

First consider the situation where both the ambulance and the car are stationary. Here the sound waves emitted by the siren of the ambulance has a wave length $\lambda = \frac{v_s}{f}$, where v_s is the speed of the sound in the air and f the frequency of the sound emitted by the siren. The wave fronts of sound waves are detected by the car at a speed $v_{det} = v_s$.

Now consider the case shown where both vehicles are moving as indicated. Denote the wavelength of the sound waves in the air at the car by λ' and the speed of the wave fronts relative to the detector (the driver in the car) by v'_{det} .



Choose the correct relation.

- A) $\lambda' > \lambda$ and $v'_{det} > v_{det}$.
- B) $\lambda' > \lambda$ and $v'_{det} < v_{det}$.
- C) $\lambda' < \lambda$ and $v'_{det} > v_{det}$.
- D) $\lambda' < \lambda$ and $v'_{det} < v_{det}$.

Since the siren is moving along the direction of travel of the waves, it

compresses the waves, so $\lambda' < \lambda$.

The detector is moving along the same direction as the traveling waves.

Relative to the detector the waves travel slower.

Answer **D**

17.05-05 Ambulance Siren and Nearby Car 2004-3-24