## Intensity of Sound Waves

**PROBLEM**

What is the intensity of the sound waves produced by a trumpet at a distance of 3.2 m when the power output of the trumpet is 0.20 W? Assume that the sound waves are spherical.

**SOLUTION**

**Given:** $P = 0.20$ W $\qquad r = 3.2$ m

**Unknown:** Intensity = ?

Use the equation for the intensity of a spherical wave.

$$\text{Intensity} = \frac{P}{4\pi r^2}$$

$$\text{Intensity} = \frac{0.20 \text{ W}}{4\pi (3.2 \text{ m})^2}$$

$$\boxed{\text{Intensity} = 1.6 \times 10^{-3} \text{ W/m}^2}$$

**CALCULATOR SOLUTION**

The calculator answer for intensity is 0.0015542. This is rounded to $1.6 \times 10^{-3}$ because each of the given quantities has two significant figures.

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**PRACTICE A**

### Intensity of Sound Waves

1. Calculate the intensity of the sound waves from an electric guitar's amplifier at a distance of 5.0 m when its power output is equal to each of the following values:
   **a.** 0.25 W
   **b.** 0.50 W
   **c.** 2.0 W

2. At a maximum level of loudness, the power output of a 75-piece orchestra radiated as sound is 70.0 W. What is the intensity of these sound waves to a listener who is sitting 25.0 m from the orchestra?

3. If the intensity of a person's voice is $4.6 \times 10^{-7}$ W/m$^2$ at a distance of 2.0 m, how much sound power does that person generate?

4. How much power is radiated as sound from a band whose intensity is $1.6 \times 10^{-3}$ W/m$^2$ at a distance of 15 m?

5. The power output of a tuba is 0.35 W. At what distance is the sound intensity of the tuba $1.2 \times 10^{-3}$ W/m$^2$?