Name: ___Key___

Practice – 16.9 Waves

1. Storms in the South Pacific can create waves that travel all the way to the California coast, which are 12,000 km away. How long does it take them if they travel at 15.0 m/s?

$$d = vt \Rightarrow t = \frac{d}{v} = \frac{12{,}000 \times 10^3 \, m}{15.0 \frac{m}{s}} = \boxed{8.00 \times 10^5 \, s} = 9.26 \, d$$

2. Wind gusts create ripples on the ocean that have a wavelength of 5.00 cm and propagate at 2.00 m/s. What is their frequency?

$$v = \lambda f \Rightarrow f = \frac{v}{\lambda} = \frac{2.00 \frac{m}{s}}{5.00 \times 10^{-2} \, m} = \boxed{40.0 \, Hz}$$

3. How many times a minute does a boat bob up and down on ocean waves that have a wavelength of 40.0 m and a propagation speed of 5.00 m/s?

$$f = \frac{v}{\lambda} = \frac{5.00 \frac{m}{s}}{40.0 \, m} = \frac{0.125}{s} \left(\frac{60 \, s}{1 \, min} \right) = \boxed{7.50 \frac{times}{min}}$$

4. What is the wavelength of an earthquake that shakes you with a frequency of 10.0 Hz and gets to another city 84.0 km away in 12.0 s?

$$v = f\lambda \implies \lambda = \frac{v}{f} = \frac{\frac{d}{t}}{f} = \frac{d}{tf} = \frac{(84.0 \times 10^3 \, m)}{(12.0 \, s)(10.0 \, Hz)}$$

$$= \boxed{7.00 \times 10^2 \, m}$$

5. Radio waves transmitted through space at 3.00×10^8 m/s by the Voyager spacecraft have a wavelength of 0.120 m. What is their frequency?

$$c = \lambda f \implies f = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \, \frac{m}{s}}{0.120 \, m} = \boxed{2.50 \times 10^9 \, Hz}$$