UNIT NINE PROBLEMS

Name _____ Pd. 4

1. If a wave source produces 30 pulses every 5 seconds, calculate its period and frequency.

$f = \frac{30 \text{ pulses}}{5 \text{ sec}} = \frac{6 \text{ pulses}}{1 \text{ sec}} = 6 \text{ hz}$

$T = \frac{1}{f} = \frac{1}{\frac{6 \text{ pulses}}{1 \text{ sec}}} = \frac{1}{6} \frac{\text{sec}}{\text{pulse}} = \frac{1}{6} \text{ sec}$

2. A wave tank produces a wave every 0.25 seconds with $\lambda = 5$ cm. What is wave speed?

$T = .25 \text{ s} = \frac{1}{4} \text{ s}$ so $f = \frac{1}{T} = \frac{1}{\frac{1}{4} \text{ s}} = 4 \text{ Hz}$

$V = f\lambda = (4 \text{ hz})(.05 \text{ m}) = (4 \text{ s}^{-1})(.05 \text{ m})$

$V = .20 \text{ m/s}$

3. A 80 cm-long string fixed at both ends vibrates with a frequency of 440 Hz. Sketch the first three harmonics and calculate the wave speeds of each.

1st H $\frac{\lambda}{2} = .8 \text{ m}$ so $\lambda = 1.60 \text{ m}$ $V = \lambda f = (1.60 \text{ m})(440 \text{ hz}) = 352.0 \frac{\text{m}}{\text{s}}$

2nd H $\lambda = .8 \text{ m}$ $V = \lambda f = (.8 \text{ m})(440 \text{ hz})$

3rd H $\frac{3}{2}\lambda = .8 \text{ m}$ so $\lambda = .53 \text{ m}$ $V = \lambda f = (.53 \text{ m})(440 \text{ hz})$

$V =$

4. In an experiment to calculate the speed of sound, a 480 Hz tuning fork causes resonance in an 18 cm-long closed tube. Calculate the speed of sound.

$\frac{1}{4}\lambda = .18 \text{ m}$ $f = 480 \text{ Hz}$

$\lambda = .72 \text{ m}$ $V = f\lambda = (480 \text{ hz})(.72 \text{ m})$

$V =$

5. Calculate the fundamental frequency (1st harmonic) for an open tube of length 1.25 m. Use v = 340 m/s.

$V = f\lambda$

$\frac{1}{2}\lambda = 1.25 \text{ m}$ so $\lambda = 2.5 \text{ m}$ $f = \frac{V}{\lambda} = \frac{340 \text{ m/s}}{\frac{5}{2} \text{ m}} = 136 \text{ Hz}$