P #62

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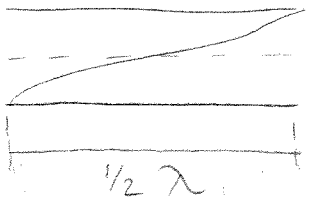
$f_1 = 261.6\ Hz$
$T_1 = 20.0°C$

a) For fundamental frequency:



$\lambda_1 = 2 \cdot L$
$(1.31\ m) = 2 \cdot L$

$L = .655\ m$

$$v_1 = 331 \cdot \sqrt{1 + \frac{T}{273}}$$

$$v_1 = 331 \cdot \sqrt{1 + \frac{20}{273}}$$

$v_1 = 342.9\ m/s$

$v_1 = f_1 \cdot \lambda_1$
$(342.9\ m/s) = (261.6\ Hz) \cdot \lambda_1$

$\lambda_1 = 1.31\ m$

b) $f_{Beat} = 3.00\ Hz$

For $T_2 < T_1$, $v_2 < v_1$ so $f_2 < f_1$

$f_{Beat} = |f_1 - f_2|$

$3.00\ Hz = 261.6\ Hz - f_2$

$f_2 = 258.6\ Hz$

For identical flute, $\lambda_1 = \lambda_2$ so $\lambda_2 = 1.31\ m$

$v_2 = \lambda_2 \cdot f_2$
$= (1.31\ m)(258.6\ Hz)$

$v_2 = 338.98\ m/s$

$$v_2 = 331 \cdot \sqrt{1 + \frac{T}{273}}$$

$T = 13.3°C$