Name: _____ *Key* _____ Id: _____ Sect: _____

1. A sound wave propagating in water (ρ = 1030 kg/m^3) is described by the following pressure variation wave;

$$\Delta P = 2.2 \sin(0.833x + 1250t)$$

where x is in meter and t in second, and ΔP in N/m^2.

(a) Write the expression for the displacement wave **corresponding to this pressure wave?**

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

$$S_m = \frac{\Delta P_m}{\rho v \omega} = \frac{2.2}{(1030)\left(\frac{1250}{0.833}\right)(1250)} = 1.14 \times 10^{-9} m$$

$$\Rightarrow \boxed{S(x,t) = 1.14 \times 10^{-9} \cos\left(0.833x + 1250t\right)}$$

(b) If the sound level 3 m from the source is 60 dB, what is **the power of the source?** Assume the source emits sound isotropically.

$$I = I_o \, 10^{\frac{\beta}{10}} = 10^{-12} \times 10^{6} = 10^{-6} \, w/m^2$$

$$P = I A = I \, 4\pi r^2 = 10^{-6}\left(4\pi (3)^2\right) = \boxed{1.1 \times 10^{-4} \, w}$$