Key

Worksheet 8.1: **Universal Wave Equation**

1. A wave has a frequency of 5.0×10^{-1} Hz and a speed of 3.3×10^{-1} m/s. What is the wavelength of this wave?

$V = \lambda F$ $\lambda = \frac{V}{F}$ $\frac{0.33}{0.5}$

$\lambda = 0.66$ m

2. A wave moves through a 4.60 m slinky in 2.00 s. What is the velocity of the wave?

$V = \lambda F =$ $4.6 \times \frac{1}{2} =$ 2.3 m/s

$F = \frac{1}{t}$

3. A water wave has a wavelength of 5.0 m and a speed of 2.50 m/s. What is the period of the wave?

$V = \lambda F$ $t = \frac{1}{F}$ $2.5 = 5 \times F$ $F = 0.5$ $T = \frac{1}{0.5}$

T = 2 sec

4. If 9.5 waves break on a beach in 1.0 minute, what is the frequency of the waves?

1 min = 60 sec

$V = \lambda F$ $F = \frac{1}{t}$ $9.5 \div 60 =$ 0.1583 Hz

$\frac{1}{0.1583} = 6.3$

5. Tommy Morello is playing his guitar on a sunny day when he notices that the A string is vibrating at 220 Hz and that the wavelength of the waves on the string is 2.20 m. Determine the speed of these waves as they travel up and down the string.

$V = \lambda F$ $V = 2.2 \times 220$

$V = 484$ m/s

6. Sitting on the dock of the bay, you notice that the waves rolling under the dock measure about 1.5 m from crest to crest and appear to be traveling at about 3.0 m/s. Determine the frequency and period of these waves.

1.5m $V = 3$ m/s

$V = \lambda F$ $F = \frac{V}{\lambda} = \frac{3}{1.5} =$ F = 2 Hz

P = 0.5 sec

7. A certain radio station broadcasts radio waves that have a wavelength of 298 cm. if radio waves travel at 3.00×10^{8} m/s, what is its broadcast frequency?

0.298m $V = \lambda F = \frac{3 \times 10^8}{0.298} = 1.01 \times 10^8$

100671409 or 1.01×10^8 Hz = 101 MHz

8. Flipper (the dolphin) is out in the open ocean hunting tuna avec sonar. He emits a pulse at 22 KHz and 0.42 s later hears it echo bouncing back from a fat tuna (dolphins can get a general idea of size from these echoes). If these dolphin sound waves have a 2.0 cm wavelength, how far away is the tuna?

$V = \lambda F$ $V = 22000 \times 0.02 = 440$ m/s

$\times 0.42$

184.8 m.

$\div 2$ (there/back)

92 m

9. A hiker shouts toward a vertical cliff 685 m away. The echo is heard 4.00 s later.

a. What is the speed of sound of the hiker's voice in air?

$V = \lambda F$ $F = \frac{1}{t}$ $d = v \cdot t$

$v = \frac{d}{t}$ $\frac{685}{4} = 171$ m/s $\times 2$

= 343 m/s

b. The wavelength of the sound is 0.750 m. What is the frequency?

$V = \lambda F = \frac{343}{0.75} = 0.75 F$

F = 457 Hz

1) 0.66 m 2) 2.30 m/s 3) 2.0 s 4) 0.16 Hz 5) 484 s 6) 2.0 Hz, 0.50 s 7) 1.01×10^8 Hz or 101 MHz 8) 92 m 9) a. 343 m/s b. 457 Hz