Ex 14.2, 14.3, #9, 13

Calculate β if

a) $I = 1 \times 10^{-12} \frac{\text{Watts}}{m^2}$

$\beta = 10 \log\left(\frac{I}{I_0}\right) = 10 \log\left(\frac{1 \times 10^{-12}}{1 \times 10^{-12}}\right)$ (I over I_0)

$= 10 \log 1 = 0$ dB

b) $I = 1 \times 10^{-11} \frac{\text{Watt}}{m^2}$ $\quad \log 10 = 1$

$\beta = 10 \log\left(\frac{1 \times 10^{-11}}{1 \times 10^{-12}}\right) = 10$ dB

c) $I = 1 \times 10^{-10} \frac{\text{Watt}}{m^2}$ $\quad 100 = 10^2$

$\beta = 10 \log\left(\frac{1 \times 10^{-10}}{1 \times 10^{-12}}\right) = 20$ dB

Ex. 14.3 $I = 1 \times 10^{-5} \frac{\text{Watts}}{m^2}$

$\beta = ?$

$I = 10 \log\left(\frac{1 \times 10^{-5}}{1 \times 10^{-12}}\right) = 70$ dB

1 grinder

$10 \log\left(\frac{2(1 \times 10^{-5})}{1 \times 10^{-12}}\right) = 73$ dB

freq aka pitch

C, D#, B♭

Intensity

Energy of wave

$I = \frac{P}{A}$ ($\frac{W}{t} = \frac{\Delta E}{t}$ power)

area

units $\frac{\text{Watts}}{m^2}$

aka loudness

Intensity Level

(relative to lowest I_0 sound we hear)

$\beta = 10 \log\left(\frac{I}{I_0}\right)$

unit dB decibels

$\frac{\text{Watt}}{m^2}$

$I = I_0 \, 10^{\frac{\beta}{10}}$

always $I_0 = 1 \times 10^{-12} \frac{\text{Watts}}{m^2}$