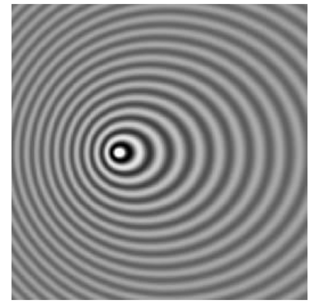
Name: ______________________________



Practice 17.4 - Doppler Effect

Equations:

$$v = 331.3\sqrt{1+\frac{T}{273.15}} \approx 331.3 + 0.606\ T \text{ m/s} \qquad f_o = f_s\frac{v \pm v_o}{v \pm v_s}$$

1. Suppose a train that has a 150-Hz horn is moving at 35.0 m/s in still air on a day when the speed of sound is 340 m/s.
   A. What frequencies are observed by a stationary person at the side of the tracks as the train approaches and after it passes?

   B. What frequency is observed by the train's engineer traveling on the train?

2. What frequency is received by a mouse just before being dispatched by a hawk flying at it at 25.0 m/s and emitting a screech of frequency 3500 Hz? Take the speed of sound to be 331 m/s.

3. A car passes through an intersection at 1.00×10^2 km/hr. If the air temperature is 20.0 °C and the frequency of the car's horn is 3.00×10^2 Hz, what change in frequency would a stationary observer notice as the car passes? **Note:** $\Delta f = f_{towards} - f_{away}$

4. Two police cars pass each other, both moving at 80.0 km/hr. The air temperature is 25.0 °C. If each car sounds its siren with a frequency 4.00×10^2 Hz, what change in frequency will be heard by each policeman as the cars pass?

5. A sound meter at a race track records the frequency of the exhaust of an approaching race car to 6.00×10^2 Hz. The actual frequency is known to be 5.30×10^2 Hz. The air temperature is 20.0 °C. How fast is the car going?

6. A sound meter records the exhaust frequency of a receding race car to be 4.00×10^2 Hz. The actual frequency is 4.50×10^2 Hz. If the air temperature is 15.0 °C, how fast is the car going?

Solutions: 1. A. 167 Hz, 136 Hz B. 150 Hz 2. 3.79×10^3 Hz 3. 48.9 Hz
4. 103 Hz 5. 40.0 m/s 6. 42.5 m/s