>NOT</u> regrow. If research says we <u>will</u> be able to regrow cochlear hairs, that means it may be possible to restore hearing loss!

(7) Rotating the pinna allows animals such as cats to collect sounds from different directions without moving their whole head. Humans are required to move the head to collect sounds from different directions. This means we may not be able to keep looking @ what we were originally watching. Rotating pinna allows a cat to monitor sound all around while (perhaps) watching a mouse + preparing to attack.

10.2 - Musical Instruments

p. 460 #1, 4, 8, 9a

① a) highest pitch = highest frequency = ii)

b) loudest = greatest amplitude = iii)

c) highest quality = (iii) More complex wave

④ $L_1 = 0.66\,m$ $L_2 = 0.66\,m - 0.11\,m = 0.55\,m$

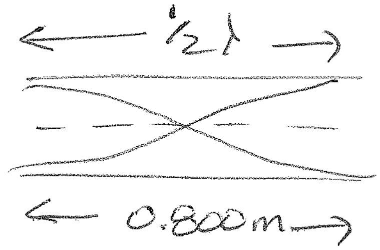
$f_1 = 140\,Hz$ $f_2 = ?$

$$f_1 L_1 = f_2 L_2$$

$$(140)(0.66) = (0.55) f_2$$

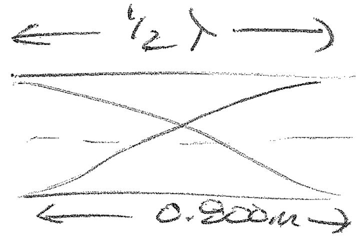
$$f_2 = 168\,Hz$$ * new freq = <u>170 Hz</u>

⑧



T = 22°C

⟹



T = 11°C

a) $v = f\lambda$ This formula will determine the fundamental frequency (f)

$\therefore f = \frac{v}{\lambda}$

λ is the <u>same</u> at 22°C and 11°C but the <u>speed</u> changes. speed is <u>greater</u> at 22°C

$f = \frac{V_{\text{small value}}}{\lambda}$ or $f = \frac{V_{\text{big value}}}{\lambda}$

11°C outside

22°C inside

greater frequency

So... instrument's fundamental frequency will lower when you go from inside → outside
(22°C) (11°C)

b) $f = ?$

11°C

$v = 331.4 + (0.606)11$
$= 338 \text{ m/s}$

$v = f\lambda$
$\therefore$ ~~$\lambda = \frac{v}{f}$~~ $f = \frac{v}{\lambda}$

need λ

length = length
$0.800 \text{ m} = \frac{1}{2}\lambda$
$\lambda = 1.6 \text{m}$

$f = \frac{338}{1.6} = 211 \text{ Hz}$

$f = \underline{210 \text{ Hz}}$

22°C

$v = 331.4 + (0.606)22)$
$= 345 \text{ m/s}$

need λ

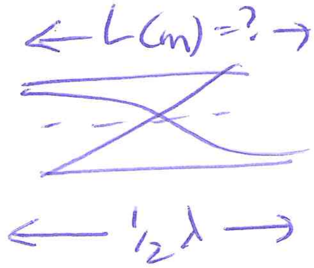
length = length
{ same math
$\lambda = 1.6 \text{ m}$

$f = \frac{345}{1.6} = 216 \text{ Hz}$

$f = \underline{220 \text{ Hz}}$

p. 460 # 9

9a)



f = 420 Hz

T = 24° C

find v

find λ

then find L(m)

$v = 331.4 + (0.606)(T)$

$= 331.4 + (0.606)(24) = \underline{346 \text{ m/s} = v}$

$v = f\lambda \therefore \lambda = \frac{v}{f} = \frac{346}{420} = \underline{0.82 \text{ m}}$ $\quad \underline{\lambda = 0.82}$

$L_{(m)} = L_{(\lambda)}$

~~L(m) = (0.82 m)λ~~ } sorry!

~~= 0.82~~

$L(m) = \frac{1}{2}\lambda$

$= \frac{1}{2}(0.82)$

$= 0.42$

$\therefore$ Length is 0.42 m = $\underline{42 \text{ cm}}$