v = speed
f = frequency
λ = wavelength

Hz = vibrations / second

$(f = \frac{v}{\lambda})$ $(\lambda = \frac{v}{f})$ $(v = f \cdot \lambda)$

Waves Practice Problems

1. **A wave with a frequency of 60.0 Hertz travels through steel with a wavelength of 85.5 meters. What is the speed of this wave?**

$v = f \cdot \lambda$

$v = (60.0\ Hz)(85.5\ m)$

$= 5{,}130\ m/sec.$

2. **A dolphin can typically hear sounds with frequencies up to 150,000 Hertz. What is the speed of sound in water if a wave with this frequency has a wavelength of 0.01 meter?**

$v = f \cdot \lambda$

$v = (150{,}000\ Hz)(0.01\ m)$

$= 1{,}500\ m/sec.$

3. **The lowest pitch that the average human can hear has a frequency of 20.0 Hertz. If sound with this frequency travels through air with a speed of 331 meters/second, what is its wavelength?**

$\lambda = \frac{v}{f}$

$\lambda = \frac{331\ m/s}{20.0\ Hz} = 16.55\ m$

4. **Sonar is a device that uses reflected sound waves to measure underwater depths. If a sonar signal has a frequency of 288 Hertz and the speed of sound in water is 1,450 meters/second, what is the wavelength of the sonar signal?**

$\lambda = \frac{v}{f}$

$\lambda = \frac{1{,}450\ m/s}{288\ Hz} = 5.03\ m$

5. **Cicadas produce a buzzing sound that has a wavelength in air of 2.69 meters. If the speed of sound in air is 346 meters/second, what is the frequency of the sound produced by a cicada?**

$f = \frac{v}{\lambda}$

$f = \frac{346\ m/s}{2.69\ m} = 128.62\ Hz$

6. **One of the largest organ pipes is in the auditorium organ in the convention hall in Atlantic City, New Jersey. The pipe is 38.6 feet long and produces a sound with a wavelength of about 10.6 meters. If the speed of sound in air is 346 meters/second, what is the frequency of this sound?**

$f = \frac{v}{\lambda}$

$f = \frac{346\ m/s}{10.6\ m} = 32.64\ Hz$

7. **A sunbather counts how often waves reach the shore. She determines that one wave reaches the shore every 2.3 seconds. What is the frequency of these waves?**

$f = \frac{1}{T}$

$f = \frac{1}{2.3\ sec.} = 0.435\ Hz$

8. **A speaker vibrates at a frequency of 200 Hertz. What is its period?**

$f = \frac{1}{T}$

$\downarrow$

$T = \frac{1}{f}$

$T = \frac{1}{200\ Hz} = 0.005\ sec.$