7.4 Sound Intensity

1. A typical adult ear has a surface area of 2.1×10^{-3} m^2. The sound intensity during a normal conversation is about 3.2×10^{-6} W/m^2 at the listener's ear. Assume that the sound strikes the surface of the ear perpendicularly. How much power is intercepted by the ear? (**6.7×10^{-9} W)**

2. What is the intensity in watts per meter squared of 85.0-dB sound? (**3.16×10^{-4} W/m^2)**

3. The warning tag on a lawn mower states that it produces noise at a level of 91.0 dB. What is this in watts per meter squared? (**1.26×10^{-3} W/m^2)**

4. What sound intensity level in dB is produced by earphones that create an intensity of 4.00×10^{-2} W/m^2? (**106 dB)**

5. (a) What is the intensity of a sound that has a level 7.00 dB lower than a 4.00×10^{-9} W/m^2 sound? (**8.00×10^{-10} W/m^2)**

   (b) What is the intensity of a sound that is 3.00 dB higher than a 4.00×10^{-9} W/m^2 sound? (**8.00×10^{-9} W/m^2)**

6. People with good hearing can perceive sounds as low in level as –8.00 dB at a frequency of 3000 Hz. What is the intensity of this sound in watts per meter squared? (**1.58×10^{-13} W/m^2)**

7. An 8-hour exposure to a sound intensity level of 90.0 dB may cause hearing damage. What energy in joules falls on a 0.800-cm-diameter eardrum so exposed? (**1.45×10^{-3} J)**

8. The bellow of a territorial bull hippopotamus has been measured at 115 dB above the threshold of hearing. What is the sound intensity? (**0.316 W/m^2)**