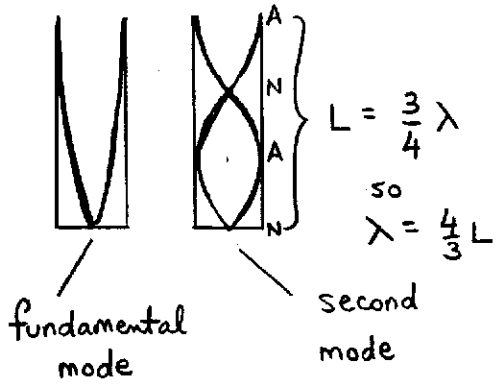
B3. An organ pipe of length 0.250 m is open at one end and closed at the other. Calculate the second-lowest resonant frequency. The speed of sound in air is 343 m/s.



$L = \frac{3}{4}\lambda$

so $\lambda = \frac{4}{3}L$

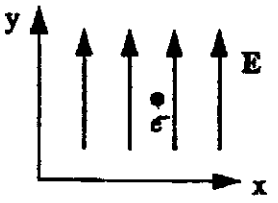
$v = f\lambda$

$f = \frac{v}{\lambda} = \frac{v}{\frac{4}{3}L}$

$f = \frac{3v}{4L} = \frac{3(343\,m/s)}{4(0.250m)}$

$f = 1030\ Hz$

B4. An electron is placed in a region of space where there is a uniform electric field which is in the +y direction as shown. The magnitude of the electric field is 51.0 V/m. Determine the magnitude and direction of the force on the electron.



$\vec{F} = q\vec{E}$

$F = (-1.60 \times 10^{-19}\,C)(51.0\ V/m)$

$F = -8.16 \times 10^{-18}\ N$

↑ indicates opposite dirn to $\vec{E}$, $\therefore -y$.

B5. Calculate the diameter of a 2.00-cm length of tungsten filament in a small lightbulb if its resistance is 0.0510 Ω. The resistivity of tungsten is $5.65 \times 10^{-8}\,\Omega.m$.

$R = \frac{\rho L}{A}$ and $A = \frac{\pi d^2}{4}$ so $R = \frac{4\rho L}{\pi d^2}$

$\therefore\ d = \sqrt{\frac{4\rho L}{\pi R}} = \sqrt{\frac{4(5.65 \times 10^{-8}\,\Omega.m)(0.0200m)}{\pi\,(0.0510\,\Omega)}}$

$d = 1.68 \times 10^{-4}\ m$