Nicholas Hender
VCE Physics Unit 4, Detailed Study, Sound

Detailed Study, Sound, Formula And Data Sheet

Wave Formulæ

Period and Frequency: $f = \frac{1}{T} = T^{-1} \rightarrow T = \frac{1}{f} = f^{-1}$

Velocity: $v = \frac{\lambda}{T} = f\lambda$

Intensity And Level Formulæ

$I = \frac{P}{4\pi r^2}$

$I \propto \frac{1}{r^2}$

$I_1 r_1^{\,2} = I_2 r_2^{\,2}$

Intensity (Wm^{-2}) To Level (dB): $L = 10 \log \frac{I}{I_0}$

Level (dB) To Intensity (Wm^{-2}): $I = I_0 10^{L/10}$

Harmonic Series

$f_n = nf_1$

Resonance In Strings And Open Ended Pipes

$\lambda_n = \frac{2L}{n}$

$f_n = \frac{v}{\lambda_n}$

Resonance In Pipes Closed At One End

$\lambda_n = \frac{4L}{n}$

Data

Speed of sound in air at 20°C: $343 ms^{-1}$

Lower intensity threshold of human hearing at 1000Hz: $1 \times 10^{-12} Wm^{-2}$ = 0dB

Pain and damage threshold of human hearing at 1000Hz: $1 Wm^{-2}$ = 120dB

Frequency range of human hearing: 20Hz to 20000Hz