

1. Work Y&F Exercise 15.1. Sound waves have many characteristics in common with waves on a string. A sound wave, like a wave on a string, has a period T , frequency f , wave length λ , wave number k and wave speed v . The following familiar formulas also apply to sound waves:

$$T = \frac{1}{f}, \quad \omega = 2\pi f, \quad k = \frac{2\pi}{\lambda}, \quad v = \frac{\omega}{k} = \lambda/T.$$

c) What are the wave numbers of the waves in parts (a) and (b)?

2. Work Y&F Exercise 15.5. Light behaves like a wave, having the same characteristics given above, namely T , f , ω , k and v .

c) What are the wave numbers of the waves in part (a)?

3. Work Y&F Exercise 15.12.

d) Also show that the forms of eq. 15.3 in part (a) are equivalent to

$$y(x, t) = A \cos(kx - \omega t).$$

4. Work Y&F Exercise 15.14.

5. Work Y&F Exercise 15.19. This oscillator/wave system is similar to our lab setup. The system involves the *interaction* of an oscillator with a wave. The interaction may be described in terms of the power of the oscillator, which is the rate at which the oscillator does work on the string. Another way of stating this is: the power of the oscillator is the rate at which it pours energy into the wave on the string.

The power of the oscillator is calculated in terms of the force \vec{F} exerted on the string by the oscillator, and the transverse velocity \vec{v} of the string at the point of attachment. The power is given by $P = \vec{F} \cdot \vec{v}$, a formula derived in chapter 6. The formula is also used in chapter 15 to calculate the power of the wave. The power of the wave is the rate at which the wave carries the energy away from the point of attachment, in the direction of travel of the wave. In steady state, the power delivered by the oscillator is equal to the power of the wave.

f) Using the formula derived in chapter 15.5, what is the power of the traveling wave discussed in exercise 15.19?

6. Work Y&F Exercise 15.24.