7. $\eta = 1 - \frac{T_c}{T_H}$ $\qquad 0.30 = 1 - \frac{T_c}{(550+273)\,K}$

$\Rightarrow -0.70 = -\frac{T_c}{823K} \Rightarrow T_c = 576.\ K$

now: $0.35 = 1 - \frac{576.1K}{T_H'}$ $\qquad (T_H' = ?)$

$-0.65 = -\frac{576.1K}{T_H'} \Rightarrow T_H' = \frac{576.\ K}{0.65} = 886.\ K$

$= (886. - 273)^\circ C$

$= 613^\circ C.$

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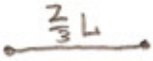
8. $f_n = \frac{nv}{2L}$ $\qquad$  $n=1$ vibration $f_1 = 330Hz$

when  then $(f_{new} = ?)$

First part of information gives "v", the speed of the waves on the string.

$f_1 = \frac{1v}{2L} = 330Hz \Rightarrow 1v = (2L)(330Hz)$

$f_{new} = \frac{1v}{2L_{new}} = \frac{1v}{2(\frac{2}{3}L)} = \frac{(2L)(330Hz)}{(2)(\frac{2}{3}L)}$

$f_{new} = (\frac{3}{2})(330\ Hz) = 495Hz.$

Intuitive Check: f goes up? Yes! ☺