UNIT 9 PROBLEMS

NINE

Name _____

Pd. _____

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

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

$f = 6 s^{-1}$

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

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

$\lambda = .05 m$

$T = .25 s = \frac{1}{4} s$

$f = \frac{1}{T} = 4 hz$

$V = f\lambda = (4 s^{-1})(.05 m) = .20 \frac{m}{s}$

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.

.8 m

1st $.8 m = \frac{\lambda}{2}$ so $\lambda = 1.6 m$ $V = f\lambda = (440 hz)(1.6 m) =$

2nd $.8 m = \lambda$ $V = f\lambda = (440 hz)(.8 m) = 352 m/s$

3rd $.8 m = \frac{3}{2}\lambda$ $\lambda = .53 m$ $V = f\lambda = (440 hz)(.53 m) = 234.6$

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.

f

.18 m

$.18 m = \frac{\lambda}{4}$ $\therefore \lambda = .72 m$

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

$V = 345.6 \frac{m}{s}$

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

$V = f\lambda$

$1.25 m = \frac{\lambda}{2}$ $\therefore \lambda = 2.50 m$

$f = \frac{V}{\lambda} = \frac{340 m/s}{\frac{5}{2} m}$

$f = 136 hz$