Physics 11/11H Standing Waves WS

1. (a) $\lambda = 1.5\,m$, $f = 585\,Hz$

$v = f\lambda = (585\,Hz)(1.5\,m)$

$\boxed{v = 8.8 \times 10^2\,m/s}$

(b) 

$\lambda = 1.5\,m \times 2$

$f_1 = \frac{v}{\lambda} = \frac{(585\,Hz)(1.5\,m)}{2 \times (1.5\,m)}$

$\boxed{f_1 = 292\,Hz}$

2. $L = 85.0\,cm = 0.850\,m$

$v = 13.00\,m/s$

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

f_1  $L = \frac{1}{2}\lambda_1$ $\quad f_1 = \frac{v}{2L} = \frac{13.00\,m/s}{2(0.850\,m)} = \boxed{7.65\,Hz}$

f_2  $L = \lambda_2$ $\quad f_2 = \frac{v}{L} = \frac{13.00\,m/s}{0.850\,m} = \boxed{15.3\,Hz}$

f_3  $L = \frac{3}{2}\lambda_3$ $\quad f_3 = \frac{3v}{2L} = \frac{3(13.00\,m/s)}{2(0.850\,m)} = \boxed{22.9\,Hz}$

3. 

$L = \frac{1}{2}\lambda$

$\therefore \lambda = 2 \times (1.050\,m)$

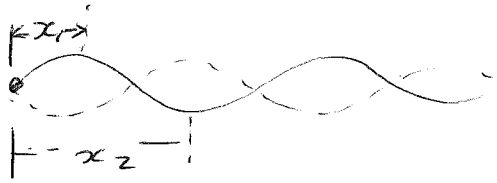
$v = 85\,m/s$

$f = \frac{v}{\lambda} = \frac{85\,m/s}{2(1.050\,m)} = \boxed{4.0 \times 10^1\,Hz}$

4. $\lambda = 0.60\,m$

$v = 3.0\,m/s$

$L = 3.6\,m$



$x_1 = \frac{1}{4}\lambda = \frac{1}{4}(0.60\,m) = \boxed{0.15\,m}$

$x_2 = \frac{3}{4}\lambda = \frac{3}{4}(0.60\,m) = \boxed{0.45\,m}$

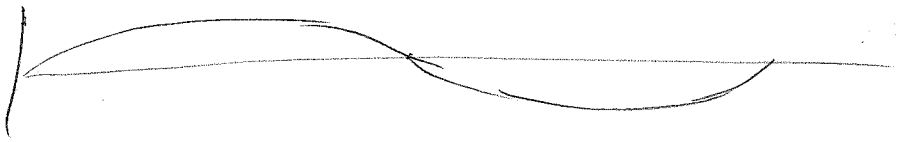
5. $f = 225\,Hz$

(a) Amplitude = $\boxed{5.0\,cm}$

(b) $\boxed{\lambda = 1.10\,m}$

(c) $v = f\lambda = (225\,Hz)(1.10\,m) = \boxed{248\,m/s}$

(d) @ $\frac{1}{2}f$ λ would double.



6. 

$\lambda_1 = 2L = \boxed{80.0\text{cm}}$

$\lambda_2 = L = \boxed{40.0\text{cm}}$

$\lambda_3 = \frac{2}{3}L = \boxed{26.7\text{cm}}$

$\lambda_4 = \frac{L}{2} = \boxed{20.0\text{cm}}$

$\lambda_5 = \frac{2}{5}L = \boxed{16.0\text{cm}}$

7. $v = 285\text{m/s}$ $\quad f_n = \frac{v}{\lambda_n}$

$f_1 = \frac{285}{0.80} = \boxed{3.56\times10^2\text{Hz}}$

$f_2 = \frac{285}{0.40} = \boxed{7.12\times10^2\text{Hz}}$

$f_3 = \frac{285}{0.2667} = \boxed{1.07\times10^3\text{Hz}}$

$f_4 = \frac{285}{0.20} = \boxed{1.42\times10^3\text{Hz}}$

$f_5 = \frac{285}{0.16} = \boxed{1.78\times10^3\text{Hz}}$

8. 

$L = 60.0\text{cm} \quad \therefore \lambda = 120.0\text{cm}$

$v = 195\text{m/s}$

$f = \frac{v}{\lambda} = \frac{195\text{m/s}}{1.20\text{m}} = \boxed{162\text{Hz}}$

9. 

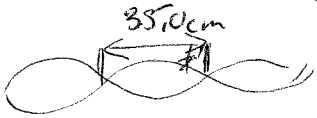
$f = 20.0\text{Hz}$

$v = 35.0\text{m/s}$

$\lambda = \frac{v}{f} = \frac{35.0\text{m/s}}{20.0\text{Hz}} = \boxed{1.75\text{m}}$

(a) $x_1 = \frac{1}{4}\lambda = \boxed{0.438\text{m}}$

(b) $x_2 = \frac{1}{2}\lambda = \boxed{0.875\text{m}}$

10. 

(a) $f = 350.0\text{Hz}$

$\lambda = 2\times(0.35\text{m})$

$v = f\lambda = (350.0\text{Hz})(2\times0.35\text{m})$

$\boxed{v = 245\text{m/s}}$

(b) $f = 150.0\text{Hz}$

$v = f\lambda \quad \therefore \lambda = \frac{v}{f} = \frac{245\text{m/s}}{150.0\text{Hz}} = \boxed{1.63\text{m/s}}$