Unit Review: Sound Waves

① frequency (pitch), wavelength, amplitude (volume)

② Sound travels faster in steel than in air, so you could feel the vibration in the tracks before you could hear the train.

③ The length of the tube must be a multiple of one half the wavelength.

④ The same as all waves: reflection, refraction, diffraction, interference.

Interference causes beats.

⑤ All waves.

⑥ Timbre - the assortment and amplitude of harmonics played along with the fundamental frequency.

⑦ a) The frequency does not change as it only depends on the source frequency.

b) The wavelength increases.

⑧ ① The sound should be heard after the explosion is seen since sound is much slower than Light.

② There is no sound in space.

9. a) higher frequency

   b) lower frequency

10. a) Large insects would reflect more sound. Thus, the sound intensity would be higher.

    b) Toward - higher frequency

    Away - lower frequency.

11. a) increases

    b) decreases

    c) no change

    d) no change

12. $\lambda = 2L$, so the wavelength is constant.

    $v = f\lambda$, so if v increases and λ is constant, then f must <u>increase</u>.

13. farther apart

14. a) $v = f\lambda$

$$f = \frac{v}{\lambda} = \frac{330}{0.7} = \boxed{471\ Hz}$$

(14) b) $f = \frac{\# \text{ of waves}}{\text{time}}$

$\# \text{ of waves} = f \times t$

$= (471)(0.5)$

$= \boxed{235.7 \text{ waves}}$

c) $d = vt$

$= (330)(0.5)$

$d = \boxed{165 \text{ m}}$

(15) $d = vt$

$= (1498)(1.8)$

$d = 2696.4 \text{ m}$ (to the bottom and back)

$\therefore \text{Depth} = \frac{2696.4}{2} = \boxed{1348.2 \text{ m}}$

(16) $d = vt$

$= (343)(6)$

$d = \boxed{2058 \text{ m}}$

(17) Time to far side = 2 s

$d = vt$

$= (343)(2)$

$d = \boxed{686\ m}$

(18) Time to wall 1 = 1.0 s

$d_1 = vt$

$= (343)(1)$

$d_1 = 343\ m$

Time to wall 2 = 2.0 s

$d_2 = vt$

$= (343)(2)$

$d_2 = 686\ m$

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

(19) $t = \frac{d}{v}$

$= \frac{3}{343}$

$t = 0.00875\ s$ (time to subject)

Time to subject <u>and</u> back

$2(0.00875) = \boxed{0.0175\ s}$

(20) $v = f\lambda$

$\lambda = \frac{v}{f} = \frac{1435}{261.6} = \boxed{5.5\ m}$

(21) $v = f\lambda$

$= (440)(3.3)$

$v = \boxed{1452\ m/s}$

(22) $v = f\lambda$

$= (442)(11.66)$

$v = \boxed{5153.7\ m/s}$

(23) $v = f\lambda$

$f = \frac{v}{\lambda} = \frac{343}{3.5\times10^{-3}} = \boxed{98\,000\text{ Hz}}$

(24) $\lambda = \frac{v}{f} = \frac{1500\text{ m/s}}{4\,250\,000\text{ Hz}} = \boxed{3.53\times10^{-4}\text{ m}}$

(25) a) 100 x greater

b) 10 000 x greater

(every 10 dB is x10 intensity)

(26) Time for stone to hit bottom:

$d = v_i t + \frac{1}{2}at^2$

$-122.5 = 0 + \frac{1}{2}(-9.8)t^2$

$t = 5\text{ s}$

Time for sound to come back up:

$t = \frac{d}{v} = \frac{122.5}{343} = 0.036\text{ s}$

Total $= \boxed{5.036\text{ s}}$

(27) The difference between consecutive resonant lengths is always $\frac{\lambda}{2}$.

$$\therefore \quad 49 - 17 = \frac{\lambda}{2}$$

$$32 = \frac{\lambda}{2}$$

$$\lambda = 64 \text{ cm} = 0.64 \text{ m}$$

$$v = f\lambda$$

$$f = \frac{v}{\lambda} = \frac{343}{0.64} = \boxed{536 \text{ Hz}}$$

(28)

$$445 - 3 = \boxed{442 \text{ Hz}}$$

$$445 + 3 = \boxed{448 \text{ Hz}}$$

(29)

$$f_2 = 2(370) = 740 \text{ Hz}$$

$$f_3 = 3(370) = 1110 \text{ Hz}$$

$$f_4 = 4(370) = 1480 \text{ Hz}$$

(30)

$$f_2 = 3(370) = 1110 \text{ Hz}$$

$$f_3 = 5(370) = 1850 \text{ Hz}$$

$$f_4 = 7(370) = 2590 \text{ Hz}$$