**Physics of Sound Worksheet Answer Key**

**Useful equations**

$f=\frac{v}{λ}$ $f=\frac{1}{T}$ $β\left(dB\right)=10log⁡\left(\frac{I}{I\_{0}}\right)$

$f=$ frequency $λ=wavelength$ $T=period$

$v=$ wave velocity $β\left(dB\right)=sound intensity$

$I\_{0}=10^{-12}\frac{watts}{m^{2}}$ I0, reference intensity, is the standard threshold of hearing intensity

1. **How does sound move through different media?**

Sound travels through media by vibrating molecules in the matter. Closely packed molecules, like in solids, transfer sound faster than loosely packed molecules, like in liquids and gases.

1. **Calculate the wave velocity of the given wave.**

$$λ=4mm$$

$f=\frac{v}{λ}$ f = 1/4 seconds v = (1/4 seconds) x 4 mm = 1 mm/second



x-axis (time in seconds)

1. **A soundwave hits a wall at a rate of 32.2 Hz.**
	1. **What is the period of the wave?**

f = 1/t t= period 32.2 Hz = 32.2 seconds**-**1

period = 1/ 32.2 seconds = .031 seconds

* 1. **Calculate the speed of the wave if the distance between wave crests is 12 meters.**

$f=\frac{v}{λ}$ λ = 12 m v = 12 m x 32.2 Hz = 386.4 m/s

1. **The speed of sound at room temperature is 346 m/s.**
	1. **What is the frequency of a wave with a wavelength of 2.5 mm?**

$$f=\frac{v}{λ}$$

λ = 0.0025 m v = 346 m/s f = 346 m/s ÷ 0.0025 m = 138400 Hz

* 1. **What is the period?**

t = period f = 1/t t = 1/138400 Hz = 7.2 x 10**-**6 seconds

1. **A quiet library has a sound intensity of 1x10-8 W/m2**
2. **Calculate the sound intensity in dB.**

$β\left(dB\right)=10log⁡\left(\frac{I}{I\_{0}}\right)$ $I\_{0}=10^{-12}\frac{watts}{m^{2}}$

$β$ = 10 log (1x10-8 W/m2 ÷ 1x10-12 W/m2) = 40 dB

1. **What is the threshold of pain?**

140 dB