

Phys10-2Rec
Quiz#2-Sect.22
Chapter 17

Name:

Key

Id:

The pressure variation wave describing a sound wave propagating in oxygen gas having a density of 1.42 kg/m^3 is given by $\Delta P(x,t) = (8.0 \text{ mPa}) \sin(kx - 1268t)$, where x is in meter and t in second. The speed of the wave in oxygen is 317 m/s .

Find the displacement in meters of a particle located at $x = 2.0 \text{ m}$ at the instant $t = 1.0 \text{ s}$.

$$S(x,t) = S_m \cos(kx - \omega t)$$

$$S_m = \frac{\Delta P_m}{\rho v \omega} = \frac{8 \times 10^{-3}}{1.42 \times 317 \times 1268}$$
$$= 1.4 \times 10^{-8} \text{ m}$$

$$v = \frac{\omega}{k} \Rightarrow k = \frac{\omega}{v} = \frac{1268}{317} = 4 \text{ m}^{-1}$$

$$S(x,t) = (1.4 \times 10^{-8} \text{ m}) \cos(4x - 1268t)$$

$$S(2,1) = (1.4 \times 10^{-8} \text{ m}) \cos(8 - 1268)$$

$$= \boxed{-1.36 \times 10^{-8} \text{ m}}$$