

Work each of the following problems. SHOW ALL WORK.

1. A siren emits a frequency of 2,000 Hz. If an observer hears a frequency of 1,800 Hz, is the siren moving toward or away from him?

2. A car horn emits a frequency of 400 Hz in 20 °C air, at which temperature the speed of sound is 343 m/s. If the car moves toward a stationary observer at 20 m/s, what is the observed frequency of the horn?

$$f_{obs} = f_{source} \left(\frac{v \pm v_{obs}}{v \pm v_{source}} \right)$$

$$f_{source} = \underline{\hspace{2cm}} \qquad v_{obs} = \underline{\hspace{2cm}}$$

$$v = \underline{\hspace{2cm}} \qquad v_{source} = \underline{\hspace{2cm}}$$

3. The frequency of a tornado siren is 1,000 Hz. If a cyclist moves toward the siren at 10 m/s in 15 °C air, at which temperature the speed of sound is 340 m/s, what frequency does the cyclist observe?

$$f_{obs} = f_{source} \left(\frac{v \pm v_{obs}}{v \pm v_{source}} \right)$$

$$f_{source} = \underline{\hspace{2cm}} \qquad v_{obs} = \underline{\hspace{2cm}}$$

$$v = \underline{\hspace{2cm}} \qquad v_{source} = \underline{\hspace{2cm}}$$

Work each of the following problems. SHOW ALL WORK.

4. A tug boat horn emits a frequency of 250 Hz in 18 °C air, at which temperature the speed of sound is 342 m/s. If the tug boat moves away from a stationary observer at 15 m/s, what is the observed frequency of the horn?

$$f_{obs} = f_{source} \left(\frac{v \pm v_{obs}}{v \pm v_{source}} \right)$$

$$f_{source} = \underline{\hspace{2cm}} \qquad v_{obs} = \underline{\hspace{2cm}}$$

$$v = \underline{\hspace{2cm}} \qquad v_{source} = \underline{\hspace{2cm}}$$

5. A jogger runs at 9 m/s and is trailed by a bumblebee moving at 5 m/s and buzzing at a frequency of 270 Hz. What frequency does the jogger hear if the speed of sound in the air is 336 m/s?

$$f_{obs} = f_{source} \left(\frac{v \pm v_{obs}}{v \pm v_{source}} \right)$$

$$f_{source} = \underline{\hspace{2cm}} \qquad v_{obs} = \underline{\hspace{2cm}}$$

$$v = \underline{\hspace{2cm}} \qquad v_{source} = \underline{\hspace{2cm}}$$