yohandi ~ physics assignment 15

7. $v = \lambda f = \sqrt{\frac{T}{\mu}}$  $\sqrt{\frac{T}{\mu}}$

$v_1 = \lambda_1 f_1 = 600 \cdot \ell$

$v_2 = \lambda_2 f_2 = 608 \cdot \ell$

$\frac{v_1}{v_2} = \frac{600}{608}$

$\frac{T_1}{T_2} = \left(\frac{600}{608}\right)^2 \Rightarrow T_2 = 1.03\, T_1$  (3% increase)

19a) $I = \frac{P}{A} = \frac{30}{4\pi(180)^2}$ W/m²

$\simeq 7.37 \times 10^{-5}$ W/m²

b) $P_m = I \cdot A$

$= 7.37 \times 10^{-5} \times 0.750 \times 10^{-4}$ W

$= 5.53 \times 10^{-9}$ W

20. $\sin\theta = \frac{v}{v_s} = \frac{1}{M}$

since $v_s = 2v$, $M = 2$

$\sin\theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{6}$

height $= S \cdot \tan\left(\frac{\pi}{6}\right)$

$= 660 \cdot \frac{1}{3}\sqrt{3}$  35.4 m

$= 13500$ m

22a) $f = n \cdot \frac{v}{4L} = \frac{3v}{4L} = 286$ Hz

b) $T = \mu \cdot v^2$

$= \mu \cdot (2f \cdot \ell)^2$

$= 4f^2 \cdot \ell m$

$= 1035.3$ N

26 a) $S_m = \frac{2 \times 5 \times 10^{-3}}{343 \cdot 1.21 \cdot 1000\pi}$ m

$= 7.67 \cdot 10^{-9}$ m

b) $k = \frac{2\pi}{\lambda} = \frac{2\pi f}{v} = 9.16$ 1/m

c) $\omega = 2\pi f = 3142$ 1/s

d) $S_m' = \frac{343}{320} \cdot \frac{1.21}{1.35}$  $S_m = 7.37 \cdot 10^{-9}$ m

e) $k' = \frac{343}{320} \cdot k = 9.81$ 1/m

f) $\omega' = \omega = 3142$ 1/s

31a) $f = 1560 \cdot 10^3 \, \frac{5470 + 72}{5470 - 48}$ Hz

$= 1595 \cdot 10^3$ Hz

b) $f = 1.595 \cdot 10^3 \cdot \frac{5470 + 48}{5470 - 72}$ Hz

$= 1.630 \cdot 10^3$ Hz

36. $\frac{B}{\rho} = \frac{dP}{d\rho}$

$\Rightarrow v = \sqrt{\frac{dP}{d\rho}}$

$f = \frac{1}{\lambda}\sqrt{\frac{dP}{d\rho} \cdot \frac{dv}{dv}}$

$\frac{dv}{dP} = \frac{1}{(\lambda f)^2} \cdot \frac{dv}{d\rho}$

$\frac{\left(\frac{dv}{dP}\right)_f}{\left(\frac{dv}{dP}\right)_i} = \frac{f_i^2}{f_g^2} = \frac{1}{4}$

50 a) $S_m = \frac{\Delta P_m}{v \rho \omega} = 7.99 \cdot 10^{-10}$ m

b) $I = \frac{1}{2}\rho \cdot v \omega^2 S_m^2 = 7.53 \cdot 10^{-9}$ W/m²

58. $L = q\lambda$

$\frac{L}{\lambda} = 0.5, 1.5, \ldots$

a) smallest $q = 0.5$

b) third smallest $q = 2.5$