Chapter 15

15.1 (b)

15.2 (c)

15.3 (c)

15.4 (c)

15.5 (b)

15.6 (c)

15.7 (d)

15.8 (b)

15.9 (b)

15.10 (c)

15.11 (a), (b), (c)

15.12 (b), (c)

15.13 (c), (d)

15.14 (b), (c), (d)

15.15 (a), (b), (d)

15.16 (a), (b)

15.17 (a), (b), (d), (e)

15.18 Wire of twice the length vibrates in its second harmonic. Thus if the tuning fork resonaters at L, it will resonate at $2L$.

15.19 L/2 as λ is constant.

15.20 517 Hz.

15.21 5cm

15.22 1/3. Since frequency $\alpha\sqrt{\frac{1}{m}}$ $m = \pi r^2 \rho$

15.23 2184°C, since $C\alpha\sqrt{T}$

15.24 $\frac{1}{n_1 - n_2}$

15.25 343 m s^{-1}. $\left[n = \frac{1}{2l}\sqrt{\frac{T}{m}}\right]$

15.26 3nd harmonic $\left[\text{since } n_o = \frac{v}{4l} = 412.5 \text{ with } v = 330\,\text{m/s}\right]$

15.27 412.5Hz $\left[n' = n\left(\frac{c}{c - v}\right)\right]$

15.28 Stationary waves; 20cm

15.29 (a) 9.8×10^{-4}s. (b) Nodes-A, B, C, D, E. Antinodes-A^1, C^1. (c) 1.41m.

15.30 (a) 348.16 ms^{-1}

(b) 336 m/s

(c) Resonance will be observed at 17cm length of air column, only intensity of sound heard may be greater due to more complete reflection of the sound waves at the mercury surface.

15.31 From the relation, $\nu = \frac{nv}{2L}$, the result follows.

15.32 $t = \left[\frac{6400-3500}{8} + \frac{2500}{5} + \frac{1000}{8}\right] \times 2$

= 1975 s.

= 32 minute 55 second.

15.33 $c = \sqrt{\frac{3P}{\rho}} = \sqrt{\frac{3RT}{M}}, v = \sqrt{\frac{\gamma P}{\rho}} = \sqrt{\frac{\gamma RT}{M}}$

$\frac{c}{v} = \sqrt{\frac{3}{\gamma}}$ *and* $\gamma = \frac{7}{5}$ for diatomic gases.

15.34 (a) (ii), (b) (iv), (c) (iii), (d) (i).

15.35 (a) 5m, (b) 5m, (c) 50Hz, (d) 250ms^{-1}, (e) 500π ms^{-1}.

15.36 (a) 6.4π radian, (b) 0.8π radian, (c) π radian, (d) 3π /2 radian, (e) 80π radian.