Physics 20 - Lesson 31
Resonance and Sound – Answer Key

/ 41

1) Third harmonic = $3f_o = 3(300Hz) = 900Hz$

/4 Fourth harmonic = $4f_o = 4(300Hz) = 1200Hz$

2) $n = 3$ $\quad \lambda_3 = \frac{2L}{3} \rightarrow L = \frac{3\lambda_3}{2} = \frac{3(45cm)}{2}$

$\lambda = 45cm$

/3 $\boxed{L = 67.5cm}$

3) $n = 1$ $\quad \lambda_n = \frac{2L}{n} \rightarrow \lambda_1 = \frac{2L}{1} = \frac{2(75.0cm)}{1}$

$\lambda = 75cm$

$\boxed{\lambda_1 = 150cm}$

/6

$v = f\lambda = 252Hz(1.5m)$

$\boxed{v = 378m/s}$

4) $L_1 = 30cm$ $\quad L_n = \frac{(2n-1)\lambda}{4}$

$L_2 = \frac{[2(2)-1]120cm}{4}$

$\lambda_n = \frac{4L_n}{2n-1} = \frac{4(30cm)}{1}$

$\lambda = 120cm$

/7 $\boxed{L_2 = 90cm}$

$L_3 = \frac{[3(2)-1]120cm}{4}$

$\boxed{L_3 = 150cm}$

5) $L_3 = 75cm$ $\quad L_3 = \frac{[2(3)-1]\lambda}{4}$

/7 $\lambda = \frac{4L_3}{5} = \frac{4(75cm)}{5} = 60cm$

$L_1 = \frac{[2(1)-1]\lambda}{4} = \frac{60cm}{4} = \boxed{15cm}$

$L_2 = \frac{[2(2)-1]\lambda}{4} = \frac{3(60cm)}{4} = \boxed{45cm}$

6) $\lambda = \frac{v}{f} = \frac{352 m/s}{440 Hz} = 0.80 m$

/4 $L_n = \frac{[2(n)-1]\lambda}{4} = \frac{[2(1)-1]0.80}{4} = \boxed{20 cm}$

7) $L_2 = 48 cm$

$L_n = \frac{n\lambda}{2} \rightarrow L_2 = \frac{2\lambda}{2} = \lambda$

/6

$\lambda = 48 cm$

$L_1 = \frac{1(48 cm)}{2} = \boxed{24 cm}$

$L_3 = \frac{3(48 cm)}{2} = \boxed{72 cm}$

8) $\lambda = \frac{v}{f} = \frac{346 m/s}{128 Hz} = 2.70 m$

/4

$L_n = \frac{n\lambda}{2} \rightarrow L_1 = \frac{1(2.70 m)}{2} = \boxed{1.35 m}$