

Physics 102Rec
Quiz#2
Chapter 18

10 March, 2002

Name: _____

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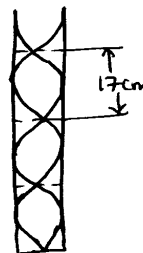
Sect: _____

1. A vibrating tuning fork is held over a water column with one end closed and the other open. As the water level is allowed to fall, a loud sound (resonance) is heard for water levels separated by 17 cm. If the speed of sound in air is 340 m/s, what is the frequency of the tuning fork?

See Figure: $\frac{\lambda}{2} = 0.17 \text{ m} \Rightarrow \lambda = 0.34 \text{ m}$

$$v = \lambda f \Rightarrow f = \frac{v}{\lambda} = \frac{340}{0.34}$$

$$\boxed{f = 1000 \text{ Hz}}$$



2. The pressure variation for a sound wave traveling in water ($\rho = 1000 \text{ kg/m}^3$) is given by

$$\Delta P(x, t) = (2 \text{ Pa}) \sin[\pi(2x - 2964t)]$$

where x is in meters and t in seconds.

- (a) Write the equation that describes the displacement of the particles in the medium.

$$S(x, t) = S_m \cos[\pi(2x - 2964t)]$$

$$S_m = \frac{\Delta P_m}{\rho v \omega} = \frac{2}{1000 * \left(\frac{2964}{2}\right) * 2964} = 4.6 \times 10^{-10} \text{ m}$$

$$\Rightarrow \boxed{S(x, t) = [4.6 \times 10^{-10}] \cos[\pi(2x - 2964t)]}$$

- (b) What is the maximum longitudinal speed of the particles in the medium?

$$u_{\max} = S_m \omega = 4.6 \times 10^{-10} * 2964\pi$$

$$\boxed{u_{\max} = 4.2 \times 10^{-6} \text{ m/s}}$$