Waves Worksheet #9

① a) loudness - volume of a sound
- correlates to amplitude

pitch - whether a sound is "high" or "low"
- correlates to frequency

b) ultrasonic - sound frequencies above the normal range audible to humans

infrasonic - sound frequencies below the normal range audible to humans

② Dogs have a larger audible range, allowing them to hear higher pitched sounds than we can.

A dog whistle has a frequency that is ultrasonic for humans, but audible to dogs.

③ a) amplitude

b) frequency

④ Sound travels faster in steel than in air, so you can "hear" the train coming earlier by "listening" through the tracks.

⑤ The timers would start a few hundredths of a second after the race began, resulting in faster times.

⑥ a) no change (f only depends on the source)

b) increases ($v = f\lambda$, so if $v \uparrow$ $\lambda \uparrow$)

⑦ a) $v = 331 + 0.6T$

$= 331 + 0.6(-30)$

$v = \boxed{313 \text{ m/s}}$

b) $v = 331 + 0.6(8)$

$v = \boxed{335.8 \text{ m/s}}$

c) $v = 331 + 0.6(37.5)$

$v = \boxed{353.5 \text{ m/s}}$

⑧ $v = 331 + 0.6T$

$= 331 + 0.6(20)$

$v = 343 \text{ m/s}$

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

$= \frac{343}{0.667}$

$f = \boxed{514 \text{ Hz}}$

⑨ Smallest

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

$= \frac{343}{20000}$

$\lambda = \boxed{0.017 \text{ m}}$

Largest

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

$= \frac{343}{20}$

$\lambda = \boxed{17.2 \text{ m}}$

(10) $\lambda = 0.58\ m$

$v = f\lambda$

$= (9800)(0.58)$

$v = \boxed{5684\ m/s}$

(11) $d = vt$

$= (343)(0.2)$

$d = 68.6$ ← distance to wall and back

distance to wall $= \frac{68.6}{2} = \boxed{34.3\ m}$

(12) $d = vt$

$= (343)(6)$

$d = \boxed{2058\ m}$

(13) $v = 343\ m/s$ @ 20°C

Woofer

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

$= \frac{343}{0.38}$

$f = \boxed{903\ Hz}$

Tweeter

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

$= \frac{343}{0.076}$

$f = \boxed{4513\ Hz}$

(14) $v = 343$ m/s @ 25°C

Distance to First Wall

$d = vt$

$= (343)(2)$

$d = 686$ m ← to the wall and back

∴ distance to wall $= \frac{686}{2} = 343$ m

Distance to Second Wall

$d = vt$

$= (343)(4)$

$d = 1372$ m ← to the wall and back

∴ distance to wall $= \frac{1372}{2} = 686$ m

Total $343 + 686 = \boxed{1029 \text{ m}}$